



Adoption of Research Utility Tools Among Research Scholars in Central University Libraries of North India

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In today's world, adopting advanced research utility tools (ARUTs) for information access are essential for every research scholar to maximize digital innovation in their research work and academic field or other research domains. Now a day's researchers are recognized the power of these research utility tools in maximizing their capabilities and effectively addressing complex issues. This study explores various research utility tools, focusing on their practical applications and research scholars' perceptions of these tools, ultimately leading to the development of even more effective research tools for their benefit. This study investigated among research scholars from seven well-known Central Universities of North India who have vast experience in research utility tools. The researchers shared a structured questionnaire administrated via an online survey link on WhatsApp and email to collect data from 210 research scholars from January 15, 2026 to January 30, 2026. The descriptive statistical analysis showed a strong correlation between performance expectancy and behavioral intention ($r = 0.71, p < .01$), as similar facilitating conditions ($r = 0.67, p < .01$), effort expectancy ($r = 0.64, p < .01$), and social influence ($r = 0.52, p < .01$). These results clearly demonstrate that perceived usefulness, ease of use, social influence, and institutional support play a significant role in adoption of research utility tools in universities. The results of multiple regression analysis confirmed that performance expectancy ($\beta = 0.45, p < .001$) is the strongest predictor of behavioral intention to use research utility tools. Accordingly, effort expectancy ($\beta = 0.29, p < .001$), facilitating conditions ($\beta = 0.26, p < .001$), social influence ($\beta = 0.21, p < .001$) and this model explains (68%) of the variance in behavioral intentions ($R^2 = 0.68$), indicating the model's high explanatory power ($F = 108.72, p < .001$).

Keywords: Adoption of Research Utility Tools (ARUTs); Research Planning Management (RPM); Technology Adoption; UTAUT/UTAUT1.

1. Introduction

The growth and development of digital technologies, including Research Utility Tools (RUTs), have significantly transformed the way research is conducted in today's rapidly changing world. These research utility tools have made everything much easier and academic libraries traditionally considered repositories of knowledge are now evolving into dynamic digital hubs that effectively support researchers in research planning, literature searching, data analysis, academic writing, and scholarly communication. Similarly, research utility tools such as; online research databases tools, reference management software tools, AI-based research assistants, tools plagiarism detection systems tools, and data visualization platforms have become essential for all the researchers to enhance efficiency

and quality of their research in this modern era. The Figure 1 show that the different types of Research utility tools for researchers.

In the context of the Indian higher institutes system (HEIs), role of the central university libraries in promoting research and innovation in various field is very crucial. It is very important for all registered researchers associated with higher education learning centers engage in multiple research activities. Furthermore, utilization of effective research tools that can be facilitated by the digital resources available at central universities library in multiple courses. However, it has been observed that an availability of numerous research utility tools, there are significant difference in their usage. A major reason for research scholars being deprived of access to these research utility tools is the lack of free access.



Fig. 1 — Conceptual Framework Chart “Research Utility Tools”

(Source: Developed by the authors based on literature review and analysis of contemporary research utility tools)

This study completely depends onto evaluate the adoption of research utility tools among research scholars taken in the central university libraries of North India.

The key areas of this study include awareness level among research scholars, intention to use, purpose of using, problems faced, and limitation of tools, along with Unified Theory of Acceptance and Use of Technology (UTAUT/UTAUT2) constructs. This study found significant rules regarding implications of (ARUTs) for librarians across academic universities in India. It also including their contribution to policy development, creation of digital infrastructure for researchers and also development of library training programs. The major objective of this study is to developed guidelines for usage and adoption of research utility tools (ARUTs). It also contributes to existing knowledge about the adoption of these tools by academics and the decisions made by librarians in a manner that is likely to lead to positive change.

2. Review Of Related Litrature

Factors affecting that promote knowledge-sharing behaviours and research collaboration among academic systems and researchers were identified by Ali, Zahra, Vaidya, and Mohsin (2022). They

recognized the important role that academic social networking sites have to offer in the process of research work, which is common among researchers/scientists to evaluate the research metrics and their research performance, as well as various specialized platforms related to rankings of universities. Childress (2011) were carried out a study related to citation analysis tools (CATs) in academic libraries, including their best practices related to reference/citation managers and library instruction. The researcher felt the need to not only help users in writing citations, as librarians can suggest reference management tools like EndNote or RefWorks and emphasize the importance of reference management in the overall process of research work. Donner (2023) carried out a systematic literature review on research data management systems used within organizational processes. This study contributed that implementation policy of research data management tools systems (RDMTs) within academic research universities/institutions can present a significant impact in research sectors. Similarly, Training, education, and strategic thinking are needed to improve their organizational structure of between higher education institutions and libraries to enhance their library services profile in libraries. In this study,

some valuable information can be gathered on research data management systems, which can create an environment that can set the ground for developing an open data/science movement. Hase, Gaikwad, & Jadhav (2021) conducted a case study based on Rajaram Bapu Institute of Technology (RBIT), that are focused on the backbone of online databases for teaching and research communication. From this study, it can be highlighted that research data management systems are being utilized significantly within the higher education research process, including how research possibilities can be classified and disseminated to wider audiences. From that particular study can be concluded with the power of social media marketing and various user services for users are being conducted, disseminating the academic profile of institutions/universities. Maurya and Subaveerapandian (2022) both are carried out a survey-based study for concerning experiences of Asian library and information science (ALIS) faculties in practice of research data conservation and preservation in libraries. According to results obtained in the online survey, majority of the LIS faculties members have their enough expertise and knowledge in practices of curating and preserving research data sets. However, they also want to access more services from their library in core areas of data discovery, preservation, knowledge sharing/dissemination, and data visualization in the academic institution where they teaching. Moreover, findings also revealed that it could be based on purely research output idea that if one is equipped with enough expertise in scientific and technical areas, they can easily avoid plagiarism in the academic field. Finally, findings could also be based on idea that can included use of plagiarism detection tools makes the act of writing in the research field effective. Teixeira da Silva (2020) presented the issues of research scholars with regard to the academic objectives, role, and application of Open Researcher and Contributor ID (ORCID) for research integrity. This study provides an opportunity to identify specific scholarly communication activities related to individual and collective initiatives and co-operations in research section, such as analytical research or other field output, fundings and publications. This research mainly issues cited by some author seem to be related in their academic freedom and unfair treatment of those without ORCID. They include inconsistent application of ORCID by co-authors of the research. The empty

ORCID entries must be filled with adequate information and hence are an indicator of the misuse of ORCID by incorporating fictitious data. ORCID majorly defined as a digital identifier for researchers' outputs that connects with published research works by individual researchers its own, attribute content correctly and help others locate them relevantly in effective & significant manner.

3. Aims And Objectives Of The Study

This study mains aims & objectives are to explore factors influencing the adoption of research utility tools (ARUTs) using the Unified Theory of Acceptance and Use of Technology (UTAUT) model:

1. To assess level of awareness in using research utility tools (ARUTs) among research scholars.
2. To identify most frequently used categories of research utility tools and their intended to uses.
3. To analysis the effects of UTAUT core constructs on research scholars' behavior in using research utility tools.
4. To explore the various benefits and functions of research utility tools for users.
5. To know the problems and challenges/shortcomings associated with research utility tools.

4. Scope And Limitations Of The Study

The present study targeted on adoption, awareness, and usage patterns of research utility tools among research scholars in central university libraries in North India. The restricted range of research utility tools includes that literature search and discovery platforms, online research databases, reference management tools software, AI-based tools and technologies, plagiarism detection tools, research writing and editing tools, and data analysis tools. Additionally, the study also embraces the (UTAUT/UTAUT2) model for analyzing the performance expectancy, effort expectancy, social influence, and facilitating conditions that influence the behavioral intention of research scholars. There are several limitations of this study. First, the data is gathered from a limited number of central universities in North India, so generalizability might be affected in other geographical regions or for types of higher education in India. The study also depends on self-reported users' responses, that are open to response bias in nature. Moreover, a systematically organised survey despites that perceptions and usage patterns at a single moment and cannot changes over time. This

study excluded deep analysis of subject-specific research tools and qualitative insights.

5. Methodology Of The Study

The present study follows a descriptive and analytical research design to examine the adoption and usage of research utility tools among research scholars in central universities of North India. It involved systematic data collection through a structured questionnaire, appropriate sampling techniques, and statistical analysis of data using descriptive and inferential statistical methods. Reliability testing, correlation analysis, one-way ANOVA, and multiple regression analysis were employed to analyze the data and test the proposed relationships based on the UTAUT/UTAUT2 model.

Research Design

This study involved a cross-sectional survey design that is to be evaluated the level of awareness, frequency of use, and adoption behavior of research utility tools among research scholars. Descriptive statistics were used to analyze demographic characteristics, awareness levels, and usage patterns, while inferential statistics were applied to examine differences across age groups and to determine the influence of UTAUT constructs Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC) on behavioral intention to use research utility tools.

Population and Sampling

The population used were consisted of research scholars studying in seven prominent central universities libraries of North India (BHU, DU, JNU, BBAU, AMU, JMI and CUPB). A purposive sampling technique were implemented to select those respondents actively engaged in research activities in universities. A total of 210 valid responses were collected for one-way ANOVA and regression testing.

Instrumentation

Primary data were collected through a structured valid questionnaire developed on the basis of an extensive expert review of related literature under (UTAUT/UTAUT1) framework model. The questionnaire comprised the following sections:

- Demographic information (gender, age group, and university affiliation)
- Awareness and frequency of use of research utility tools
- Categories and purposes of research utility tools
- UTAUT/UTAUT2 constructs: Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, and Behavioral Intention

The instruments were reviewed by subject experts (Supervisor) and refined to ensure clarity, relevance and content validity.

Data Collection Procedure

The data were collected from period 15 January 2026 to 30 January 2026 using both online as well as offline mode. Respondents were completely informed about purpose of the study and they were purely voluntary. Moreover, the confidentiality of the collected responses was maintained and only complete valid questionnaires used for conducting in final analysis.

Reliability and Validity

To established the reliability measurement scale (Table 1), Cronbach’s alpha was used for validated questionnaire, This CB alpha test indicated that strong reliability for all constructs where alpha value of 0.88. The validity was supported through Pearson correlation and regression analysis for confirming the relationships between UTAUT core construct variables. The valid statistical techniques (Descriptive Statistics, Pearson correlation, one-way ANOVA, and multiple regression analysis) were used to ensure qualitative findings.

Table 1 — Reliability and Validity Test for UTAUT Core Construct

Construct	No. of Items	Cronbach’s Alpha
Performance Expectancy (PE)	5	0.87
Effort Expectancy (EE)	4	0.83
Social Influence (SI)	3	0.79
Facilitating Conditions (FC)	4	0.81
Behavioral Intention (BI)	3	0.85
Overall Scale	19	0.88

(Source: Developed by the authors based on literature review and analysis of contemporary research utility tools)

Table 2 — Demographic Information of Respondents (n=210)

Demographic Variable	Category	Frequency (n)	Percentage
Gender	Male	138	65.71 %
	Female	72	34.29 %
Age Group	21-25	22	10.48 %
	26-30	120	57.14 %
	Above 30	60	32.38 %
	Babasaheb Bhimrao Ambedkar University, (Gautam Buddha Library), Lucknow	46	21.90 %
	Banaras Hindu University, (Sayaji Rao Gaekwad Central Library), Banaras	30	14.29 %
	University of Delhi (Central Reference Library), New Delhi	39	18.57 %
	Central University of Punjab Bhatinda, (Dr. S.R Ranganathan Library), Bhatinda	25	11.90 %
	Jamia Millia Islamia, (Dr. Zakir Husain Library), New Delhi	11	05.24 %
	Jawaharlal Nehru University, (Dr. B.R Ambedkar Library), New Delhi	21	10.00 %
	Aligarh Muslim University, (Maulana Azad Library), Aligarh	38	18.10 %
TOTAL		210	100%

(*Source: Data based on primary survey data (N = 210))

Ethical Considerations

The study followed established academic research ethics:

- Participation was voluntary, anonymous, and confidential.
- No personally identifiable information was collected.
- Respondents were informed about the purpose and their right to withdraw at any stage.
- Data were used solely for academic and research purposes.

6. Data Analysis And Interpretation

6.1 Demographic Information

The demographic data, including education level, respondents' age, and gender, are major phenomena that lead to any research's core area (Table 2).

As shown in Table 2, Out of the 210 participants, 138 (65.71%) were male respondents and 72 (34.29%) were female respondents, it is clearly indicated that male respondents are more than female respondents in the sample population. Additionally, a majority of 120 (57.14%) respondents belonged to the 26–30 years age group, while only 22 respondents (10.48%) were in the 21–25 years category and

remaining 60 respondents (32.38%) were above 30 years of age. In terms of academic affiliation, the highest number of responses came from Babasaheb Bhimrao Ambedkar University (BBAU), Lucknow 46 (21.90%), followed by University of Delhi (DU), 39 (18.57%) and Aligarh Muslim University (AMU), 38 (18.10%). Other participating universities, included Banaras Hindu University (BHU), 30 (14.29%), Central University of Punjab Bhatinda (CUPB), 25 (11.90%), Jawaharlal Nehru University (JNU), 21 (10.00%), and Jamia Millia Islamia (JMI), 11 (5.24%). Overall, the demographic distribution of institutions confirms that this study covers a diverse and mature group of research scholars, making the findings relevant and reliable for understanding the adoption of research utility tools in central university libraries of North India.

6.2 Awareness and Usage of Research Utility Tools (RUTs)

In this modern internet age, most of the researchers are used various types of research utility tools for enhance their ability to present research findings, collaborative study with colleagues and disseminate a valid information. These research utility tools are crucial for all types of research communication.

Table 3 — Awareness and Usage of Research Utility Tools (n=210)

Statement	Category	Frequency	Percentage
Are you aware of research utility tools used for academic and research activities?	Yes	210	100 %
	No	00	00
Level of Awareness	Highly Aware	166	79.05 %
	Moderately Aware	28	13.33 %
	Slightly Aware	16	07.62 %
	Total	210	100 %
Do you use research utility tools in your research work?	Yes	210	100 %
	No	00	00
Frequency of Use of Research Utility Tools	Daily	110	52.38 %
	Weekly	56	26.67 %
	Occasionally	30	14.29 %
	Rarely	14	06.67 %
	Total	210	100 %

(*Source: Data based on primary survey data (N = 210))

Table 3 below shows that the percentage of research scholars who are aware of these research utility tools and the frequency with which they use them.

In Table 3, indicate that all (Research Scholar) respondents 210 (100%) reported being aware of research utility tools used for academic and research activities. This finding reflect that research utility tools have become an integral part of the contemporary research landscape in central universities. Similarly, majority of (Research Scholars) respondents 166 (79.05%) are highly aware of (ARUT), while 28 (13.33%) are moderately aware, and only 16 (7.62%) are slightly aware of research utility tools. Findings Regarding actual usage, all (Research scholars) respondents 210 (100%) confirmed using research utility tools in their research work, so it's indicating that complete adoption among the surveyed scholars. Furthermore, the frequency of use, more than half of the (Research Scholars) respondents 110 (52.38%) indicated that daily use, followed by 56 (26.67%) use these tools weekly and a smaller group of research scholars uses them occasionally 30 (14.29%) or rarely 14 (6.67%).

6.3 Purpose of usage and Ranking of Research Utility Tools among Research Scholars

This research has involved valuable research utility tools for researchers. Now's a day, academicians, researchers, teachers, and students use of different intelligent/innovative smart tools (AI-Enabled research tools) are to perform their research functions early and smoothly. Adoption of research utility tools (ARUTs) are essential to enhance academic and learning activities in the research environment. The

intelligent usage of Research Utility tools affects the research activity. The usage of different applications of intelligent/innovative research utility tools are totally depends on the research activity (Such as data collection, analysis, collaboration, and data organization). In Table 4: showed that different Research Utility tools to enhance the researcher works and their functions.

In Table 4, highlighted that literature search and discovery platforms emerged as the most frequently used category 186 (88.57%) respondents reporting their use, and securing the first rank. This data shown that the crucial role of these tools in identifying and accessing literature for academic research activities. Similarly, online research databases followed by second rank 179 (85.24%) respondents select this option, plagiarism detection software tools at third rank with 172 (81.90%) respondents, that reflecting the strong emphasis placed by universities on access to authentic academic content and academic integrity. Similarly, research writing and editing software, 164 (78.10%) respondents were select and reference management software 158 (75.24%) respondents showed high usage, that indicated research scholars' need for relevant academic writing and citation management tools for research. The usage level of AI/AI-based research utility tools 141 (67.14%) respondent were selected and citation generators 149 (70.95%) respondents were moderate for suggesting a growing but still developing adoption of intelligent research support tools for researchers. In contrast, data visualization tools 14 (39.52%) and survey and questionnaire tools 92 (43.81%) ranked lowest,

Table 4 — Category-wise Usage Pattern and Ranking of Research Utility Tools

Research Utility Tool Category	Purpose of Use	Frequency	Percentage	Rank
Research Planning & Management Tools	Planning, scheduling, and managing research tasks	98	46.67 %	12
Note-Taking & Organization Apps	Organizing notes, ideas, and references	132	62.86 %	8
Literature Search & Discovery Platforms	Identifying relevant scholarly literature	186	88.57 %	1
Online Research Databases	Accessing peer-reviewed journals and theses	179	85.24 %	2
Reference Management Software	Managing references and citations	158	75.24 %	5
AI / AI-Based Smart Tools	Literature review support, summarization, idea generation	141	67.14 %	7
Survey & Questionnaire Tools	Collecting primary research data	92	43.81 %	13
Data Analysis & Statistical Software	Data analysis and statistical interpretation	117	55.71 %	10
Data Visualization Tools	Visual representation of research data	83	39.52 %	14
Research Writing & Editing Software	Writing, editing, and language improvement	164	78.10 %	4
Citation Generators	Automatic generation of references	149	70.95 %	6
Reference & Citation Checkers	Verification of citation accuracy	121	57.62 %	9
Plagiarism Detection Software	Checking originality and similarity	172	81.90 %	3
Academic Social Networks	Academic networking and collaboration	109	51.90 %	11

(*Source: Data based on primary survey data (N = 210))

Table 5 — Correlation Matrix among UTAUT Constructs (Adoption of Research Utility Tools)

Construct	PE	EE	SI	FC	BI
Performance Expectancy (PE)	1				
Effort Expectancy (EE)	0.68**	1			
Social Influence (SI)	0.54**	0.49**	1		
Facilitating Conditions (FC)	0.62**	0.59**	0.46**	1	
Behavioral Intention (BI)	0.71**	0.64**	0.52**	0.67**	1

(*Source: Data based on primary survey data (N = 210))

indicating limited engagement with advanced analytical and primary data collection tools.

6.4 Relationship among UTAUT Constructs Influencing Adoption of Research Utility Tools

This section examines the relationships between the key constructs of the UTAUT model that influence the adoption of research utility tools among research scholars in a central library in North India. The correlation matrix shown in Table 5 illustrates the relationships between performance expectancy, effort expectancy, social influence, facilitating conditions, and behavioral intention. Similarly, the conceptual relationships between these constructs are depicted in Figure 2, that providing a comprehensive understanding of the factors driving adoption behavior.

In Figure 2 and Table 5, above shows the acceptance rate of research utility tools among respondents. Performance Expectancy (PE) received the most favourable response, with (40.00%) of respondents agreeing and (39.05%) strongly agreeing that these research utility tools enhance both the efficiency and productivity of research and simplify the researcher's work. This is further supported by a

strong and significant correlation with behavioral intention ($r = 0.71, p < 0.01$), which is considered the most influential factor in adopting PE. Similarly, Effort Expectancy (EE) received a positive response from research scholars, (43.33%) of respondents agreeing and (30.96%) respondents strongly agreeing that these research utility tools were easy to use. A significant correlation observed that Behavioral Intention (BI) ($r = 0.64, p < 0.01$), indicated that ease of use significantly influences the decision to adopt research utility tools. Despite moderate agreement in Social Influence (SI) (39.05% of respondents agreed; 25.72% of respondents strongly agreed), a slightly higher proportion of neutral responses was observed (21.90%), although its correlation with Behavioral Intention (BI) ($r = 0.52, p < 0.01$) still made it significant within the research context. Facilitating Conditions (FC) emphasized the role of university support, with (42.38%) of respondents agreeing and (30.95%) of respondents strongly agreeing, and also showed a strong correlation with Behavioral Intention (BI) ($r = 0.67, p < 0.01$). Overall, Behavioral Intention (BI) received the most positive responses (43.81% of respondents

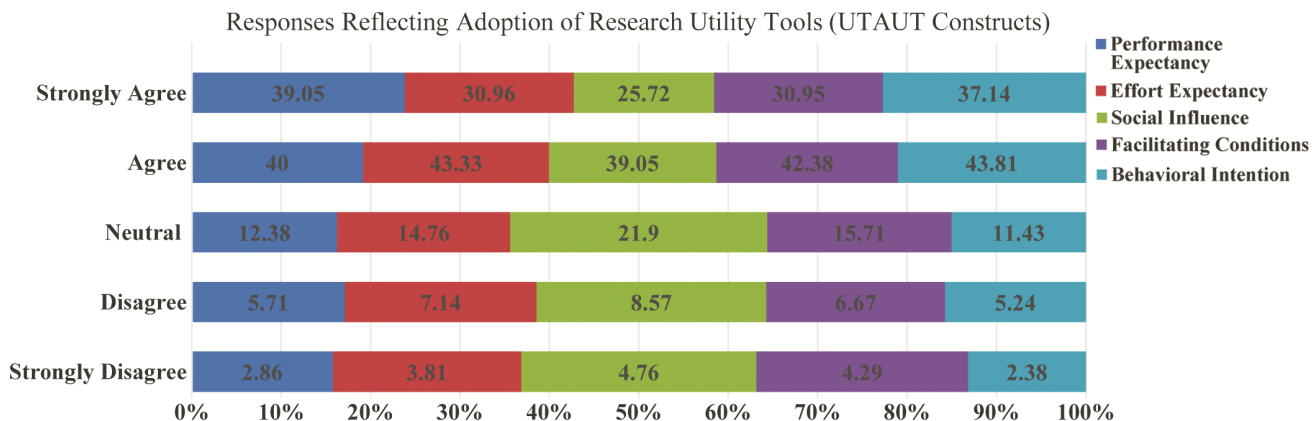


Figure 2: Adoption of Research Utility Tools (UTAUT Constructs) By Respondents
(Source: Authors' calculation and visualization based on primary survey data (N = 210))

Table 6 — One-Way ANOVA between Age Group and Usage of Research Utility Tool

Source of Variation	Sum of Squares	df	Mean Square	F-value	Sig.
Between Groups	6.84	3	2.28	5.76	0.001
Within Groups	81.52	206	0.40		
Total	88.36	209			

(*Source: Data based on primary survey data (N = 210))

agreed; (37.14%) of respondents strongly agreed), clearly demonstrating a strong intention among scholars to continue using the research utility tools.

7. Hypotheses of This Study

H1: There is a statistically significant difference in the usage of research utility tools among research scholars across different age groups.

H2: Performance Expectancy significantly and positively influences the behavioral intention of research scholars to adopt research utility tools.

NOTE: Both hypotheses are tested using one-way ANOVA and Regression Analysis.

The results of the one-way ANOVA indicate a statistically significant and substantial difference in the use of research utility tools across different age groups ($F = 5.76, p = 0.001$), thus supporting H1. This finding confirms that age plays a significant role in shaping scholars' adoption and use of research utility tools.

In the Table 7 and Table 8, the multiple regression analysis reveals that Performance Expectancy ($\beta = 0.45, t = 8.40, p < 0.001$) is the strongest predictor of Behavioral Intention, thereby supporting H2. The overall regression model is highly significant ($F = 108.72, p < 0.001$) and explains 68% of the total variance ($R^2 = 0.68$) in the adoption of research utility tools, indicating strong model fit and high explanatory power.

The statistical findings confirm that both hypotheses are strongly supported. Age group significantly affects the usage pattern of research utility tools, while Performance Expectancy emerges as the most influential predictor of Behavioral Intention.

8. Usage Of Research Utility Tools In Research Communication: Problems And Challenges

In the modern age, researchers are using a variety of research utility tools, which further develop their capabilities of publishing findings and shared information. These tools are very crucial for facilitating research communication for research scholars but they also present both problems and limitations. This overview explores the landscape of research tools, (Table 6 and Table 7) highlighting the opportunities, problems and limitations they present.

In above Table 9 and 10, illustrates that the main primary problems and limitations faced by research scholars in Adopting Research Utility Tools (ARUTs). Regarding the main problems, 134 (63.81%) respondents cited a lack of awareness of advanced features as one of the primary major issues. followed by 121 (57.62%) respondents mentioned high subscription or licensing costs, and 118 (56.19%) respondents reported difficulty in choosing the right tools. Similarly, a lack of advanced technical skills

Table 7 — Multiple Regression Analysis Predictors of Behavioral Intention toward (ADRTs)

Predictor	B	Std. Error	β	t-value	Sig.
Performance Expectancy (PE)	0.42	0.05	0.45	8.40	< .001
Effort Expectancy (EE)	0.31	0.06	0.29	5.17	< .001
Social Influence (SI)	0.18	0.04	0.21	4.50	< .001
Facilitating Conditions (FC)	0.24	0.05	0.26	4.80	< .001
R ²	0.68				
Adjusted R ²	0.67				
F-value	108.72				< .001

(*Source: Data based on primary survey data (N = 210))

Table 8 — Results of Hypothesis Testing

Variables (H1/H2)	Hypothesis	Statistical Test	Key Statistics	Result
H ₁	There is a significant difference in the usage of research utility tools among research scholars across different age groups.	One-Way ANOVA	F = 5.76 p = 0.001	Accepted
H ₂	Performance Expectancy significantly influences the Behavioral Intention to adopt research utility tools.	Multiple Regression	β = 0.45 t = 8.40 p < 0.001	Accepted

(*Source: Data based on primary survey data (N = 210))

Table 9 — Problems Faced by Research Scholars in the ARUTs

Problems	Frequency	Percentage
Lack of advanced technical skills	96	45.71 %
Difficulty in selecting appropriate tools	118	56.19 %
Limited awareness of advanced features	134	63.81 %
High subscription or licensing cost	121	57.62 %
Data privacy and ethical concerns	87	41.43 %
Inadequate institutional training/support	102	48.57 %
Compatibility issues across platforms	74	35.24 %
Overdependence on tools affecting critical thinking	69	32.86 %

(*Source: Data based on primary survey data (N = 210))

Table 10 — Limitations/Shortcomings Faced by Research Scholars in the ARUTs

Limitations/Shortcomings	Frequency	Percentage
Limited access to premium databases/tools	138	65.71 %
Inconsistent internet connectivity	91	43.33 %
Lack of discipline-specific tools	84	40.00 %
Insufficient training programs/workshops	129	61.43 %
Steep learning curve of advanced tools	111	52.86 %
Limited integration between different tools	97	46.19 %
Language and interface-related barriers	66	31.43 %

(*Source: Data based on primary survey data (N = 210))

affected 96 (45.71%) respondents. In terms of limitations (shortcomings), maximum of respondents chose limited access to premium databases and tools was the biggest obstacle, reported by 138 (65.71%) respondents. Furthermore, 129 (61.43%) respondents followed by inadequate training programs and workshops and the steep learning curve of advanced tools with 111 (52.86%) respondents highlighting the need for better training and infrastructure support.

8. Major Findings Of This Study

The Major key findings in this study are as follows:

- **Awareness and Adoption:** All the respondents, i.e., 210 (100%) knew and used research utility tools, showing complete adoption of these tools into academic research.
- **High Frequency of Usage:** The majority of research scholars 110 (52.38%) frequently used research utility tools on daily basis. Similarly, 56

(26.67%) respondents are weekly exhibited high rates of using digital tools.

- **Most Preferred Tool Categories:** A majority of respondents selected Literature search and discovery platforms 186 (88.57%), online research databases 179 (85.24%), and plagiarism detection software 172 (81.90%) as the most frequently used tools, emphasizing the need for information retrieval as well as the prevention of plagiarism.
- **UTAUT Model Validation:** Performance Expectancy (PE), showed a correlation of ($r = 0.71$) and ($\beta = 0.45$) are ranked highest as a key factor affecting behavioral intention (BI). The other key factors were Facilitating Conditions (FC), ($\beta = 0.26$), Effort Expectancy (EE), ($\beta = 0.29$), and Social Influence (SI), ($\beta = 0.21$). A regression ($R^2 = 0.68$) is revealed that the analysis had a high explanatory value.
- **Age-based Differences:** There were significant differences found in research utility tool usage across age groups were observed ($F = 5.76$, $p = 0.001$). So, Its confirming that demographic factors influence adoption behavior.
- **Key Problems and Limitations:** In this study major challenges included limited awareness of advanced features 134 (63.81%), high subscription costs 121 (57.62%), limited access to premium databases 138 (65.71%), and insufficient training programs 129 (61.43%).
- **Institutional Role:** There are strong correlations between Facilitating Conditions (FC) and Behavioral Intention (BI) ($r = 0.67$) illustrated that critical role of institutional infrastructure, training, and policy support in adoption of these research utility tools.

9. Conclusion

This present study reflects comprehensive analytical evidence regarding the Adoption of Research Utility Tools (ARUTs) and their use by research scholars in central university libraries of North India; which are purely based on the (UTAUT/UTAUT1) framework. The research findings reveals that all research scholars were aware of these Research Utility Tools, and according to valid responses, very high adoption of 210 (100%) was reported, reflecting how research utility tools (RUTs) have deeply embedded into contemporary academic research practices. Further, performance expectancy appeared to be the strongest predictor of

behavioral intention, followed by effort expectancy, facilitating conditions, and social influence, confirming that perceived usefulness, ease of use, institutional support, and peer influence together determine scholars' adoption behavior. The regression model explained 68% ($R^2 = 0.68$) of the variance, thereby showing the robustness and applicability of the UTAUT model in an academic research environment. Along with, there are significant differences in usage of research utility tools (RUTs) across different age groups highlighted, the role of demographic factors in technology adoption are totally perfect and feasible for research scholars. Indeed, this research has shown that a high subscription rate, limited awareness of advanced features of the applications, high subscription costs, and inadequate training are still some of the major challenges users face.

10. Future Scope Of This Study In Research

The future scope of these studies can provide perhaps be expended by increasing the sample size of studies by including respondents from different regions across the country/world. Also, choosing different types of higher education institutions/universities (like Central, Deemed and Private) in this study can gain more insights into the phenomenon of technology adoption. In future studies, longitudinal studies may prove to be more helpful in understanding changes in the pattern of technology adoption as well as behavioral changes among the sample population. Furthermore, focused on some qualitative measures of study like interviews and focus group discussions, it can be more profitable, deeper insights into the thoughts, motives, and problems faced by respondent's research scholars. How AI technology can affect the quality of the research conducted can perhaps be one of the dimensions for future studies. A cross-national study may prove to have more value with respect to gaining insights into international best practices as well.

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