

Use of E-resources for Improving Scholarly Output and Academic Progress: Perceptions of Faculty Members and Researchers in Bangladesh



Doctor of Philosophy

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Use of E-resources for Improving Scholarly Output and Academic Progress: Perceptions of Faculty Members and Researchers in Bangladesh



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CERTIFICATE

It is certified that the work entitled **Use of E-resources for Improving Scholarly Output and Academic Progress: Perceptions of Faculty Members and Researchers in Bangladesh** was carried out by Sabrina Aktar under my supervision.

(Dr. Md. Shiful Islam)

Supervisor

To
My Parents
&
Family

[The soul behind my inspirations]

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Progress: Perceptions of Faculty Members and Researchers in
Bangladesh

DECLARATION

I hereby declare that the thesis titled **“Use of E-resources for Improving Scholarly Output and Academic Progress: Perceptions of Faculty Members and Researchers in Bangladesh”** is my original work. The information collected and used for this study from various sources have been appropriately referenced.

Furthermore, I affirm that I have not previously submitted this thesis to any university or for any degree.

Registration No: 33

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Signature:

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List of Abbreviations and Acronyms

AACR2	— Anglo-American Cataloguing Rules, Second Edition
ANOVA	— Analysis of Variance
ALA	— American Library Association
AJOL	— African Journals OnLine
ASNS	— Academic Social Networking Sites
BRUR	— Begum Rokeya University, Rangpur
BOU	— Open University of Bangladesh
CUET	— Chittagong University of Engineering & Technology
CU	— Chittagong University
E-RESOURCE	— Electronic Resource
ERs	— Electronic Resources
EIRs	— E-resources
ER	— E-resource
E-BOOK	— Electronic Book
DSpace	— Digital Repository System
DOAJ	— Directory of Open Access Journals
DVD	— Digital Versatile Disc
DU	— University of Dhaka
CD-ROM	— Compact Disc-Read Only Memory
CU	— University of Chittagong
CUET	— Chittagong University of Engineering and Technology
CSIR-IGIB	— Council of Scientific and Industrial Research Institute of Genomic and Integrative Biology
E-conference proceedings	— Electronic Conference Proceedings
E-data	— Electronic Data
E-Journal	— Electronic Journal
E-learning	— Electronic learning
FM	— Faculty Members
E-zine	— Electronic Magazine

ETD	— Electronic Theses and Dissertations
E-thesis	— Electronic Thesis
E-print	— Electronic Print
E-reports	— Electronic Reports
EL	— E-learning
FUNAAB	— Federal University of Agriculture, Abeokuta
HTML	— Hyper Text Markup Language
HINARI	— HINARI stands for Health InterNetwork Access to Research Initiative
ICT	— Information Communication Technology
ICDDRDB	— International Centre for Diarrhea Disease Research, Bangladesh
IFLA	— International Federation of Library Associations and Institutions
JSTU	— Jessore Science and Technology University
JSTOR	— Journal Storage
Koha-ILS	— Koha Integrated Library System
LIS	— Library and Information Science
LSS	— Learning Support Systems
MS Teams	— Microsoft Teams
MANOVA	— Multivariate Analysis of Variance
NU	— National University
NSTU	— Noakhali Science and Technology University
OCLC	— Online Computer Library Center
SEM	— Structural Equation Modelling

OER	— Open Educational Resources
OPAC	— Online Public Access Catalogue
PC	— Personal Computer
PDF	— Portable Document Format
PEOU	— Perceived Ease of Use
PhD	— Doctor of Philosophy
PRQ	— Primary Research Question
RTF	— Rich Text Format
RU	— University of Rajshahi
RS	— Research Students
RQ	— Research Question
SRQs	— Subsidiary Research Questions
SEM	— Structural Equation Modelling
SPSS	— Statistical Package for Social Sciences
SAU	— Sylhet Agricultural University
TAM	— Technology Acceptance Model
UDL	— UGC Digital Library
UGC	— University Grants Commission
UTAUT	— Unified Theory of Acceptance and Use of Technology
Wi-Fi	— Wireless Fidelity
WWW	— World Wide Web
WebCT	— World Wide Web – Course Tool

Abstract

Purpose: This study aims to explore the perceptions of faculty members and researchers in public universities of Bangladesh about e-resource usage for scholarly output and academic progress. The specific objectives are to assess the current state of e-resource access and usage, perceptions, and evaluation of the Impact of e-resources on scholarly output and identify the challenges.

Methodology: The study used a quantitative research approach to analyze the perceptions and practices regarding e-resource usage of faculty members and research students in public universities in Bangladesh. Data were collected through two different semi-structured questionnaires for two distinct groups that were developed and refined with a pilot survey to ensure clarity and reliability. Clusters for faculty members and research students were selected using purposive sampling techniques to ensure representation across various disciplines and demographic groups from ten universities. The analysis included descriptive and inferential statistics, such as frequency, percentage, ANOVA, MANOVA, and correlation, to examine patterns, relationships, and perceptions of e-resource utilization. Ethical considerations, including informed consent and data confidentiality, were strictly followed to uphold the integrity of the research process.

Findings: The study reveals that faculty members and research students at public universities in Bangladesh actively use e-resources for various academic and research purposes, with notable differences across disciplines and age groups. Faculty members frequently utilize ERs to write research articles, conduct project work, and prepare teaching materials, while research students rely on these resources primarily for thesis work and coursework. Science and Engineering disciplines demonstrate higher ER usage compared to Arts. Despite intermediate to advanced digital literacy among users, limited access to full-text documents, slow internet, and inadequate training hinders optimal usage. The respondent perceived the urgent need for improved infrastructure, targeted training, and increased access to vital databases as critical measures to enhance ER utilization and support academic progress.

Conclusions: This research highlights the significant impact of ERs on the respondents of public universities in Bangladesh. Faculty members utilize these resources effectively,

enhancing their research output and productivity. However, research students show lower engagement, indicating a need for better access and support. The study also reveals disparities in ER usage across disciplines and demographic groups, emphasizing the importance of addressing these inequities. To maximize the benefits of ERs, universities should improve technological infrastructure, provide comprehensive training, and develop user-friendly support services. By focusing on these initiatives, institutions can strengthen the research capabilities of both faculty and students, fostering a dynamic academic culture for the entire university community.

Originality/ Value: The perceptions in scholarly output and academic progress i.e. the insights and views of faculty members and researchers in Bangladesh regarding ERs is original in nature.

Keywords: E-resources, Online Resources, Scholarly Databases, Scholarly Output, Academic Progress, Perceptions, Academic productivity, public universities, Faculty members, Researchers, Ban

Chapter One: Introduction

1.1 Background of the study

In the era of digital innovations, the process of knowledge acquisition has been profoundly transformed, making learning more efficient, accessible and engaging. Worldwide, most universities and academic institutions have significantly invested in e-resources (ERs), in essence, the modern scholarly activities and academic works have changed quite radically. ERs refer to any electronic resources that can be accessed through a computer or digital device and include a collection of data, information or content, which may be available in visual or textual formats. “Electronic resource is defined as any work encoded and made available for access using a computer” (Library of Congress, 2016). According to Baskaran and Prasad (2019), an ER collection is a systematic compilation of data organized for preservation in an electronic format and accessible on smartphones, laptops, tablets, and e-readers. ERs include E-books, E-journals, Databases, E-Thesis, E-zine, Websites, Open Educational Resources (OER) and other electronic object, all in academia, that are readily available and accessible for use by the end-user; these ERs can disseminate in different views, forms, and topics. ERs are an integral part of the educational system. These resources serve scholarly output among students, academics, and researchers. ERs have various advantages over print resources, such as quick and easy access, especially for retrospective searches. Most academics and researchers have consumed and reproduced such content, making ERs increasingly essential in the research system. With the help of ERs, information can be disseminated to anyone anywhere in the world. These ERs change today's scientific and educational landscape, encompass the entire spectrum of information practices. Today, researchers and academician not only use and access to ERs but also to engage deeply with information, analyze data and generate the new knowledge in similar ways. The cycle begins with reading ERs and concludes with publishing new content in ER formats. The ERs provides ease of accessing, storing, sharing, and reuse, making them fundamental to academic pursuits. Consequently, the academic world has recognized the paradigm; this changes in the methodologies of educational and research activities is significantly influencing these processes (Hashim et al., 2021).

ERs are pivotal in distance learning because they provide up-to-date information, self-directed learning, clear user guidance, user-friendly interfaces, and fast access to academic literature, that support better learning (Anyim, 2021). This has, therefore, become very popular because large volumes of data can hold on a single electronic device for easy storage and retrieval by the user in convenient ways (Buba, Abubakar, & Lawal, 2019). In addition, devices and networks like library OPAC, databases, discovery services, and subject portals enhance usability of these resources. These ERs augment and bolster the academic and intellectual production of researchers and academics (Habiba & Ahmed, 2020). ERs are gradually becoming more important compared with print acquisitions (Swaminathan & Raja, 2017). In the higher education system, scholars often face issues, like they have to acquire and retrieve their required and relevant information in a short time, to grasp concepts effectively for deeper and better understanding and to enhance their comprehension of courses, subjects, and overall academic learning. According to Ali et al., 2017, the availability of required information in electronic format is supposed to facilitate improved access to relevant information for scholars. To meet the needs of scholars and academicians, academic libraries across the globe are focused on acquisition, preservation, disseminate and access of ERs.

The availability of ERs in a library, according to Bachalapur and Manjunatha (2022), can thus assist users in finding sources that match their needs. Through these efforts, ERs contribute to enhancing patrons' perceptions of their effectiveness, relevance and experience (Issa et al., 2023). The availability of ERs in academic and research libraries is highly important. It is due to this reason that the libraries should move forward in their mission and objectives especially in this digital era where the ERs are majorly the central library collections. A study conducted at Landmark University by Aregbesola and Oguntayo (2014) observed that most faculty members make use of ERs for different academic and scholarly purposes. The finding of previous study demonstrates ERs' acceptance and integration into the academic environment, reflecting their importance in the institution's teaching, research, and other scholarly activities. The use of ERs among faculty members and researchers in Bangladesh is pivotal for enhancing scholarly output. The most commonly utilized ERs from Academic Social Networking Sites (ASNSs) namely Google Scholar, ResearchGate, and specialized databases like HINARI, which have been shown to positively influence research productivity and academic performance. The use of ERs correlates with higher academic output, with studies

indicating 67% impact on research productivity (Rafi, JianMing, & Ahmad, 2019). Despite the growing usage of ERs, studies consistently identify access issues and dissatisfaction as major challenges.

Bangladesh has made remarkable advancements in integrating digital technologies across various sectors, particularly in education, health, services given its status as a developing country. This evolution provides valuable insights into the impact of digital technologies on educational practices, research methodologies, and overall academic development within the country. University Digital Consortium (UGC-UDL) stands out as a pivotal facilitator, ensuring accessibility and serving as a cornerstone for the educational development and scholarly research in Bangladesh. Its role is in consolidating ERs and fostering collaboration among participating institutions in shaping the academic landscape. Given the importance of these resources and effectiveness, it is essential to study their usefulness, accessibility and perception, as they directly affect scholarly output and academic activities in higher education in Bangladesh, particularly for faculty members and researchers.

The faculty members and researchers at different universities are of the invaluable assets of the Bangladesh academic frontier that have contributed significantly in various ways that ensure academic advancement and innovation. This study explores the perceptions of ERs and their significant impact on scholarly outputs and academic activities as perceived by faculty members and researchers in Bangladesh. This research aims to uncover insights that can further increase the utilization and effectiveness of ERs, finally contributing to the advancement of academic pursuits and research initiatives in the region. The research findings aim to offer comprehensive guidance to policymakers and educators, aiding them in effectively integrating educational resources into academic settings and developing targeted policies and practices to enhance the overall quality of education. It becomes essentials to carry out a comprehensive evaluation of ER usage from the researcher's and faculty member's perspective given the fast-paced academic environment.

Even though Bangladesh's academic libraries have commendably taken steps toward digitization, challenges persist that are problems to the best usage of ERs. For instance, faculty members' dissatisfaction with limited titles and restricted access to old issues (Ahmed, 2013) underlines the need for more comprehensive collections that meet users' academic and research needs. Besides, insufficient IT infrastructure, slow access to the Internet, and scarcity

of computers continue to create significant issues for effective utilization of digitized resources (Islam & Habiba, 2015). Libraries are overcoming these challenges; however, decreasing budgets and demands on continuous capacity-building processes test these institutions (Rahman, Rahman, & Chowdhury, 2015). The dedication of the library professionals towards advancing the management of ERs is a positive indication of a better future awaiting academic libraries in Bangladesh, despite these challenges. Strategic and collaborative digitization can help nurture resource-sharing networks in a way that modern technology complements traditional library services. Addressing infrastructural limitations, ensuring sustainable funding, and providing ongoing training are essential for supporting faculty members and research students in their academic pursuits as libraries adapt to rapidly evolving technology. The findings of the research suggest that the experiences and knowledge gained from public universities in Bangladesh, including strategies used to overcome challenges related to educational resources and digital proficiency, can offer valuable insights for developing nations facing similar challenges.

1.2 Problem statement

ERs have revolutionized the academic landscape, playing a crucial role in research, teaching, learning, and knowledge dissemination. These ERs provide access to vast information repositories, foster collaboration, and enable innovation, significantly transforming traditional academic practices (Faustino & Kaur, 2023). Despite their potential, several challenges hinder the effective use of ERs by faculty members and research students in universities in Bangladesh. The following issues highlight the research problem:

The first limitation relates to the general lack of thorough understanding of how faculty members and research students engage in research, using the ERs to enhance their academic productivity and maximize scholarly output within public universities.

Secondly, the users face restricted accessibility to use these resources. Therefore, these aspects contribute to poor adoption and integration of ERs into the academic workflow, for instance, may prevent institutions or users from subscribing and accessing full text ERs.

Thirdly, faculty members and researchers face challenges such as limited access to ERs infrastructural limitations, technological barriers, and insufficient institutional support. Additionally, disparities in usage can arise based on factors like age, academic rank, field of study, and institutional affiliation, which need to be addressed to ensure fair access and engagement

Fourthly, systemic and institutional challenges related to unequal funding, inadequate digital infrastructure, and lack of strategic planning at universities are resulting in increased inequalities in access to and use of ERs. With the evidence at hand, institutions should be in a better position to formulate policies that would align with user needs and keep pace with technological developments. This study is supposed to investigate these issues in a systematic manner and present evidence-based recommendations to help improve ER access, enhance training, revise policies, and address digital infrastructure gaps. The study eventually led to increased academic and research productivity in line with the national vision of Smart Bangladesh.

1.3 Objectives of the study

This study aims to examine the patterns of ER usage among faculty members and research students in public universities in Bangladesh, with an emphasis on their impact on enhancing scholarly output and academic growth. The study therefore has made an all-encompassing evaluation of patterns of use of ERs, their impact on research output, and users' assessment regarding the effectiveness of ERs. This study has reviewed the challenges in integrating ERs into academic and research workflows and suggested specific solutions for improving their application.

The specific objectives of the study are:

1. To assess the current scenario of the usage and access to ERs in public universities of Bangladesh for academic and research purposes;
2. To analyze the variation in the use of ERs across demographic information such as academic discipline and age;
3. To evaluate the impact of ERs on research productivity, quality of publications, and overall academic works;
4. To investigate the perceptions of the respondents on ER usage in terms of accessibility, effectiveness, utilization, and cost-effectiveness;
5. To recognize challenges faculty members and researchers face in using ERs for integrating ERs into public universities in Bangladesh;

1.4 Research questions

To achieve the above aim and objectives, this study has formulated one major research question (MRQ) and five subsidiary research questions (SRQs) to guide the research.

MRQ: How do faculty members and researchers at public universities utilize ERs and perceive the role of ERs in enhancing their scholarly outputs?

SRQ1: What is the current state of ER usage and access at public universities in Bangladesh?

SRQ2a: How does the use of ERs vary across different academic disciplines and respondent types in various public universities in Bangladesh?

SRQ2b: Is there a significant relationship between the utilization of ERs and the age demographic of faculty members and research students?

SRQ3: How do ERs impact the research output, publication quality, and academic activities of the respondents in public universities?

SRQ4: What are the perceptions of faculty members and research students about the accessibility, effectiveness, utilization, and cost-effectiveness of ERs?

SRQ5: What challenges do faculty members and research students face in accessing and effectively using ERs into their scholarly activities?

1.5 Significance of the study

The study is significant because it addresses a vital topic in academia; how ERs can serve to enhance teaching, scholarly output in general. In this era, information resources are key to academic success. The educational institutions should be offering the access of ERs to enhance quality of learning and meet the need of required information, in research and academic purpose. ERs provide a wealth of scholarly resources; their success depends on researchers and academicians having the efficiency to widely access and use these resources efficiently and effectively. The study tends to present the perspectives of academics and researchers in Bangladesh, a developing nation that has restricted access to both ERs and infrastructure; however, it is something developing nations are finding increasingly crucial for their growth. It is important because the study looks at how these resources are used effectively and are accessible in public universities in Bangladesh. Understanding the current state of ER utilization will make it easier to recognize potential obstacles like restricted access, low digital literacy, and institutional constraints that affect ER utilization. Based on the responses from the academic staff, this study also examines their levels of digital literacy and areas where training in and support for technology should be enhanced and purposes of users to explore performance of ERs. This research has significance on the basis that it could contribute to the usage of ERs in academic environments, with special regard to the public universities in Bangladesh. This study tries to fill this gap by providing an understanding of how faculty members and research students in Bangladesh use ERs and the influence of such resources on their academic work and research productivity. Significant contributions of the study include:

15.1 Enhancing understanding of ER usage patterns: The study reveals the pattern of usages of ERs across different disciplines, it provides valuable data on the current status of ERs access and utilization in higher education system in Bangladesh. This is important for university administrators, policymakers, and library professionals to understand the implementation levels of ERs and identify areas that need improvement.

15.2 Evaluating Impact on productivity of scholars: One of the objectives of this research is to examine the impact of ERs on scholarly output, including publications, research activities, and overall academic progress. Understanding this relationship helps to demonstrate the

benefits of ERs in improving academic work and how they can be leveraged to enhance the quality and quantity of scholarly contributions from faculty members and research students

1.5.3 Informed policy development and UGC guidelines: The research findings will be useful to the UGC and the other governing bodies in the country, like development of UGC policies regarding ERs provision and digital access. Beyond this, the findings may also support the UGC in its efforts to help improve access to academic content, which is considered a precondition for developing a research-based academic culture in our country through UDL.

1.5.4 Strengthening library resource acquisition and infrastructure: Recommendations based on the study will be helpful for university libraries to enhance their digital infrastructure and allocating budget in improving access of quality ERs. Identification of gaps in acquisition and access to ERs will help libraries improve their procurement strategies so that access to relevant and updated research materials is provided smoothly to faculty members and students. Additionally, it may also guide the investment in library infrastructure to support the effective use of ERs.

1.5.5 Facilitating consortium planning: A significant aspect of this study contributed to the establishment of resource-sharing through consortia among university libraries. By understanding the similar challenges universities face in procuring and accessing ERs, universities can come together to establish consortia for sharing resources, getting better deals with publishers, and sharing expensive ERs. This will go a long way toward improving the availability and accessibility of ERs among institutions, especially in resource-poor settings.

1.5.6 Addressing the utilization barriers of ERs: The study will hence be able to provide a set of recommendations that will help faculty members and research students overcome the barriers in the use of ER like limited access, infrastructure, and training. Recommendations would alter the effectiveness of ERs and add to their impact on scholarly pursuits. Most importantly, these recommendations will contribute to policies aimed at overcoming infrastructure deficits and digital literacy.

1.5.7 Contributing to the literature: The contribution of this study will add to the pool of literature on ERs in higher education, specifically in developing countries. This will contribute

to the increasing body of global discourses on the best ways through which ERs can be integrated into academic systems, especially within environments that pose unique challenges.

1.5.8 Supporting capacity building in higher education: Given the in-depth analysis provided by this research of using ERs at the level of public universities of Bangladesh, the set of data will help through insightful lessons that can enable efforts pertaining to capacity-building; determining what needs to be initiated toward strengthening institutional infrastructures for better faculty-student use and toward sustainability of programs based on ERs.

1.5.9 National academic advancement: Integrating ERs within the research and academic environment could thus promote more innovative and high-quality research work across Bangladesh. This will help evidence a wider process of uplifting the academic and research setup in the country for greater compatibility with national aspirations relating to educational and technological development.

The study's significance extends beyond Bangladesh, offering valuable insights for other developing countries facing similar challenges in integrating ERs into their education systems. By examining the experiences of Bangladeshi public universities, the study provides recommendations for improving ER usage, resource allocation, and digital infrastructure. Policymakers and academic leaders will now have the potential to integrate better policies to ensure effective improvements in access to ERs, strengthening the technological infrastructure, and implementation of training programs for digital literacy.

The results of this study go beyond catering to immediate Bangladeshi academic needs to providing insight to inform policies in other nations regarding how best to update educational systems through strategic ER integration. Moreover, the research will have an added advantage of helping improve the broader educational ecosystem in Bangladesh on issues such as policy, library resource acquisition, and consortium planning to achieve a digitally empowered and research-driven academic environment at all.

1.6 Scope of the study

This study investigates the use of ERs by faculty members and research students and their perspectives, in public universities in Bangladesh, considering how these resources contribute to improving scholarly output and academic progress. The scope of this study is defined by several key dimensions: geographic focus, target population, the range of ERs considered, and the academic outcomes being investigated. The following elements outline the scope of this research:

1.6.1. Geographic focus: This study is conducted in ten public universities of Bangladesh. This therefore encompasses those falling under the UGC, and are quite relevant for carrying out such research on the use of ERs within the country.

1.6.2 Target population: The target population of this present study is faculty members and research students (both at postgraduate and doctoral researcher) in selected public universities. Faculty members are key users of ERs meant for research, teaching, and publication, while on the other hand, the research students are considered very important in understanding the utilization of ERs on academic research and writing their thesis/dissertations. Both groups have differential needs and experiences with regards to ERs, each making them important to investigate.

1.6.3 Type of ERs: A wide range of ERs were studied, including but not limited to online journals, e-books, databases, digital repositories, and other academic materials accessible either through university libraries or external platforms. These materials are considered indispensable in academic research, teaching, and publication; they form the backbone of intellectual production.

1.6.4 Use pattern and accessibility: It finds out the way in which research students and faculty members utilize and access these resources. This includes investigating frequency, preferred type, use of ERs, sources utilized to get ERs, and others. In the present study, various disciplines were also compared concerning how they access and utilize the ERs and, more interestingly how demographic factors (such as age, academic position, and discipline) influence the use of these resources.

1.6.5 Influence of ERS use on research productivity and academic progress: This research will quantify the effect ERs have on scholarly output in regard to research production and academic productivity. The study shall test whether the ERs increases publication, improves quality, and rises academic productivity amongst faculty members and research students. Furthermore, the study will analyze how the tools enhance both teachers and research students academically on pedagogic and learning enhancement.

1.6.6 Perceptions and attitudes: The study reveals the perceptions in the use of ER with regard to availability, accessibility, and utility by faculty members and students engaged in research. Also, it determines attitudes toward using ERs-advantages and challenges experienced in an effort to outline barriers in the effective use of ERs and, further, to provide insights into user perceptions influencing the adoption of ERs.

1.6.7 Barriers to effective use: The study investigates the challenges that faculty and research students face in accessing or using ERs. These may be infrastructural issues, including internet connectivity, lack of technical support, or insufficient training on how to use ERs effectively. Such identification will provide valuable information to improve the integration of ERs into academic workflows in Bangladesh.

1.7 Study framework and mapping

The study framework and mapping of the study presents the overall structure of the study, from chapters' aims to expected outcomes. It shows the research's general structure, which links each chapter's objective to its sources, methods, and expected results. The framework ensures that the study of ERs in academic settings is carried out in a simple and organized way, from examining previous studies to developing final ideas.

Table 1.1: Study framework and mapping

Chapters	Chapters' aims	Sources	Mechanisms	Expected Outcomes
Chapter One: Introduction	To present Background of the study, statement of the research problems, and why significant the study.	Journal, Articles, Books, government publications and Secondary Sources.	Literature review and content analysis of policy documents, institutional guidelines, and reports.	Understanding of research background and objectives that lead the study.
Chapter Two: Literature Review	To review existing relevant literature on ERs and identify the gap of literature.	Journal articles, books, conference proceedings, reports, thesis/dissertation etc.	Thematic analysis and synthesis of key findings.	Explored knowledge gaps and understanding the state of study on ERs.
Chapter Three: Research Methodology	To present the design of the study, sampling methods, ways of gathering data, and data interpretation approach.	Similar types of research, and globally recognized research design.	Designing a clear, structured framework for data collection and analysis.	Structured methodology supervised data collection from respondents and to show the data scientifically.
Chapter Four: Data Analysis & Presentation	To analyze data and presentation with tables, charts and figures.	Statistical Software (SPSS), MS Excel.	Analyze the data using statistical methods to uncover patterns and trends, Present the results following APA guidelines.	Final analysis of ER usage, perception and challenges of the FMs and RSs.

Chapter Five: Discussion and Key findings	To Discuss the result and major findings and compare with previous studies.	Relevant previous study that conducted in different developing country.	Critically compare the study's findings and identify patterns, similarities, and differences in the results.	A deeper understanding of the key findings, supported by relevant theories and concepts.
Chapter Six: Recommendations and Conclusion	To provide implication, limitations, recommendations and conclusion of the study.	Perceived knowledge from the study.	Summarize the study's contributions and significance, concluding with a reflection on its overall impact.	Implication of the research, and future direction with conducting the study.

1.8 Operational definitions

In the research, several research terms are either explicitly stated or implied. The following are different research terms that are relevant to the study:

1.8.1 E- Resources

ERs has broadly been defined as, a wide range of digital materials, information accessed by a computer and others electronic devices (Finch, 2015). ERs refer to a broad category of digital materials that facilitate access to information and promote educational and research activities. These are the resources that have proved to be vital in the academic, public, as well as special libraries. These can be classified into types according to format, access, and purposes.

1.8.2 E-books and E-journals

E-books are the digital version of books accessible through any device, whereas e-journals are the electronic forms of academic journals accessible online. According to Meghan (2015), digital books and digital-format academic journals allow for easy access and reading on any device. E-books and e-journals are accessible at any time and location, making it easier for

users to study and be educated (Sohail, Siddiqui, & Ali, 2018). These ERs enhance academic efforts by allowing access to various information and increasing learning efficiency in the modern knowledge environment (Diens, Wahyudin, & Mulyadi, 2022). E-journals are primarily available online, often as PDFs, which allows for the dissemination of scholarly output more widely than traditional printed journals (Webber, 2005).

1.8.3 Databases

Databases are organized collections of data that provide efficient, easy access, preservation, and retrieval. They are the foundation of contemporary information systems and facilitate numerous applications across multiple domains, including academic research, clinical treatment, and corporate intelligence (Finch, 2015). Databases often have subject-specific information organized in tables with rows and columns, rendering them effective instruments for handling substantial data volumes (Plummer, 2023).

1.8.4 Digital Libraries

Digital libraries are organized collections of ERs, including audio, video, and text, that are designed to be efficiently retrievable (Bharathy, 2015). Digital libraries are online storage facilities that provide access to a variety of ERs. They allow for information retrieval and knowledge dissemination, whereby the user can access resources at any time and from any location using the internet. The concept of digital libraries has transformed the traditional services of libraries, making them more efficient and accessible to users (Abinowi et al., 2024).

1.8.5 Electronic Theses and Dissertations (ETDs)

ETDs are digital versions of academic theses and dissertations submitted by researchers after finishing their research work. Over the past two decades, ETDs have become the prime technique for producing, submitting, distributing their work, via digital institutional repositories (Banerjee et al., 2022). Digital scholarly works contribute significantly to academic knowledge (Finch, 2015).

1.8.6 E-learning

E-learning resources include interactive tools and platforms that increase knowledge experiences by offering multimedia tutorials, online courses and virtual settings (Kasymaliev, Ibraev, & Ongarbaeva, 2023). Platforms such as MS Teams and Zoom provide interactive

learning spaces in a structured way where scholars can be involved in real-time collaboration, discussions, collaborative projects, and interactions with mentors, fostering a consistent knowledge group (Kononenko et al., 2022). Virtual simulators allow learners to practice and refine skills in a safe, controlled environment, bridging theoretical knowledge with practical application. This approach is particularly valuable in fields where hands-on practice is essential but may be limited by access to resources or safety concerns. E-learning resources effectively break barriers in traditional learning processes. They allow students to learn at their own pace and within their environments and these support flexible and accessible education for diverse learners (Kasymaliev, Ibraev, & Ongarbaeva, 2023).

1.8.7 Websites and Portals

Platforms with various information and services, often designed to meet the needs of academic or research users (Levin, 2017). The following sections present the web portal characteristics in light of recent studies. Web portals allow effective dissemination of information, such as city management data and environmental resources, which is conducive to sustainable development (Rasskasova, 2022).

1.8.8 Academic Social Networking Sites (ASNS)

ASNS have emerged as pivotal platforms for enhancing research communication and collaboration among scholars. ASNSs help in the dissemination of knowledge, professional networking, and the building of academic identities. Different dimensions related to the use of ASNS are described below. Google Scholar and ResearchGate, these are two frequently used channels for information and networking for researchers (Habiba & Islam, 2022).

1.8.9 Scholarly Output

The most prestigious forms of scholarly work include peer-reviewed journal articles and books, especially in the specific field. Different types of outputs are valued differently in different academic fields. However, most are still lacking formal recognition of the non-traditional outputs of the review processes, therefore limiting diverse scholarly contributions (Alperin et al. 2022).

1.8.10 Academic Progress

This term academic progress refers to the students' progression into their respective programs, which assessment policies can affect (Kickert, et. al., (2021). In this paper, academic progress involves in educational achievements and research contributions made by faculty members and researchers in their respective fields. This includes vital educational experiences such as completing coursework, publishing papers in journals, attending conferences, having research funds, and working with other researchers on projects. The study explores how ERs improve scholarly outcomes and academic progress by gaining knowledge, improving access to high-quality resources, and encouraging research productivity.

1.8.11 Faculty Members

Faculty members are tasked with delivering lectures, preparing course materials, and mentoring students, which requires significant time and effort (Apaydin, 2012). In this study, the term "Faculty Members" describes to university teachers holding various academic designations, including Junior Lecturer, Lecturer, Senior Lecturer, Assistant Professor, Associate Professor, and Professor. Faculty Members play a vital role in academic and research activities, encompassing teaching, curriculum development, mentoring, and scholarly research. To represent this Respondents, different terminologies such as Academicians, Academics, Faculty Members, and Teachers are used interchangeably throughout the study.

1.8.12 Researchers

In this study, "Researchers" refers to postgraduate research students (PGRs) who adopt the roles of Research Students (RS), comprises Master's students (Thesis Group), MPhil candidates, and PhD scholars from selected public universities in Bangladesh. As Cairns (2023) highlights, Post Graduate Research students (PGRs) embody multiple identities, including that of a researcher, junior scholars that influences their personal, academic and research lives. To better capture the dynamic nature of their roles, we utilize a spectrum of terminologies, including Research Students (RSs), Early Researcher, and Research Scholars.

1.9 Structure of the study

This research is structured into six comprehensive chapters, each chapter focusing on a distinct aspect of the research. The chapters are as follows:

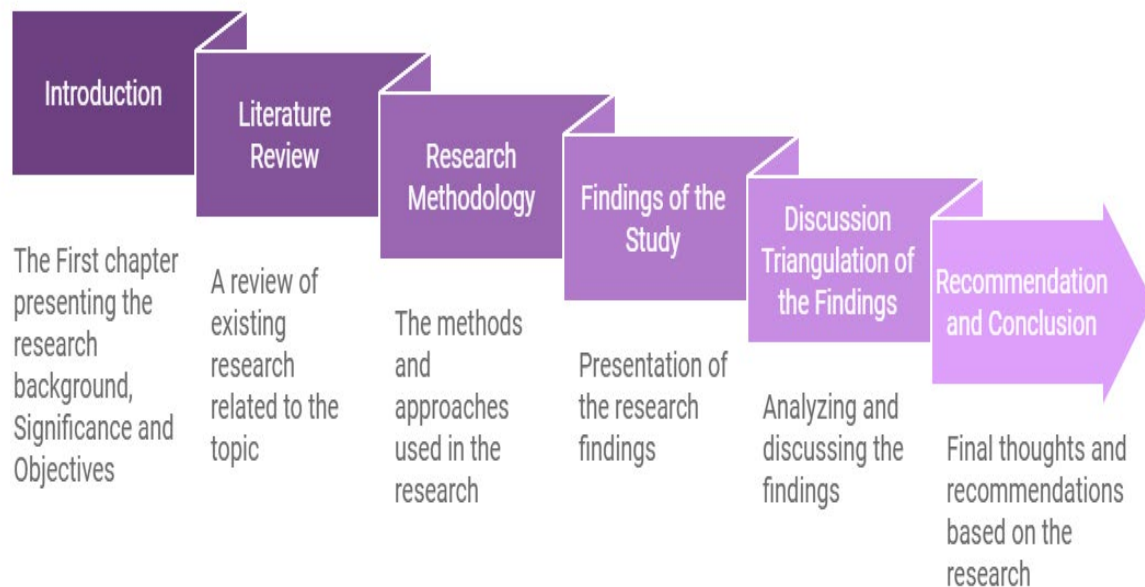


Figure 1.1: Structure of the Study

Chapter One: This chapter provides the study's background by contextualizing and framing the research problem, highlighting its scope, and significance. It defines the research objectives and guiding questions, shaping the study's direction. Operational definitions of key terms and concepts are included for clarity and precision. Finally, a structured thesis blueprint is presented, outlining each chapter to ensure coherence and understanding.

Chapter Two: This literature study investigates how ERs could improve academic growth and research output. The assessment focuses on how trends of use and applications influence the performance of academics in their works while addressing issues on students' and teachers' challenges in research studies, including their organizational and technological difficulties. The

evaluation also indicates deficiencies in the body of knowledge within the realm of investigation.

Chapter Three: This chapter describes the research methodology regarding the type of study design, population, sample techniques used, research region or any particular geographic location, and pilot survey. It also discusses how the data were collected, including the types of surveys, piloting, and final implementations of the survey. This section also explains the instruments and methods used in conducting the data analysis and refers to ethical issues regarding upholding the integrity of this study and adherence to moral principles.

Chapter Four: This chapter presents the findings of the data analysis, which start with the demographic profiles of Faculty Members (FMs) and Research Students (RSs), go through the ERs that each group used, and end with the comparison analysis. Major issues to be dealt with include demographics, types and frequency of ER use, advantages, attitudes, difficulties, and suggestions pertaining to using them. This chapter explains in details both the differences and similarities of FMs and RSs in their use and view about ER through descriptive and inferential data that present the variables which influence the interaction of these respondents with the said resources. The presentation, clarity, and understanding are enhanced by the use of tables, figures, and charts.

Chapter Five: This chapter presents a detailed discussion of the research findings about the research question, highlighting key findings and their significance in the broader context of the study. It integrates relevant views the researchers and academics expressed, highlighting their divergent and shared experiences with ERs. The chapter places the findings in the larger academic discourse by connecting them to more general literature and theoretical frameworks. It also shows the contribution of this study to the field of research and the possible ramifications for subsequent research and practice.

Chapter Six: This chapter summarizes the study's implications and consequences, especially as they pertain to academics, methods of research, and policy making. It also goes further to make some pragmatic suggestions on how better ERs use can be affected, especially for academics and institutions, while pointing out the pitfalls of the study, such as methodological limits and possible biases. Further avenues of study could support ongoing scholarly development and creativity.

1.10 Chapter summary

The chapter starts with an overview of ERs in the contemporary academic environment, with their crucial role of providing access to information and supporting research work. It outlines the problem statement, proposing one MRQ and five SRQs which further explore the different dimensions of ER utilization. This section highlights the significance of the research, particularly in the current context and for a developing country like Bangladesh. Besides that, ERs in the higher education context are considered crucial, particularly in Bangladesh, since access to quality information are useful to enhance academic growth and development. It completes with the description of some key terminologies and the structure of the research.

Chapter Two: Literature Review

2.1 Introduction

The literature review is one of the most fundamental academic practices, which links new research with previous studies. It helps to provide scholarly information and increasing knowledge within the subject area. This chapter synthesizes the contemporary studies on e-resources (ERs) and develops a scientific framework for the study. It thus points out the significance of ERs in improving academic productivity and scholarly output while considering perspectives related to ERs utilization. The chapter includes definition of ERs and conceptual development, accessibility and usage of ERs, focusing the impact of ERs on research output and academic endeavors and problems related to accessing these resources. It provides a crucial analysis of previous literature to inform similar findings, unresolved challenges, and indicates knowledge gaps that present research attempts to fill. This chapter highlights that faculty members, researchers, and postgraduate students depend on ERs as the core contributors to scholarly work. It also examines some vital issues relating to technological infrastructure, institutional support, and digital proficiency to present a general perspective of the factors that affect the adoption and usage of ERs.

This synthesis is instructive for the study as it investigates the views held by academic communities in Bangladesh and other countries especially about enhancing scholarly contribution through adequate utilization of ERs. ERs play a crucial role in highlighting the growth of technology acceptance and its consequences in the academic landscape for future learning and research. A meticulous analysis of prior research is crucial for contributing to the ongoing dissertation and the progression of knowledge, whether included within a broader study or studied alone. It also makes the knowledge understandable and meaningful to others (Pautasso, 2019; Snyder, 2019). The literature review is an analytical overview of research findings on a particular issue (Pati & Lorusso, 2018). According to Hossain, Akhter, and Sultana (2022), the literature review is a core part of the research process and substantially enhances almost every operational phase. This also indicated that the purpose of a literature review is to provide a theoretical framework for the most important results of previous studies and to outline gaps where further research may be needed. The development of ERs starting in the

late 1990s opened a whole new world of possibility for academic communities by allowing access to vast repositories, streamlining research methods, and fostering inter- and multi-disciplinary and regional collaborations. This literature review critically analyses various forms of literature, including books, journal articles, research reports, conference proceedings, and case studies. This wide-ranging collection of work helps explain the history, challenges, and prospects of ERs within the academic environment. This study was focused on academic research communities because faculty members, research researchers, and postgraduate students are the most frequent and dependent patrons of ERs in public universities of Bangladesh. In addition, these organizations are usually accountable for producing a sizeable amount of scholarly knowledge, making them indispensable for understanding the actual value of ERs.

2.2 Search strategy in previous work review

A well-structured search strategy ensures that relevant, high-quality literature is identified on which to base the review. It involves defining the search terms, appropriately selecting databases, and applying inclusion and exclusion criteria.

2.2.1 Keywords and Search Terms

The search uses applicable keywords, including:

- *E-resources, electronic resources, digital libraries*
- *Research productivity, academic research*
- *Faculty members, research students and ERs*

This study used Boolean operators namely AND, OR, NOT to combine terms or refine the results e.g., "ERs" AND "research productivity"

2.2.2 Databases and Information Sources

A broad range of databases and information sources facilitate academic study by offering access to peer-reviewed articles, conference proceedings, reports, and other educational materials. In this study, relevant databases include Google Scholar, JSTOR, and ERIC. These

sources provide access to academic publications in the journals, conference proceedings and reports on the use of ERs within academia.

2.2.3 Inclusion and Exclusion Criteria

This study followed certain inclusion and exclusion criteria to ensure the collected data were relevant, reliable, and valid. It was designed cautiously in line with the objectives and the scope of participants, resources, or studies that would be analyzed.

Table: 2.1 Inclusion and exclusion criteria for the study

Inclusion	Exclusion
Peer-reviewed articles published between 2014 and 2024 focused on the impact of ERs on academic research and the perceptions of faculty and research students, with theoretical insights and definitions derived from prior studies. N.B.: Furthermore, our study incorporates insights from earlier scholarly works, including research publications up to 1989, to support theoretical frameworks, conceptual definitions, and related information.	Non-peer-reviewed sources. Publications not relevant to the academic scope or those about other fields of learning.

The literature review, therefore, identifies several challenges and factors related to ERs, including technological challenges, user perceptions of their usefulness and usage trends, and how they are made accessible. Influencing factors for the effective utilization of ERs relate to infrastructure availability, the user's ability in information literacy, and institutional support systems. Secondly, there are many discussions about the implications of ERs regarding the time efficiency and productivity of research collaboration among academic communities. Many studies reveal how ERs may improve time efficiency by enabling researchers to keep current with the most recent advancements in their domains, accelerate their research process, and rapidly access large materials.

The literature reviewed for this study is organized into the following key categories:

- **Theoretical Framework**
- **Conceptual Framework**
- **Definition and Evolutions of ERs**
- **Access and Usage of ERs**
- **Impact of ERs on Scholarly Output and Academic Progress**
- **Perceptions of Faculty members and Research students**
- **Challenges in using ERs**

The search results are separated by reviewing abstracts, titles, methodologies, and geographical presentation and then include reviewed studies aligned with the study's objectives. The limitations are language barrier, availability of full-text articles, and publication bias. Thus, these factors are considered during the review process.

2.3 Theoretical framework

The use and adoption of ERs have become increasingly crucial in the contemporary academic environment for augmenting scholarly productivity and supporting educational advancement. The rapid evolution of digital technologies has brought faculty members and research students a plethora of ERs with enormous potential to improve the quality of research, learning, and academic output. Yet, the adoption and proper use of such resources are influenced by a range of psychological, social, and institutional factors. However, a wide range of psychological, social, and institutional factors influence the acceptance and appropriate utilization of such services.

The theoretical framework of the study, informed by established technology acceptance models, examines perceptions that drive the use of ERs among faculty members and research students. The Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology provide the base to build users' perceptions concerning accessibility, quality of the content, usefulness, and cost-effectiveness in driving their adoption and use of ERs. These theories give an insight into the factors that affect technology adoption: perceived ease of

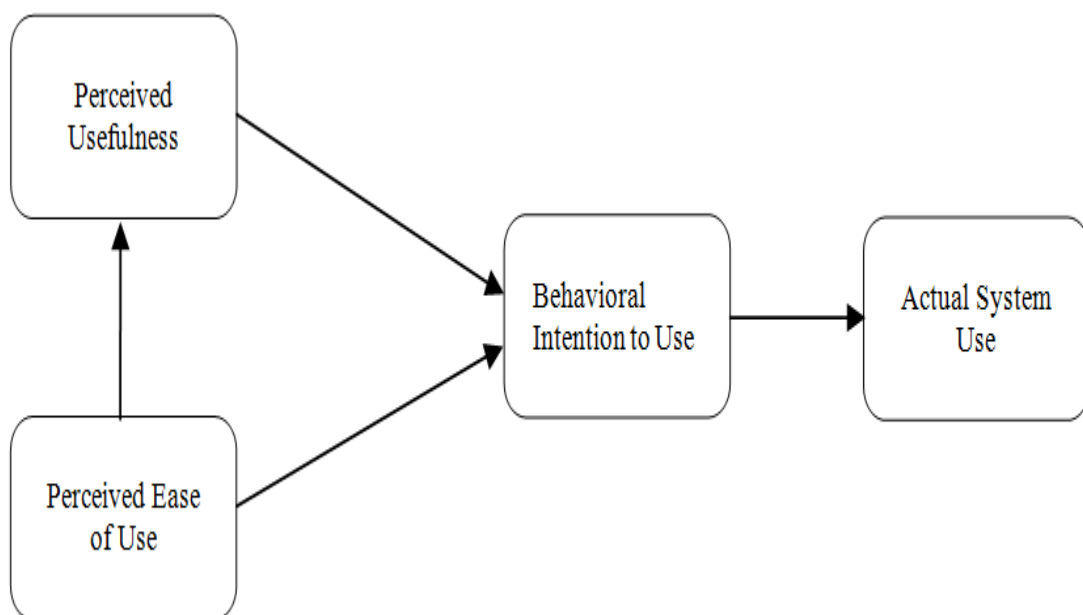
use, perceived usefulness, and other external variables such as social influence and facilitating conditions.

2.3.1 Technology Acceptance Model (TAM)

The theoretical basis for understanding the adoption and use of ERs among FMs and RSs is the Technology Acceptance Model, TAM, proposed by Davis in 1989. According to TAM:

2.3.1.1 Perceived Usefulness: This signifies to what degree the users perceived that ERs enhance academic work and productivity. It will directly impact the perception of usefulness and shape the decision concerning using ERs.

2.3.1.2 Perceived Ease of Use (PEOU): The degree to which users think using ERs is free of effort. This influences the Perception of Accessibility; the more manageable the access, the greater the usage.

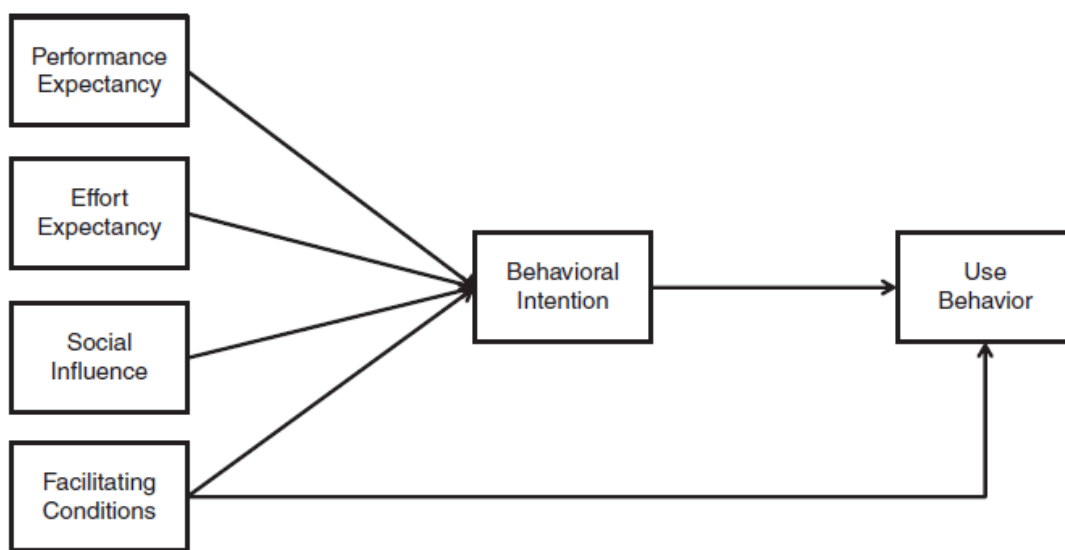


Source: Technology Acceptance Model (Davis, 1989)

These two constructs, perceived usefulness and ease of use, have a considerable effect on the behavioral intention to use ERs again, influencing the actual usage behavior of faculty members and research students.

2.3.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) builds on the TAM by integrating additional constructs influencing technology adoption. These constructs are:



Source: Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003)

2.3.2.1 Effort Expectancy: The ease with which one perceives using ERs. A positive perception of the effort expectancy increases users' willingness to adopt and use ERs. This affects the Perception of Accessibility because it covers the ease of accessing and navigating ERs.

2.3.2.2 Performance Expectancy: The benefits one expects to gain by using ERs, such as enhanced academic productivity. This increases the Perception of Usefulness since students and faculty are most likely to use ERs when they perceive tangible academic benefits.

2.3.2.3 Social Influence: The degree to which users feel that important others (e.g., colleagues, mentors, and institutional culture) believe they should use ERs.

2.3.2.4 Facilitating Conditions: The availability of resources, such as institutional support, access to technical infrastructure, and training. Facilitating conditions shape the Perception of Cost-Effectiveness by reducing barriers to access and providing cost-effective access to ERs.

2.3.2.5 Effort Expectancy: The more straightforward the ERs to use, the more one believes the return on time and effort invested is worth the investment. This perception enhances the positive Perception of Cost-Effectiveness. Subscription availability through institutions and support systems provided makes the ERs less expensive, as individual purchases are not required, adding to their cost-effectiveness.

2.3.2.6 Performance Expectancy: ERs that are reliable, credible, and relevant to academic work will enhance academic productivity, leading to a higher Perception of Content Quality.

2.3.2.7 Social Influence: Positive feedback from peers, colleagues, and academic mentors about the quality and reliability of ERs reinforces their credibility and strengthens users' trust in their content.

2.4 Conceptual framework

It provides an organization for the key dimensions of perception that influence the use of ERs among Faculty Members and Research Students.

2.4.1 Perceptions in accessibility

This dimension focuses on how users view the availability and accessibility of ERs. The influencing factors in accessibility include:

2.4.1.1 Accessibility Features: Easy navigation, mobile compatibility, multilingual options, and practical search functions (Palchevich & Rosa, 2019).

2.4.1.2 Technical Barriers: These include poor internet connectivity, the use of outdated platforms, and complicated user interfaces (Rahiem, 2020).

2.4.1.3 Availability: Access from any device anytime and anywhere (Sharanabasappa & Talikoti, 2024).

A positive perception of accessibility would encourage increased use of ERs, while technical barriers may reduce usage.

2.4.2 Perceptions in content quality

This dimension shows how users perceive the quality of available content in the ERs. The factors underlying this dimension include:

2.4.2.1 Credibility: The authority and peer-reviewed nature of the content, ensuring accuracy and reliability (Manjula & Vijaya, 2020).

2.4.2.2 Coverage: Availability of high-quality multimedia resources (Kasymaliev, Ibraev, & Ongarbaeva, 2023).

2.4.2.3 Completeness: The scope of materials available, ranging from the general to the specific, pertinent to the field of study of the users (Jan, Pawlowski & Bick, 2012).

High-quality content cultivates trust and instils confidence in the ERs, while low-quality or irrelevant content diminishes the perceived value.

2.4.3 Perceptions in usefulness

This dimension measures which degree faculty members and research students view the practical usefulness of using ERs. The factors affecting perceived usefulness include:

2.4.3.1 Impact on Productivity: ERs that streamline research processes, save time, and keep users updated with the latest research (Talikoti, 2023).

2.4.3.2 Improvement in teaching and learning: The possibility of ERs making up-to-date academic knowledge and new teaching aids available promotes better academic performance (Maslova, Burdina, & Krapotkina, 2020).

2.4.3.3 Collaboration and management facilities: ERs allow for collaboration with scholars worldwide and also aid in organizing and managing citations effectively (Jan, Pawlowski & Bick, 2012).

A high perception of usefulness makes them more inclined to ERs because these resources are helpful for academic success and research.

2.4.4 Perceptions in cost-effectiveness

Cost is essential in the perception of ERs, especially in environments with budgetary constraints. The cost-effectiveness is determined by:

4.4.4.1 Institutional Budget Constraints: The affordability of ERs subscriptions in relation to the institution's budget, offering more value compared to traditional resources (Courtney & McAllister, 2018).

2.4.4.1 Value for Money: The perceived return on investment, considering the breadth, depth, and quality of available ERs, saving money compared to print materials (Sutton, 2013).

2.4.4.2 Sustainability: The long-term viability of maintaining access to ERs within budget limits, ensuring continued use without additional support (Cao et al., 2014).

Positive perceptions of cost-effectiveness increase the likelihood of continued usage, while concerns about cost may limit adoption, particularly in institutions with constrained budgets.

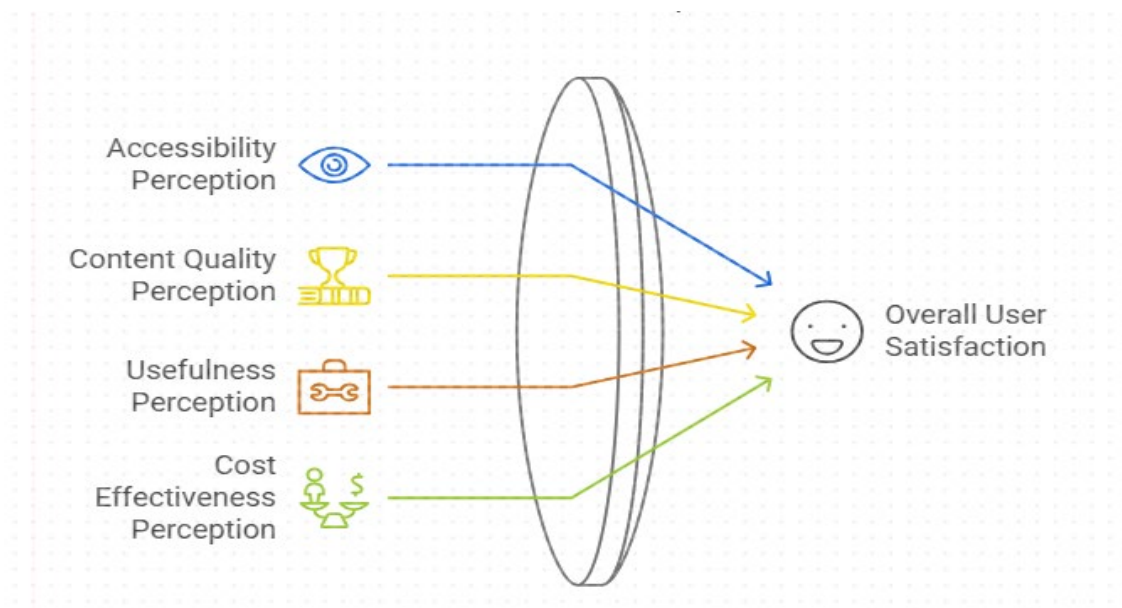


Figure 2.1: Dimensions of user experience

2.5 Definition and evolutions of ERs

The term ERs refers to information accessed electronically but may have a print counterpart. ERs refer to materials a computer or any other electronic device can access. These resources contain data, content, and information and may be presented as text or images (Finch, 2015).

According to Library of Congress (2016) “Electronic resource is defined as any work encoded and made available for access using a computer. It includes data available by (1) remote access and (2) direct access (fixed media). In other words: Remote access (electronic resources) refers to the use of electronic resources via computer networks (AACR2, 2002). Direct Access (electronic resources) refers to the use of electronic resources via physical carriers (e.g., discs/disks, cassettes, cartridges) designed to be inserted into a computerized device or its auxiliary equipment.”

In 2012, the International Federation of Library Associations and Institutions listed types of ERs including e-books, e-journals, full-text databases, indexing and abstracting databases, reference databases (such as biographies, dictionaries, directories and encyclopedias), numeric and statistical database, e-images, and e-audio/visual resources. The use of computer technology to organize and retrieve information began in the mid-twentieth century. The resources provided on the Internet, such as journals, books, databases, and abstracting tools, are called ERs. Only a few resources are still published on CD-ROMs. Some resources are free, while most of the scholarly resources are expensive. These resources are preferred using resources despite the cost, but the latest editions are available to users whenever released. With such advantages, ERs are increasingly becoming an essential ingredient of library collection-building activity in the library.

ERs are any electronic product containing a data set or any resource that requires a computer to facilitate access to its content (Johnson et al., 2012). ERs are resources that store information electronically and are accessible through electronic components and networks, according to Adeleke and Nwalo (2017).

The electronically generated or converted digital versions of the printed information media are known as electronic information resources (EIRs). EIRs use electronic networks and systems, such as computers, to store and retrieve information (Madondo et al., 2017). These

resources include OPAC information, CDROMs, online databases, e-books, e-journals, e-theses, and ERs (Oak, 2016).

The general electronic information resources available, especially to European and Asian academic libraries, include e-journals, e-books, e-databases, e-theses and dissertations, CD-ROMs, OPAC, newsgroups, subject gateways, Turnitin, RefWorks, the internet, and other computer-based electronic networks (Renz & Sullivan, 2013).

Electronic resources, now more commonly called ERs, have gradually become central in library collections worldwide. With growing interest in digital libraries, ERs are a significant part of many academic library collections. With the emergence of more recent techniques and technologies, the academic community is increasingly dependent on electronic sources of information. Thus, their awareness is paramount in the development of libraries in this 21st century (Velmurugan, 2013; Akpojotor, 2016).

Table: 2.2 Types of ERs with inclusion rationale

S. L	Types of ERs	Description	Sources	Inclusion Rationale
1.	E-Journals	An e-journal is a valuable addition to any library collection, providing extensive information for use within academic and research communities.	(Irawan et al., 2023).	The selected university subscribes
2.	E-Books	An e-book is defined as a publication in an electronic format that can be read on devices such as e-readers, tablets, computers, or smartphones.	(Davidson & Carliner, 2014).	The selected university subscribes
3.	Institutional Repository/ E-thesis	The institutional repository is an open-access digital platform that showcases the academic output of academics, staff, and students in institutions, including e-thesis/dissertations, published papers, and other scholarly works. It promotes better ethical scholarly communication and visibility.	(Silva, 2024).	Institutional resources are accessible to Faculty Members (FM) and Research Students (RS) at these universities

4.	Online Databases/ Full text database/ Scholarly Databases	Online databases are collections of information on a subject which are searchable electronically.	(Makhliyo, et. al., 2024).	Well-known and widely used by Faculty Members (FM) and Research Students (RS)
5.	E-conference proceedings	E-conference proceedings are electronic collections of research papers and presentations generated from electronic conferences that allow sharing of knowledge among participants.	(Norsyahira, 2024).	Recent and updated scholarly content
9.	Educational Websites	Educational websites are dynamic platforms for knowledge acquisition and skill development across various subjects.	(Ghodke, 2024; Moldagali et al., 2023).	Free and accessible by all

The first ERs were bibliographic records which served as digital catalogs to organize and retrieve these resources efficiently. In the 1960s, American computer scientist Henriette Avram developed MARC, or Machine-Readable Cataloging, which allowed records to be machine-readable and shared with other libraries easily. It was a turning point for the field. Library automation became known in the 1970s when Integrated Library Automation Packages were introduced, according to Schudel in 2006. Automation of libraries took a serious shape in the early 1980s when PCs started to be available at prices libraries could afford. The target was to create union catalogues through library networks like the Online Computer Library Center, OCLC, a major player in facilitating online retrieval, copy cataloguing records, and resource sharing from other libraries. Remote access to Library OPACs and union databases started in the early 1970s. Besides these, several online exploration services, viz., DIALOG, ORBIT, BRS Search and Datastar in the USA; BLAISE and Pergamon Infoline in the UK; DIMDI in Germany; Euronet and Diane in Europe; ESA-IRS in Italy; and CAN/OLE in Canada, etc., had also been made accessible online to the research community. It can be realized that the bibliographic and full-text databases on CD ROM by the late 1980s were a significant find

in the development of ERs. Most bibliographic databases, accessible through online search services such as DIALOG and STN, became accessible on CD-ROM (Arora, 2007).

Internet accessibility in the modern world enables virtually easy access to ERs; this means that, unlike before, going to a library is no longer necessary for the learner. It goes without saying that over the last decade, the library has immensely transformed in serving the demands of researchers, educators, and learners, an area significantly accelerated by the digital revolution of its assets (Anuradha, 2018). During the last couple of years, several systems and standards have been developed to create and distribute ERs. In this scenario, librarians consider ERs for their collections to meet user needs more effectively. The impact of ERs has been immense on the university library collections. Liaison activities and collection development are changing due to it. The emergence of ERs has changed the library's role, and ERs have become one of the prime concerns in an academic library (Sharma, Singh, & Sharma, 2011). ERs are advantageous in processing, such as assignment, searching, and economic advantage on storage and maintenance. Moreover, in some instances, they are the only source of availability (Venkadesan & Jagannath, 2004).

Currently, publishers can provide content as a bitmap page image or in other structured formats like HTML, PDF, or RTF. A continuous propagation was noticed when the World Wide Web was first introduced, and the electronic version of resources was also termed ERs (Tenopir et al., 2003; Bar-Ilan & Fink, 2005). Increasingly, an astronomical number of publishers began using the internet and WWW as their global route to provide resources to the international user community. Given the evidence that the technology is in a situation whereby it is possible to deliver more content to more users at a significantly reduced cost per user. These new technologies are constantly pushing ERs to new peaks of usage significantly beyond the library's subscribed content. Behind this, effectiveness, efficiency, satisfaction, and learnability are considered the essential features for the success of ERs over print versions (Olle & Borrego, 2010; Joo & Lee, 2011). According to Mollel and Mwantimwa (2019), ERs have shifted academic paradigms, especially in facilitating scholarly output and knowledge dissemination. The availability of ERs has improved the capacity to research and encouraged the building of an enlightened and responsible academic community. A network called the Consortium of University and Research Libraries, COTUL, was established to improve access and usage of ERs in the country. COTUL has made it possible to buy and

subscribe to ERs collectively like AJOL, JSTOR, Oxford Journals and Emerald, among others (Mwantimwa & Elia 2017).

Nareike et al. (2014) observed that implementing linked data meets present needs and future-proofs the libraries for changes in open access and interoperability requirements. Libraries implementing Linked Data are better positioned to manage, share, and preserve ERs within a global information ecosystem amidst proliferating digital information. Kenchakkanavar (2014) listed 14 different types of ERs, complete with definitions of each. This study examined what ERs were available and how they could be used in a library. The exponential increase in ERs has brought a sea change in the scholarly information landscape and profoundly impacted the behavior of information seekers. ERs has changed how consumers access, evaluate, and use the information for academic and research purposes (Arshad & Ameen, 2018). England and Miller (2016) defined ERM as the systems and operations created to manage library ERs. These operations are intertwined into workflows specific to libraries and their parenting institutions. Bothmann and Holmberg (2008) described ERM as "the process by which all aspects of ERs are overseen, including but not limited to pre-selection activities (such as trials and initial vendor inquiries), renewal, and cancellation decisions. Considerations include the planning, policy, and workflow issues facing many libraries." The evolution of Information and Communication Technologies (ICTs) has ushered in a new reservoir of information for patrons of libraries. The advent of ERs has significantly enhanced the operational framework of libraries and their dispensation of informational assets (Adebayo, Ahmed, & Adeniran, 2018).

2.6 Access and usage of ERs

Academics and researchers mainly access the resources through university websites, CD-ROMs, internet databases, vendor databases, and repositories (Dadzie & Van der Watt, 2015). Through all these databases and websites, accessibility is assured for ERs such as e-books, e-journals, e-magazines, e-conference proceedings, and e-data archives, among many others (Bamidele et al., 2019). These are all accessible through subscription and open-access models. Siwach and Malik (2019) used a cross-sectional survey methodology to study the use of ERs by science faculty members and researchers in selected universities in North India. According to their findings, Science Direct, Springer Link, Taylor and Francis, Nature, Web of Science,

Wiley Blackwell, SciFinder Scholar, Annual Reviews, and Oxford University Press were among the most used databases in order of ranking.

In studying the ERs usage of scholars, Gupta (2017) found Springer Link was the first choice of Banasthali University. In the same way, Nanda (2017) also reported that a more significant number of faculty and research scholars were using Science Direct and Springer Link proficiently. Kumar and Reddy (2016) indicated that Taylor & Francis, ScienceDirect, and SpringerLink are the most used and preferred e-resources for academic staff and researchers. Also, the survey pointed out that academic staff and researchers from universities use ERs extensively.

Another study explored the preferred sources of information and strategies for access to ERS. It defines ERs, types, objectives, scope, and methodology. A standardized questionnaire was used for the collection and analysis of data. Among 231 respondents, 196 respondents returned the questionnaire, making the response rate 84.84%. The overall awareness about ERs showed a high trend. There is a variation in the usage of ERs among faculty members and research students. Most academicians used ERs provided by the departments to which they belonged, while researchers accessed these resources from computer centres or lab (Kumar & Singh, 2018).

This study examines how Ghana Communication Technology University (GCTU) faculty members use electronic databases. Questionnaires were used to collect data for the descriptive study technique. No sampling process was used because the population size was manageable. The Statistical Package for the Social Sciences (IBM-SPSS 21.0) was used to analyze the data. The findings showed that the majority of faculty members were aware of the databases available at the library. Additionally, Taylor & Francis and Emerald were highly rated for accessibility and availability. However, the survey found problems, including poor internet connection and barriers to downloading information. According to the research, library management should address these issues as soon as possible to enhance the user experience (Ameyaw & Afua, 2024). Sudhier (2016) reported extensively using ERs by students at TKM College of Engineering (TKMCE) in Kollam, India. E-journals were the most utilized ERs for scholarly purposes. Since locating an ERs is relatively easy using known search tools, students predominantly used Google Scholar to locate and access these resources. Further, although in electronic format, several students preferred to read the printed version

of the sources. Al-Shboul and Abrizah (2014) examined the issue of disparities in the use of ERs among Malaysian scholars according to age. The results showed that the senior scholars preferred printed materials, while the younger scholars increasingly used electronic databases and e-journals. This trend demonstrates an increasing trend towards the use of digital platforms among younger academics. ERs increase learning by blending online and offline resources, but selecting these resources is crucial for maximizing their use and improving knowledge outcomes.

A review of articles published between January 2015 and March 2021 highlighted the advantages and challenges of using ERs in higher education. The review indicated that conference proceedings, e-theses, e-dissertations, e-journals, and e-books are crucial in higher education. These tools are vital in enhancing the teaching and learning processes, updating the recent developments of the faculty members, and assisting administrators (Faustino & Kaur, 2023). The research underlines the possible practical use of electronic documents in sociological research, particularly regarding risk factors and signs of illegal financial transactions in texts. Such an interdisciplinary approach combines digital tools and sociological analysis to categorize and evaluate the risk indicators that will help turn electronic documents into an important means of strengthening legal and financial relationship security. Results give insights into how electronic documents improve the risk assessment process to develop security measures that are effective in practice for analysts, lawyers, and government officials (Iryna, 2024).

A study on the utilization of ERs carried out at two reputed Universities, namely CCS Haryana Agricultural University-CCSHAU and Lala Lajpat Rai University of Veterinary and Animal Sciences-LUVAS by Parmar in the year 2019, expressed that the utilization of ERs was below expectation. More workshops would help to create awareness among students. The study further recommended arranging stimulating lectures, competitive activities, and personal contact with the users for resource utilization. The teachers were also advised to visit the library more often and help their students learn the usage of resources for their studies.

Researchers at the Council of Scientific and Industrial Research Institute of Genomic and Integrative Biology (CSIR-IGIB) mainly used e-journals to assist them in their work and to stay updated about recent technologies. Frequent utilization of e-journals from campus offices for literature reviews, data analyses, and staying updated in the evolving fields of integrative

biology and genomics was facilitated by a supportive environment characterized by a strong ICT infrastructure, which enabled efficient and rapid access to these resources (Qasim & Khan, 2015). Baskaran and Prasad, (2019) examined the attempts made by the academic staff of South State Universities in Tamil Nadu to access the ERs required for their research. Most of the 380 respondents were Ph.D. holders, and most were males. The most significant number of respondents were from Madurai Kamaraj University and Alagappa University. All respondents reported knowledge about ERs available in university libraries. Many accessed ERs daily for academic purposes, whereas the rest used it every alternate day. Also, most respondents had received training from university libraries, and only a few said they had not. Again, many respondents were highly satisfied with certain library services like automated circulation services, e-databases, and OPAC/Web OPAC.

Akuffo and Budu (2019) found that South Asian students are highly aware of using ERs for academic purposes. Some students knew of ERs but could not use them due to poor search skills. A study by Mwantimwa and Elia 2017 on using EIRs in Tanzanian HEIs found that only a small percentage of researchers and academic staff needed to be aware of their availability. To this end, Alasa and Quadri (2022) showed that awareness of EIRs existed among students in both institutions under consideration but was mainly utilized for research.

In contrast, the postgraduate students knew that full utilization of EIRs at Delta State University could not be wholly achieved because many had limited accessibility due to bandwidth and space constraints, poor power supply, and incompetent information-searching skills. In a related study, Ndou and Chilimo (2021) found that the University of Venda faculty members were aware of EIRs, perceived ERs to be user-friendly, and perceived them to enhance academic performance. However, most students were concerned about plagiarism and were only moderately satisfied with available EIRs. Books, journals, newspapers, magazines, dissertations, and the internet are indispensable ERs in the research process. These tools are crucial to make the research as accessible as possible. According to Hussain, Shahzad and Awan, (2021), Research participants actively and constantly use open-access resources. Academic institutions have considerably engaged in ensuring those they serve have access to electronic information resources in ways that promote academic achievement and further research.

Angadi (2017) assessed the UGC-Infonet Digital Library Consortium is very helpful in increasing access to ERs, mainly for the academic society in science and technology. The study explains that the consortium has played a crucial role in facilitating scholars access to a wide range of scholarly resources, including databases, e-journals, and other ERs. The UGC-Infonet Digital Library Consortium has been instrumental in helping scholars keep up with the latest developments in their respective areas of interest and making their research and academic functions remarkably easy. That 96.44% of the research scholars are familiar with ERs proves that ERs are widely recognized in the academic world. Nearly 90% of academics reported that electronic articles and e-reprints are important to their work and have become essential steps in the research process. The high usage percentage of ERs underpins their vital role in assisting the research activities of the respondents because they can access information that is up-to-date and relevant speedily and efficiently.

According to Jotangia (2020), African higher education institutions have also been making efforts for several years to increase their provision and access to ERs for their academic and research staff. They also negotiated with multiple publishers for free or cheaper rates for particular journals and databases. The University of Dar es Salaam Library pioneered CD-ROM search services in the country during the 1990s, enabling wider access to and usage of ERs.

The main finding of a study is that students in federal universities in southwest Nigeria use ERs primarily for academic purposes; not all are regularly used compared to investments made in the collection of these resources. Besides, the student's level of computer self-efficacy was high. Also, a positive relationship existed between students' computer self-efficacy and ERs use. Thus, the study confirmed that the undergraduates' level of computer self-efficacy significantly influenced their use of ERs (Ebijuwa and Mabawonku, 2019).

Msagati (2014) established that in Tanzania, 62 percent of the faculty members access ERs almost every day or several times a day. Therefore, the findings relate to other African studies, as by Scarboro (2014) and in other developing nations, where faculty members more frequently used more ERs.

Eiriemiokhale 2020; Hussain, Shahzad & Awan, (2021) examined the level of frequency of usage and the status of awareness regarding e-databases among university lecturers in Nigeria to identify the differences in ERs and service usage. These studies' commonly utilized

ERs and databases include Academic Library Online, World Bank, Google Scholar, AJOL, Cambridge, and International Research Journals. However, the less frequently used databases are Emerald, ERIC, DOAJ, EBSCO Host, Science Direct, J-STOR, Chicago Journals, Encyclopedia of Life Support System, Sage Online, Education Online, Bookboon, BioMed Centre, DATAD, TEEAL, AGORA, and HINARY. These results depict that most of the databases are less frequently used, which may be due to a lack of awareness and search skills among many lecturers.

Rahman (2021) discussed digital devices and ERs integrated into university libraries of Bangladesh concerning thirteen universities located in Dhaka. To this effect, a structured questionnaire was applied. The results of the above statement show that PCs and laptops, servers, smart cards, storage devices such as portable hard disks and flash drives, scanners, digital cameras, printers, speakers, headphones, multimedia projectors, and RFID technology are the most prevalent digital devices in use. The libraries are subscribed to 29 e-book databases and 48 e-journal databases. In addition, open-source software packages such as Koha-ILS, SLiMS, DSpace, and Greenstone have been implemented for automation and digitization. It advocates increasing access to digital devices, subscription to more ERs, establishing a national digital information network, and free and remote access to ERs and services.

The study attempts to explore the pattern of use of the Internet and ERs by the students and faculty members of Eastern University (EU). Data collection was done through a printed questionnaire. From the simple frequency analysis, the students and faculty members are generally satisfied with the existing Internet and ERs. However, the study found some critical constraints like limited titles, difficulty locating, limited computer access, and slow downloading speed. These factors, mainly related to poor IT infrastructure, impede the use of the Internet and ERs, leading to less frequent use and lower satisfaction, as supported by Islam and Habiba, 2015.

Mondal and Bhatt, (2022) discussed the ERs use of the University of Dhaka's research scholars and postgraduate students through the online survey in terms of the motives to use ERs, level of awareness, and how they learn their usage. In addition, the preferred type of ERs, its format, and the extent of satisfaction with the availability of the same in university libraries have been discussed here. The results indicated that research scholars and postgraduate

students are highly aware of and frequently use ERs, and PDF is the preferred format. It also emerged that self-instruction was the best way to learn how to use ERs. However, some participants faced difficulties exploiting the library's ERs.

A study focused on the web-based library services of the ICDDRDB Library in Bangladesh, regarding scientists' and researchers' usage of subscribed, registered, and open-access ERs. A mixed-method approach has been used and an online survey was conducted in June 2017 to assess the library's web-based services. The survey included 557 researchers who responded that they had a moderate level of awareness about the ERs provided by the library. However, the identified barriers to effective use were a lack of awareness, slow internet, limited databases, and insufficient search skills. PubMed and Hinari were the most commonly used databases. The study recommends increasing awareness, expanding resources, and improving marketing efforts to enhance usage and research outcomes (Uddin, Al Mamun & Rahman, 2019).

Roy et al., (2023) investigated the effect of ERs on Central Library users' reading habits and preferences at the University of Rajshahi, Bangladesh. It deals with the pattern of use, motivations, and advantages of utilizing ERs by students, faculty members, and researchers. Results show that 85% of the students know ERs while 90% use them for various purposes: learning, reading, teaching, job-related, leisure, and news. The most utilized ERs are e-books, e-journals, e-magazines, e-maps, and e-news, while mobile phones remain the ideal access device.

Hossain (2022) explored the value of ERs to the institutions of higher learning, narrowing down to JSTOR Digital Library. With the increasing investment in university subscriptions to ERs, their utilization has become unavoidable, along with traditional print materials. The present study highlights the benefits of on-campus and remote access to ERs and reveals that subscriptions through consortia are cheaper than direct subscriptions.

2.7 Impact of ERs on scholarly output and academic progress

Bamidele et al. (2019) stated that ERs have become indispensable tools for research in higher learning institutions. They also established that many of their respondents used these resources mainly for research purposes, followed by teaching, note preparation, and assignments. The findings showed that all responding academics, 100% from Nigerian

universities, agreed that ERs contributed to their research outputs. Their findings also indicated that their research output has increased tremendously due to using ERs. ERs provide vast access to diverse information quickly and empower researchers to discover wide-ranging knowledge areas conveniently and proficiently, increasing researchers' potential to develop new ideas and produce high-quality work (Teguh et al.; 2024; Bhat 2021).

A bibliometric analysis indicated that ERs resulted in a steady trend in citations, producing 137,051 publications from 2006 to 2016, with the majority in Medicine (Chhatwal, 2018). ERs play a crucial role in modern education and research, providing flexible learning opportunities and improving the quality of educational experiences (Kasymaliev, Ibraev, & Ongarbaeva, 2023). The available literature indicates that researchers acknowledge the significant role of ERs in teaching and research. The impact of ERs in research, learning, and education is very positive (Dadzie & Van, 2015; Mollel & Mwantimwa, 2019). For instance, Kalogiannakis (2010) asserted that technological innovations significantly enhance teaching and learning. The author also emphasizes that using ERs at the institutions modernizes learning and teaching methods. In their investigation into the adoption of ERs at the University of Ilorin in Nigeria, Tella et al. (2018) noted that the resources keep academics up-to-date with the most recent data and information.

ERs help people learn throughout their lives by giving them access to vast educational and informational material whenever they want. These allow people to learn independently, study information from different fields, and improve their critical thinking ability. In a knowledge-based society that changes quickly, e-resources support self-directed learning, career growth, and academic success (Yadav & Kumar, 2024). This verifies the findings by Mishra, Das and Ramesh (2019), which show that using ERs was associated with minimizing time and money. A study by Aladeniyi (2017) indicated that ERs constitute an essential resource of update data and information, ease of access, storage, and time-saving. Ebijuwu and Mabawonku (2019) indicated that attitude, computer literacy, and information retrieval skills give students in Nigeria a low usage of ERs, while little attention was given to computer self-efficacy. The result also examines the computer self-efficacy to predict the student's use of electronic library resources in federal universities in southwest Nigeria. They identified a significant relationship between computer self-efficacy and the use of online information

resources. The study's findings reveal that computer self-efficacy tends to be attributed to students' use of electronic information resources in central universities in southwest Nigeria.

Abidi, (2019) investigated the use patterns of ERs by students, researchers, and faculty members of the Department of Sociology, AMU. Information technology has bestowed bliss on the research communities through ERs, which have become the primary source of scholarly communication. E-resources are attaining popularity and acceptability because of unique advantages associated with affordability, accessibility, readability, and convenience. The study also examined the pattern of usage of the ERs through a critical literature search followed by the collection of feedback through questionnaires, interviews, and investigator observation. The significant finding of this study was that most of the users, including postgraduate students, research scholars and faculty members, found that ERs were the most valuable and preferred source of information. They also expressed satisfaction with the physical library, its hours of operation, and the services its staff provided.

Bwalya and Ssebbale (2017) supported the view that easy access to regularly updated information with hyperlinks to external content provides the latest insights on a topic. In any case, access to and utilization of ICT resources overcome time and space constraints, leading to increased engagement in teaching and learning and improved performance, as observed by Stasinakis & Kalogiannakis (2015). Interestingly, several studies (Mishra, Das & Ramesh, 2019; Tella et al., 2018) have indicated that despite the invaluable worth of subscribed ERs, these resources latter is grossly underutilized by academics and researchers in developing countries. In a related situation, Deng (2010) noted that ERs was fully implemented in higher learning institutions in Australia to assist learning and research.

In addition, (Mishra, Das & Ramesh, 2019; Aladeniyi, 2017) surveyed health science researchers and established that most of them, 85.7%, access and use ERs for research, teaching, and learning activities. It has also been reported that scholars have been using ERs to prepare articles, seminar presentations, publications, writing proposals for research and grants, and in preparation for teaching.

Another study observed the existing status of IT services, access to online information resources in the universities and the level of faculty satisfaction with university-subscribed ERs in Bangladesh. The issues were that they could not find relevant information and access

to ERs from the residence and many insufficiencies in the number of titles. No significant difference in gender and faculty members' designation was found, and the variation was found in the type of university. There have been a few significant differences regarding professional experience and age, according to Habiba and Ahmed (2020).

The literature on e-learning (EL) in Library and Information Science (LIS) programs globally highlights a growing trend in adopting e-learning systems to deliver education across various regions, including Africa, Asia, Europe, America, and Oceania. A study conducted on 370 LIS program homepages through an online survey revealed that approximately 23% (85 out of 370) of LIS programs use e-learning systems. These systems help overcome barriers faced by students who cannot participate in traditional education due to work commitments, family responsibilities, or geographical constraints. These programs' most commonly used e-learning tools are Blackboard/Blackboard Vista (25.89%) and WebCT/WebCT Vista (10.59%). Furthermore, most (86%) programs deliver their content asynchronously, allowing students greater flexibility in accessing learning materials. The findings indicate a shift toward more inclusive, accessible education in LIS, driven by technological advancements that facilitate diverse learning modes (Islam et al., 2011).

Masrek and Gaskin (2016) conducted research in which the paper aims to evaluate users' satisfaction with the web digital library. They developed a model based on the re-specified information system success model and experimented using the structural equation modelling (SEM) technique. Results showed that the information quality, systems quality, service quality, perceived usefulness, perceived ease of use and cognitive absorption were significant predictors of user satisfaction with the ERs.

Another research explored the fact that the students and faculty members were practicing ERs for teaching, learning, research and project work, paper presentations, and course activities. These types of resources help students by preserving time and assisting access to the needed relevant information. Besides this, these ERs have also contributed to recent knowledge that has enhanced the academic performance of students and faculty members (Garg, Kumar & Vandana, 2017). The different ERs types found in academic libraries are exclusively explored in this research, along with their impacts on research and development. The article highlights the main advantages of ERs, such as their current information, accessibility from anywhere in the world, anytime availability, and capacity to accommodate

multiple users at once. Moreover, the study demonstrates how ERs can improve research outputs and academic productivity by facilitating rapid information retrieval, particularly for users elsewhere. ERs are vital to contemporary academic libraries, contributing substantially to exchanging knowledge and scholarly communication (Jotangia, 2020).

University libraries have invested much in terms of ERs and connectivity, which have significantly transformed university academic and research activities. This investment opened a vast world for students and scholars. The primary notion exists, as stated by Wilson et al. 2021; Alponce and Mwantimwa, 2019, which such resources improved scholarly activities like enhancing productivity in research work. Bhukuvhani, Chiparausha & Zuvalinyenga, (2012).; Mwantimwa, Mwabungulu and Kassim, (2021) claimed that ERs make a high contribution to research productivity. Overall, ERs have transformed physical libraries into virtual ones for academics and researchers to save time by accessing them directly from their desktops. Other studies have equally reported that their availability could enhance access to information for the academic and research community to be abreast of affairs in their areas of specialization, get inspiration for new ideas, and conduct better quality research (Bamigboye et al., 2018). Faculty members use ERs for various research purposes and, hence, are significant information sources considered by academics and researchers since these materials have been used to assist in research work as stipulated (Mwantimwa, Mwabungulu and Kassim, 2021; Isibika & Kavishe 2018).

Damerchiloo et al. (2020) pointed out in their study that greater research productivity has been related positively to the regular use of Elsevier e-journals. The academic conference participation, research quality, and publication frequency were all higher among the faculty members who were its regular users. The academic process is far more efficient since the research projects are completed much quicker with credible and varied information. ERs have become a blessing for research work in institutions of higher learning. Such facilities provide a new platform that helps collect data needed for research. The perceived impact of accessibility and use of ERs on the research output of faculty members in Nigerian universities. The findings revealed that research productivity had been positively affected; thus, faculty members gained quite a lot from the available ERs, and hence, their output in terms of research was growing better (Ani, Ngulube & Onyancha, 2015).

Previous literature has established that ERs increase the faculty members and researchers' output in higher learning institutes. Other researchers have established that ERs help researchers validate their research findings with existing knowledge (Agoh, Annune & Idichaba, 2021; Singh & Kushawaha, 2020). This has enhanced the reputation and ranking of many institutions of higher learning and the impact of ERs on research findings (Bhukuvhani, Chiparausha & Zuvalinyenga, (2012). On the other hand, some other scholars, such as Joshua and King, 2020, realized that ERs have not affected research productivity. Studies such as Jan, Idrees & Naveed, (2020) and Bhukuvhani, Chiparausha and Zuvalinyenga in 2012 have evidenced that the advent of ER usage has translated to a rise in the number of research papers presented to scientific journals and various peer-reviewed journals published. With this expansion came an increase in the volume of the scientific literature that is now at the researcher's disposal level, prepared and ready for distribution.

One such study on ERs usage among faculty members and researchers in Tanzania revealed that increased access to such resources increased the positives related to research activities, journal article writing and book publications, collaborative publishing, and the dissemination of the research results Mwantimwa, Mwabungulu and Kassim, (2021) established that the access and utilization of ERs by academicians and researchers in higher learning institutions in Tanzania have increased improved research activities, publications of journal articles, books, collaborative publishing, and dissemination of research findings. In contrast, Slyder et al. (2011) found that senior faculty members published more articles than junior faculty members. Higher learning institutions have made efforts to increase access to ERs and improve the utilization of such resources for their academic and research staff. However, some challenges need to be overcome, which affect the rate and quality of output given by academicians or researchers. ERs are indispensable in this blended learning of academic institutions, for they enable modern teaching approaches and facilitate independent students' work. By incorporating digital tools and materials into traditional learning environments, such resources will allow teachers to deliver lessons more dynamically and flexibly. The combination increases students' engagement and provides self-paced learning opportunities. It also gives the learners more control over their educational path and helps them build the required academic skills (Dudka & Chumak, 2024).

2.8 Perceptions of faculty members and research students

Ani, Ngulube & Onyancha, (2015) discussed the accessibility and use of ERs in improving the research productivity of faculty members in universities. This study employed a quantitative research method with a survey approach to identify the problems in research. The findings showed that the accessibility and use of ERs by faculty members did not significantly influence improvement in productivity in research. Further, there was no significant difference in gender. These findings suggest that developing digital libraries is needed in Nigerian universities. ERs have been widely used in research and coursework, making these resources an indispensable resource in an academic setting (Sudhier, 2016).

Academic experience of students correlates more strongly with their digital literacy proficiency than their technical abilities, highlighting the importance of making efficient information integration and application in educational settings a top priority. The result implies that developing critical thinking, information assessment, and contextual knowledge are all essential components of digital literacy development, which goes beyond simply teaching technological skills. According to Bulger, Mayer and Metzger, 2014, students should be competently prepared to explore, comprehend, and use digital information meaningfully for their academic and professional endeavors by developing digital literacy aligned with their educational objectives.

A study explores users face difficulties accessing these resources, which could be facilitated by "Library User Orientation" programs. Educators and researchers can further facilitate students' use of ERs, increasing their usage in preparation for a digital future. The study aims to create awareness of the need to improve the use of JSTOR in an academic setting (Hossain, 2022). A study reported that most academic staff and researchers were satisfied with the e-library services. More than half of those who participated in this survey were satisfied with their university's e-library, which positively impacted their research output (Singh & Kushawaha, 2020).

Another study showed no significant difference between male and female faculties in Bangladesh, who showed equal satisfaction with university-paid information resources. This study stated that satisfaction scores differed significantly due to the designation of faculties in the technology-based university, as technology faculties may require broader and

diversified levels of ERs rather than other subjects. Additionally, the purpose of using ERs is that most faculty members use them for research and teaching, and they also refer these resources to their students. Among students, the study discovered a keen interest in using e-journals accompanied by e-books, e-newspapers, e-reports, and e-articles. The least interest is in utilizing electronic theses and dissertations (Ahmed, 2013).

The study reported on the behavior of science faculty members and research scholars in North India regarding electronic resource usage. The study is based on a survey method through which responses were obtained using an elaborate questionnaire. Among 668 respondents, e-journals emerged as the most used resource. Search engines are found to be the retrieval tools favored for research. However, the advanced features like Boolean operators and truncation are rarely employed. Popular ERs used included Science Direct along with resources provided by Elsevier, Springer Link, Taylor & Francis, and Wiley Blackwell (Siwach & Malik, 2018).

The literature on accessing and using scholarly electronic journals (e-journals) in university libraries highlights the increasing reliance on digital resources in academic institutions. A study conducted at Dhaka University Library (DUL) focused on understanding how e-journals are accessed and used by faculty members and students. The study employed a questionnaire-based survey with two sets of questionnaires: one for students and another for faculty members. The survey involved 50 respondents, including 30 faculty members and 20 students. The research aimed to gather data on students' access to e-journals, their usage patterns, and faculty members' expectations, opinions, and suggestions for improving e-journal services. The findings revealed a growing interest in e-journal usage among faculty and students but also identified several challenges related to access and usage. The study suggests potential solutions to improve e-journal services and accessibility, aiming to enhance the overall effectiveness of digital resource utilization at DUL (Islam, Alam & Sultana, 2011).

The contribution of ERs to assisting academic research, focusing on fostering a productive research environment. The paper highlights the resources' ability to improve research activities substantially and, therefore, calls for better access and training to maximize their effect in higher education institutions (Rafi, JianMing, & Ahmad, 2019). High levels of digital literacy guarantee ease and efficiency of access, navigation, and use of ERs for students. It is beyond just retrieving information; this skill set allows students to evaluate critically,

synthesize, and apply knowledge from varied digital platforms for academic, professional, and personal development. Furthermore, digital literacy fosters adaptability in an increasingly technology-driven world, equipping students with the tools for lifelong learning, collaboration, and innovation in various fields (Yusuf & Song, 2024).

The literature on the growing use of ERs in academic settings highlights a significant global trend in adopting digital tools for learning and research. Students and faculty members, particularly in higher education, are increasingly becoming proponents of e-resource use. A study conducted at Rajshahi University, one of the oldest and largest universities in Bangladesh, investigates the patterns of e-resource usage among undergraduate and post-graduate students. Based on a questionnaire survey, the study provides key insights into the students' usage patterns, identifying both the benefits and challenges associated with e-resource utilization. The findings suggest that there is a need for increased awareness and enhanced access to e-resources. The paper concludes with recommendations to improve the use of ERs at Rajshahi University, emphasizing strategies for fostering more significant engagement with digital tools in the future (Hoq & Haque, 2018).

E-journals are spreading scientific knowledge over the internet networks. E-journals are fundamental resources for original research data from all kinds of disciplines. The study has investigated the usage of e-journals by the research academics of Jamia Millia Islamia and Aligarh Muslim University. The comparison discussed includes how institutions' scientists and social scientists use the same resources. According to the report, the most favoured format for the researchers is PDF. It also examines the reasons behind e-journal adoption, how researchers search, and the infrastructure problems they face. It speaks about these researchers' awareness of the e-journal consortia (N. A., 2020).

This study examines faculty members' attitudes toward accessing scholarly information through electronic resources in universities across Southern Tamil Nadu. Among the 380 respondents, 130 (34.21%) were from Madurai Kamaraj University, 130 (34.21%) from Alagappa University, and 85 (22.36%) from Manonmaniam Sundaranar University. Most respondents were from the Faculty of Science (46.57%), followed by the Faculty of Arts (27.36%), Management (13.68%), and Education (12.39%). Regarding roles, 69.74% were Assistant Professors, 17.11% were Professors, and 13.15% were Associate Professors. All the respondents indicated they were aware of electronic resources at their university's library.

Also, 98.50% had received training on accessing them, with only 1.50% (males) who claimed never to have received any. Female respondents comprised 30.80% of the respondents (Prasad & Baskaran, 2019).

Academic and research purposes motivate about 55% of faculty members to use Internet resources frequently. The primary objective of their efforts is to find reliable sources of information to support their work. This interaction highlights the importance of online literacy and the ability to select relevant information from the vast amounts available, reflecting the increased reliance on digital tools and resources in academic environments. Such behaviors underscore how academic research is evolving and how effectively using internet resources is becoming integral to scholarly work (Habiba & Islam, 2022).

The central point of this study is the adoption and use of subscribed, registered, and open-access ERs by the scientists and researchers of the icddr, b Library, looking into the library's web-based services. In June 2017, an online poll was conducted among 557 researchers to assess library services through a mixed-method case study technique. Most of them used Hinari and PubMed, which means they have a modest perception of ERs. The primary challenges were the lack of internet speed, lack of awareness, underdeveloped databases, and lack of searching skills. The researchers recommend increasing the available resources, raising awareness, and addressing these issues to improve research outcomes at icddr, b. (Uddin, Mamun & Rahman 2019).

The low usage of the Internet and ERs by academic staff in some African institutes and universities is due to inadequate Internet infrastructure, students' lack of skills for using ERs effectively, and weak promotional strategies about the availability of resources. Despite all these challenges, ERs are significant in higher education and play a crucial role in supporting students with assignments and projects and providing access to various learning materials. It has to be cautiously selected since everything on the net might not be suitable for learning. Teachers and students should join hands in optimizing the use of ERs. ERs enhance higher education by making learning more flexible, engaging, and interactive, reinforcing educational objectives. This reveals that many teaching staff and researchers find ERs highly adaptable for performing their teaching duties and conducting research (Tella et al., 2018; Mwantimwa, Mwabungulu & Kassim, 2021).

The paper highlights how training in using and accessing ERs skills has positively impacted educators in terms of improved research output and teaching practices. It also provides the need for periodic training programs to overcome barriers to restricted access and unfamiliarity with these resources (Bhukuvhani, Chiparausha & Zuvalinyenga, 2012).

Siwach and Malik (2019) studied ERs usage by faculty members and researchers in some selected Indian Universities. They found that the significant purposes for which ERs were being used included writing research papers (mean = 4.62), writing research proposals/projects (mean = 4.38), and preparation for seminars, conferences, and workshops (mean = 4.35). Their results also indicated that the remaining purposes-preparation of teaching materials and lecture notes, guiding researchers and peers, exploring grant opportunities on research, designing curriculum, and accessing general information were less important (mean < 4). These findings disagree with Rehman and Ramzy (2004), who stated that health academics utilized ERs to prepare lectures.

Rimmer et al. (2014) investigated UK humanities academics' perceptions of their use of digital and physical information sources. Open-ended questionnaires showed that participants in the study demonstrated a strong preference for the physical setting of traditional libraries, where they felt more at ease being surrounded by books. The participants reported that, in comparison with traditional physical libraries, it was harder to use digital libraries. Besides, they had to spend more time finding the needed resources. Some participants distrust the reliability of digital documents due to issues such as the accuracy, quality, and authenticity of ERs. These reliability problems came in conjunction with a general unease with using digital surrogates, as expressed by the many academics who stated they were unwilling to read lengthy documents on computer screens and preferred to read printed digital documents. It revealed a conflict between increasingly easy access to resources in digital format and the long-standing importance that academics attached to printed materials and physical libraries in humanities.

Ahmed, Amjad and Khan, (2017) assessed the impact of ERs on research productivity and satisfaction amongst arts and humanities researchers in Pakistan. It has a quantitative approach, and data were collected from 261 M.Phil. and doctoral scholars from two universities. It was found that the use and quality of ERs were positively related to research productivity and user satisfaction. Regular use of these resources positively influences

research outcomes. This study confirms that ERs are a major predictor of productivity and satisfaction; therefore, academic libraries must improve the delivery of ERs to develop a research culture. These findings can also benefit policymakers, library practitioners, and educational institutions in improving the policies on using ERs.

The use of ERs by research scholars was studied by Kumbar, Kotabagi and Lamani, 2014. According to them, this research has estimated the frequency of using library ERs, the purpose of the same, and the challenges experienced while accessing. They have used the survey and interview methods to obtain data from these students. The findings showed that research scholars find ERs more important than print resources and utilize library ERs effectively. The study also assessed postgraduate students' awareness of and satisfaction with ERs. Furthermore, the authors mentioned several problems users face in accessing ERs, indicating that most users are aware of ERs and mostly use library databases instead of platforms like Google Scholar. In addition, poor access to the internet was also determined to be one of the major preventions to information access in libraries (Ankrah & Atuase, 2018).

Many research participants use these freely available databases, journals, and repositories in their academics. Open resources have struck a balance between access to quality scholarly materials and the high costs associated with subscription models. Universities have identified open-access platforms as one of the most crucial platforms that give equal opportunities for academic exploration, especially for institutions and individuals who cannot afford to pay subscription costs (Hussain, Shahzad & Awan, 2021). In this perspective, Ebijuwa and Mabawonku, 2019 examined ERs were primarily meant for academic purposes by the students in federal universities in southwest Nigeria. However, the frequency of use of such ERs did not match the costs incurred by the universities for acquiring such a resource. Computer self-efficacy has been regarded as a decisive factor in students' maximum utilization of ERs. ERs utilization and computer self-efficacy have been correlated positively at a very high level.

A study by Rimmer et al. (2014) investigated the perceptions of UK humanities scholars concerning their use of ERs. In their open-ended questionnaire study, academics generally felt comfortable with the physical presence of books, but their experiences with digital libraries were more complex. Digital libraries overwhelmed many participants, who spent more time looking for resources than they would in traditional libraries. In addition, physical

libraries offer a better browsing experience. There are also doubts concerning electronic materials' validity, quality, and reliability. Many researchers have expressed concern over the reliability of the digital document. The interviewees also mentioned not wanting to read long texts on the computer screen and how they usually print digital materials when possible. These results suggest that even as ERs become increasingly available, some humanities scholars still prefer physical resources. Research has also demonstrated that effective communication is essential in developing students' perceptions of e-learning resources.

According to Armstrong (2011), studied poor experiences attributed to online courses have always been blamed on poor implementation and communication rather than the technology itself. Online course organization and structure are crucial for student engagement and academic success. Well-structured classes increase student engagement, leading to better learning outcomes. Besides, studies have shown that students increasingly use non-academic sources of information instead of conventional library services. This trend suggests a shift in students' information-seeking behaviors towards sources that may be more accessible and user-friendly than conventional academic sources and services.

Angadi and Krishnamurthy (2017) surveyed India to determine the "electronic information resources' usage pattern among research scholars.". The study revealed that the preference of research scholars was equally distributed between print and ERs: 20% of respondents used only printed materials, 30% preferred ERs, and 50% preferred print and ERs. The result indicated that even though most academics were using more and more ERs like databases, e-books, e-journals, and e-theses, printed materials played a big part in their academic lives. It shows how print and ERs are increasingly used complementarily in order to gather relevant information.

Students were observed to perceive Learning Support Systems, such as SciPro, which provide structured ERs for learning and writing their thesis in a very positive light. Completing thesis is crucial to more than 96% of students at both the Master's and Bachelor's levels, so access to resources on thesis description, structure, and process is crucial to their success. With fundamental data available through online access, LSSs like SciPro are greatly facilitating students' completion of the thesis process. Still, these systems supplement the role of supervisors with added support through preformatted resources and supplementary videos (Aghaee et al., 2014).

Murray (2018) surveyed the views of American scholars on their perception of e-book collections and the usage of such electronic materials. No participant in the research viewed e-books as more important than printed books. In general, the humanities love physical materials, it was stated by the constant higher importance of printed books among the academics of this field. Even though e-books have many advantages, like accessibility, academics still believe that printed books mean more in their work. This preference thus underlines the continued importance of print in the humanities despite the growing popularity of digital formats.

The study ascertained the level of computer literacy and institutional factors that will influence the use of ERs by postgraduate students at FUNAAB. The population target is 312 postgraduates participating in this survey. Data collection in this study was through a one-on-one administration of the questionnaire. Data analysis shows that 92.3% of the students are highly computer literate in Internet use, 81.6%, and word processing, 75.5%. The primarily used ERs were e-prints, e-journals 76.9%, AGORA, and HINARI 67.0%, while EBSCOhost was the least utilized at 34.6%. Besides, some institutional challenges were also found to hinder the use of ERs. These included inadequate space, a shortage of computers, and a lack of ICT training. The study, therefore, established that computer literacy had no significant influence on using ERs (Ajegbomogun, Achigbue & Diyaolu, 2022). Perceived ease of use and usefulness of the ERs significantly predict how students perceive and intend to use online learning platforms. Sivo, Ku & Acharya, (2018) noted that these factors significantly influence students' tendency to succeed in using e-learning platforms. The study calls for developing accessible and easy-to-navigate systems, such as SciPro, which can support students in writing their thesis by guiding them through organized ERs. The systems do not aim to replace supervisors but rather to complement the educational process and support them.

Chen (2019) explored the application of ERs by research scholars in their academic practices through interviews and citation analysis in Taiwan. The results of the research indicated that, out of the total percent, 79.65% used e-books, 15.58% used e-journals, and only 1.74% used both e-theses and databases; hence, e-books are the most utilized resource among all the resources. The researchers most utilized E-books, and the research cleared that authenticity and correctness are the primary keys. Most respondents mentioned that verifying the information for its validity and cross-checking the electronic copies with the original physical

documents are necessary. While e-books are becoming common in the humanities, this shows how cautiously scholars use ERs, making sure that the sources are reliable a top concern.

Linsha and Bavakutty (2017) surveyed research scholars in India to understand existing and emerging use patterns of ERs among this group, besides factors affecting their preference towards those sources of information. The results indicated that while most were highly satisfied with print resources, almost an equally high percentage reported overall satisfaction with ERs. Results clearly showed that even while the availability and usage of ERs have increased, ERs have not replaced print in meeting research needs among scholars. Satisfaction with ERs falls in the middle range of this discipline, reflecting either an access gap or an experience gap that could hinder the full adoption of digital formats.

Cheung, S. K. (2021) showed that the value of OER to students increased after switching to online learning. Interestingly, the increase was comparatively more significant for certain types of OER, like open online complete courses, online tutorials, and open-access e-books. It was found that with an increased perception of the usefulness of OER, students also became more aware of the limitations of OER, especially on accuracy and comprehensiveness. This could suggest a more essential engagement with OER as students navigated online learning.

2.9 Challenges in using ERs

The literature highlights the challenges academic libraries face in Bangladesh, particularly in the slow transition from hardcopy materials to ERs. Despite their significant role in enhancing education and research, many academic libraries, including those in 78 private universities, struggle to meet user needs due to limited awareness and infrastructure. The study aims to assess user awareness of ERs in selected private universities and identify reasons for the decline in library usage. The findings will guide policymakers and university authorities in developing strategies to improve ER access and support the government's Vision 2021 for a Digital Bangladesh (Nasiruddin, Islam & Islam, (2012).

Qasim and Khan, 2015 indicated challenges related to training to search and use ERs efficiently and effectively. Even though they had access to a wealth of information, it took much work for their research topics, which was frequently challenging. The study, therefore, recommended focused training sessions that would help the scientists to develop their search

strategies and enhance their ability to sift and extract relevant data from large electronic databases. This means that even as the CSIR-IGIB was well equipped with the latest ICT infrastructure, the scientists required additional training and guidance on how to use such resources effectively.

A study focused on students' problems at the Department of Computer and Systems Sciences, Stockholm University, while accessing structured ERs for thesis courses. It soon became apparent that students struggle with finding relevant and appropriately structured ERs to support various phases of their thesis work, such as data analysis or literature review. Students felt that the SciPro system, though developed to support the process of thesis preparation, was in greater need of organization regarding ERs. The study thus proposed a model of classification and improvement in access to the ERs, which could alleviate these challenges and enhance the quality of thesis output (Aghaee et.al. 2014).

The examined literature highlights the importance of EIRs in postgraduate research and the ongoing problems that impede their proper utilization. Research indicates that inadequate information retrieval abilities, awareness deficiencies, inconsistent power supply, restricted computer access, and sluggish internet connectivity are significant obstacles. Confronting these difficulties necessitates cooperative endeavors among institutions, policymakers, and library professionals to augment ICT infrastructure, elevate digital literacy, and guarantee uninterrupted access to scholarly electronic resources. Subsequent research should investigate the efficacy of institutional measures in enhancing postgraduate students' involvement with EIRs in Nigerian universities (Obande & Ayongo, 2024).

Moreover, despite their widespread use, the study identified several challenges in accessing ERs. One major issue was the slow internet speed, which hindered adequate access and downloading of ERs. This highlights the need for reliable internet infrastructure to use these resources efficiently. Additionally, the research revealed that students expressed interest in participating in training programs to effectively enhance their skills in utilizing ERs, emphasizing the necessity of further training on searching and using ERs. The study also noted that while ERs serve as a valuable alternative to print-based resources, addressing infrastructure and user education challenges is essential to fully realizing their potential (Sudhier, 2016). Similarly, many studies consider problems with the ICT infrastructure, as reflected in the current study. The study identifies inadequate ICT infrastructure at AMU and

JMI as one of the significant obstacles to the optimal use of ERs. Due to a lack of infrastructure, all the advantages of an ERs cannot be extended to make much utilization by the research scholar (Ansari & Naushad Ali, 2019).

Another study focused on a lack of knowledge among academics regarding the efficient practice of ERs, more expressly, the CD-ROM databases and OPAC services in the library. The study also tries to discover librarians' difficulties in developing and managing the digital library and faculty members' problems accessing ERs. Similarly, the study recommended that the university authority and faculty members raise the demand for improved information literacy skills for more awareness and confirmed the maximum use of university-subscribed ERs (Ahmed & Education, 2013).

Moreover, slow download speeds, incompatible user interfaces, and poor network connectivity are general barriers to the effective use of electronic information resources (EIRs). In order to meet such technological challenges, researchers have to use the wealth of information ERs provide frequently. Poor network connectivity can disrupt access to online databases and journals, frustrating users and reducing productivity. Similarly, huge files, like scholarly articles or datasets, can be difficult and time-consuming to retrieve due to slow download speeds. A similar problem is brought to light by research at REVA University, particularly the need for better infrastructure to enable access to ERs (Angadi, 2017).

According to Vasantha, Meera & Dhanamjaya, (2018), inconsistent network connectivity and indented help are among the challenges university academics and researchers face in using ERs effectively. These align with broader findings from the academic community, emphasizing that better infrastructure development is essential to guarantee convenience in accessing scholarly material. Indeed, several studies have also reported that people who know the importance of ERs in research and academics have some challenges. The first challenge is that academics and researchers are not adequately trained to search for ERs. This has been pointed out by Joshua and King 2020 despite all these benefits, and several issues can still be addressed in ERs. The first one is the fast growth of technology, which requires upgrading library systems and infrastructures. Security risks, like virus attacks and illegal access, seriously threaten the integrity of digital collections.

Additionally, copyright issues and data migration problems complicate the management of ERs. One significant issue facing many libraries is the need for more qualified personnel to manage and handle the technical aspects of ERs. These difficulties highlight libraries' need to implement robust plans to overcome these obstacles and maximize ERs (Jotangia, 2020).

Several studies have reported that end-user training on using ERs should be comprehensive, with Mwantimwa, Mwabungulu and Kassim, (2021) added to the woes of poor utilization. Other limiting factors that are likely to hinder the practical use of ERs by researchers and academicians apart from this factor include slow internet connectivity, unreliable power supplies, inability to access full-text articles at all times, poor navigation to the resources from the libraries' websites, and limited accesses to these resources.

In another study by Jan, Idrees and Naveed (2020), the problems with the relevance of the ERs were realized. Several studies have documented that the practical usage of ERs in institutions of higher learning may not be worth the investments made in acquiring them. This may be due to factors like inadequate infrastructure brought about by lack of enough financial support for software and hardware; such have been identified as negating the rate and quality of research output. On that point, Rosenberg, 2006 singled out what is happening in university libraries; some lacked the infrastructure to avail the ERs provided through countrywide licenses. In a study by Manda, Paul and Wema, 2011, identified of access to ERs is usually provided in institutions through IP addresses with/without password intervention. In access-based mechanisms with passwords, though, comes the problem of passwords not being changed regularly or given to users by the providers, which can block access to the resources available.

Additionally, there are also concerns about the comprehensiveness and accuracy of the content in OER. Most undergraduate and graduate students expressed hesitation to rely on Open Educational Resources for their educations" (Cheung, 2018).

Though online documents carry very resourceful information, some challenges exist in using them to conduct sociological research. This assumes an impossible task of analyzing vast volumes of unstructured data in electronic documents, which is possible only with sophisticated technologies like data mining and linguistic pattern recognition. Furthermore, OSINT data accuracy and reliability might be at risk and affect the general quality of risk

assessments. Additionally, the dynamic character of digital interactions and the constantly changing nature of illicit financial transactions make it difficult to continuously update and improve risk indicators in electronic document analysis (Iryna, 2024).

Tabassum, (2023) conducted a study examining the challenges and opportunities for undergraduate students in Bangladesh, specifically at the University of Dhaka, to access academic resources. It identifies significant problems like inadequate library facilities, improper management, and non-guidance in accessing ERs, which negatively affect the student's access to essential materials. The study covers various areas of university library facilities, department seminar libraries, ERs, and Academic programmes like seminars and symposiums. Surveys and interviews show that with all the resources included, there exists a great deal of information gap, obsolete materials, and poor student participation. Including library resources and digitizing books may be potential solutions, hence putting forth a proposal for its development.

A study explored human resources in public libraries in Pakistan. It reveals that while professionals in the field of LIS manage many libraries, many are being active by non-professionals. It highlights a severe staff shortage, including LIS professionals, IT experts, and other support staff, which negatively affects libraries' ability to meet the demands of the information age. The report argues that public libraries are not adequately equipping the population with the present and future information needs. It recommends increasing the staff by hiring more LIS professionals and IT experts to address technological challenges (Hussain & Saddiqa, 2024).

The study looks at the problem of limited access to medical knowledge, especially in poorer countries where paywalls block access to nearly 75% of academic journals. This study analyses the availability of full-text articles from 27 universities across the globe and reveals sharp contrasts, with some not having any access at all. The study suggests that other methods, such as Sci-Hub, can provide access to 95.5% of paywalled papers and save money for universities. The authors suggest that there should be global efforts to make scientific information available to everyone around the world (Boudry et al., 2019).

Most users are unaware of the ERs available in their institutions, which severely limits their use. For instance, most researchers in developing countries do not know how to locate or

effectively use online research materials. Poor internet connectivity and irregular electricity supply are significant obstacles, especially in developing regions ("Low Utilisation of Online Research Resources by Lecturers: Causes and Remedies", (Omumu, Chenube & Alordiah, 2022)).

Social support and encouragement are often lacking, discouraging individuals from engaging with ERs (Lee, 2022). In most instances, users lack the relevant searching skills to use ERs, hence getting frustrated and falling out of the service. A lack of training and guidance in using ERs is prevalent, particularly among scholars and students (Ahmed, 2013).

2.10 Research gaps

Although many studies have been done on this subject, there are some limitations and gaps in the findings; the following are the gaps we found when analyzing previous studies:

2.10.1 Contextual gap

Although ERs have been gaining importance in the academic environment, their contextual relevance for universities in Bangladesh has been underexplored. Very few studies have been conducted on user behavior analysis, focusing on perception, engagement, satisfaction, and challenges faculty members and researchers face. The gap is further evident in the lack of interdisciplinary studies that examine how ERs are utilized across different academic fields within Bangladeshi universities.

2.10.2 Knowledge gap

Most current studies focus on the availability and accessibility of ERs without providing enough information about how they have impacted scholarly output and academic progress. Again, there is limited information on how best to link ERs with institutional learning management systems for long-term sustainability.

2.10.3 Population gap

After analyzing 469 titles relevant to the study from Google Scholar, JSTOR, and ERIC and screening them, we identified various types of populations studied. There is a noticeable gap in the literature, as no study has been found that explicitly examines or compares the perceptions of Faculty Members and Research Students as distinct groups.

During the screening and review of relevant papers, we identified various types of respondents mentioned in the titles, such as Graduates, Postgraduates, Faculty Members, Library Users, Researchers, Librarians, and the General Population to identify the perception of ERs. However, we did not find studies explicitly including Faculty Members and Research Students (i.e., postgraduate research students) as a combined respondent group. A summary is provided in the table below:

Table 2.3 Populations explored in related research studies

Population	Used Terminology	Number of Papers
Graduate	Undergraduate, Graduate Students, Bachelor Students	143
Post Graduate	PG, Postgraduate Students, Master's Students, Higher Degree Learners	65
Faculty Member	Teachers, Academicians, Professors, Lecturers, Instructors	84
Library Users	Users, Learners, Patrons, Information Seekers, Knowledge Consumers	34
Researchers	Research Students, Research Scholars, Investigators, Academics	57
Librarians	Library Professionals, Library Staff, Information Specialists, Knowledge Managers	33
Not indicating Population	General	53
Faculty Members and Research Students	Faculty & Researchers, Academic Users, University Scholars	0

Research on the perception of ER usage in Bangladeshi universities often lacks differentiation between faculty members and research students, missing a comparative analysis of their unique needs, preferences, and challenges. Furthermore, the perspectives of students and researchers in diverse universities ranging from public to private universities are not comprehensively studied.

4.10.4 Geography Gap

While there is much research on the perception of ERs globally and regionally, little has been related to Bangladeshi universities subscribing to the UDL consortium. Most of the literature relates either to the developed countries or to the broader South Asian contexts. It is, therefore, urgent that localized studies be carried out to assess the usage of ERs within this geographical setting.

Table 2.4 Gap of the literature

Gap	Indicator	Solution Approach
Contextual Gap	Very few studies have been conducted on user behavior analysis, focusing on perception, engagement, satisfaction, and challenges	This study committed to explore user behavior. perceptions, engagement levels, and challenges simultaneously
Knowledge Gap	There is limited information on how best to link ERs with institutional learning management systems for long-term sustainability	Develop a framework for integrating ERs in public university libraries of Bangladesh with learning management systems (LMS) based on study findings.
Population Gap	We did not find studies explicitly including both Faculty Members and Research Students in the context of perception	Conduct a comprehensive survey involving both Faculty Members and Research Students to explore their engagement, perceptions and experiences.
Geography Gap	Little has been related to Bangladeshi universities subscribing to the UDL consortium	Focus on universities within Bangladesh participating in the UDL consortium, the largest consortium in Bangladesh, to assess the effectiveness of ER subscriptions for faculty members and Researchers.

2.11 Chapter summary

The literature review chapter is the intellectual backbone of the study, integrating previous studies on the importance and development of ERs in academia. A systematic search strategy involves keywords that describe the search terms and the databases used for the studies included while following the criteria for inclusion and exclusion of specific studies. The literature review encompasses dimensions such as the definition and historical evolution of ERs, basic theoretical and conceptual frameworks, enhancement of access and use, and the impact of the resources in improving outputs and academic progression. It also emphasizes the perception of FMs and RSs. Problems and critical issues in using ERs, as well as accessibility and digital literacy, are considered in the study. It highlights important research, contextual knowledge, and population gaps that are important for subtle understanding. In synthesizing the discussions, the review emphasizes the need for further investigation of ERs to bridge such gaps and establish explicit and informed strategies for academic and institutional advancement.

Chapter Three: Research Methodology

3.1 Introduction

Research methodology is an approach for systematically addressing research problems and can be viewed as a branch of science that focuses on understanding how research is conducted (Kothari, 2004). The study intends to collect participant's views from ten public universities of Bangladesh with high engagement of ERs via UGC Digital Library Consortium. The study aims to gather diverse perspectives and statistically relevant insights into the role of ERs in academic contexts. This chapter outlines strategies and methods used in the study to assess the perceptions of ERs and the contributions to scholarly production and academic growth among faculty members and research students. A suitable research technique must be chosen for any study, as the reliability of research findings depends on scientific methodologies (Mannan, 1997). The methodology covers a detailed sample strategy for participant and discipline selection, an instrument designed to capture the essential elements of ERs use, and rigorous data collection and analysis protocols to enhance the reliability and validity of the results. Therefore, it presents the methodology used to get the results in subsequent chapters. The specific method used is the quantitative approach to objectively provide data-driven insights into how the consumption of ERs occurs according to the Bangladesh Context. These include research design, sample methods, data collection tools, and analysis procedures applied to this study, ensuring a transparent and replicable approach to exploring the study's fundamental questions.

3.2 Research design

Research can be distinguished based on qualitative, quantitative, and mixed-methods. Qualitative research is a continuous process in which meaning develops an understanding within the scientific community by revealing new, substantial differences through proximity to the investigated issue (Aspers & Corte, 2021). Quantitative research aims to quantify and collect data, study it for patterns and relationships, and verify the measurements (Watson, 2015). Using a quantitative approach, this research investigates the views of faculty members and research students on the use of ERs and their impact on scholarly output and academic enhancement. This systematic collection involves gathering numerical data, which then

undergoes statistical analysis for the objective of the study and ERs use, and impact. The structure of the research design and/or approaches is structured in figure 3.1.

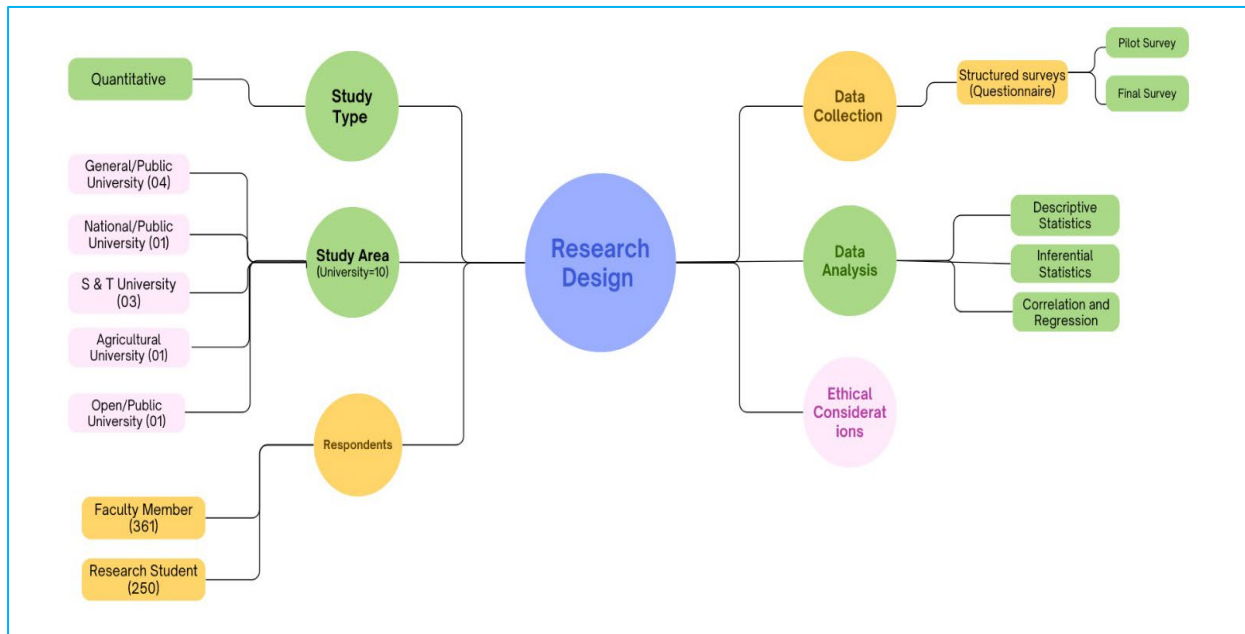


Figure 3.1: Structure of the research design

The quantitative approach was used for this study, as it statistically analyzed perceptions among a sufficiently large sample to facilitate the general application of findings to a broader population. This is already an established method in Education and Library Science. Surveys are widely used to collect data for analyzing usage patterns, frequency (Bryman, 2016), and impact (Creswell, 2014). Moreover, previous research verifies that quantitative approaches efficiently evaluate perceptions, behaviors, and the impact of ERs in Scholarly output (Waghmode et al. 2023). Utilizing structured questionnaires in this research lets the investigation quantify factors like the frequency of ERs use, perceived benefits, and their effect on academic progression. This method aligns with the purpose of the study in that it allows for the identification of trends and relationships that enhance the understanding of the impact of ERs on academic activities.

3.3 Research strategy

The research strategy serves as a comprehensive plan guiding the entire research process. The research methods used for qualitative and quantitative studies are quite different. This survey study explores target respondents' perceptions, attitudes, or thoughts on an object, concept, or phenomenon of interest. This study was supported in its course by a quantitative methodology, allowing systematic data collection and analysis; hence, generalizable conclusions could be drawn over the sampled academic institutions.

3.4 Study area

The study focuses on ten (10) prominent public universities (General, specialized, open and national) in Bangladesh, those offer post graduate degree program and that utilize ERs from the UGC Digital Library Consortium (UGC, 2024). The selected universities which have been taken as the study area of this research are noted in Table 3.1.

Table 3.1: Study area with related information

Name of the university	Type of University	Website	Establish	Location
University of Dhaka (DU)	General	https://www.du.ac.bd	1921	Dhaka
University of Rajshahi (RU)	General	https://www.ru.ac.bd	1953	Rajshahi
Chittagong University of Engineering and Technology (CUET)	Special (E&T)	https://www.cuet.ac.bd	1968	Chittagong
Sylhet Agricultural University (SAU)	Special (Agriculture)	https://www.sau.ac.bd	2006	Sylhet
Noakhali Science and Technology University (NSTU)	Special (E&T)	https://nstu.edu.bd	2001	Chittagong
University of Chittagong (CU)	General	https://www.cu.ac.bd	1966	Chittagong
Begum Rokeya University (BRUR)	General	https://www.brur.ac.bd	2008	Rangpur
Jessore University of Science and Technology (JUST)	Special (S &T)	https://just.edu.bd	2007	Khulna
Bangladesh Open University (BOU)	Special (Open)	https://www.bou.ac.bd	1992	Dhaka
National University (NU)	General	https://www.nu.ac.bd	1992	Dhaka

*E&T= Engineering & Technology S&T= Science and Technology

Strategically located across various regions, these selected universities provide a wide representation of academic disciplines, including Science, Social Science, Engineering, Arts,

Business and Management, and Agriculture. The diversity in geography and disciplines enables a more subtle understanding of how ERs are used and perceived across different academic contexts. This research also tries to explain how the use of ERs affects scholarly activities and academic development at universities by gathering insights from the faculty members and research students in Bangladesh. The ten universities selected for our study that subscribe to a good number of ERs through the UGC Digital Library Consortium. The ERs are available in the university library are as follows:

Table 3.2: Available ERs in the University Library

S.L.	University	Subscribed Database	Institutional Repository
1	DU	Emerald, IEEE, JSTOR, Emerald, Cambridge University Press, McGraw-Hill, Oxford University Press, Pearson, Sage, Springer, T&F, World Scientific, Wiley	http://reposit.library.du.ac.bd:8080/xmlui
2	RU	Emerald, IEEE, JSTOR, Emerald, Cambridge University Press, McGraw-Hill, Oxford University Press, Pearson, Sage, Springer, T&F, World Scientific, Wiley	http://rulrepository.ru.ac.bd/
3	CU	Emerald, IEEE, JSTOR, Emerald, Cambridge University Press, McGraw-Hill, Oxford University Press, Pearson, Sage, Springer, T&F, World Scientific, Wiley	https://library.cu.ac.bd/digital-repository/
4	JUST	Emerald, IEEE, JSTOR, Emerald, Cambridge University Press, McGraw-Hill, Oxford University Press, Pearson, Sage, Springer, T&F, World Scientific, Wiley	N/A
5	SAU	Emerald, JSTOR, Oxford University Press, Pearson, T&F, World Scientific, Wiley	http://archive.saulibrary.edu.bd:8080/xmlui/
6	NSTU	Emerald, IEEE, JSTOR, Emerald, Oxford University Press, T&F, Wiley	N/A
7	CUET	Emerald, IEEE, JSTOR, McGraw-Hill, Pearson, T&F, World Scientific, Wiley	http://103.99.128.19:8080/jspui/browse?type=title
8	NU	Cambridge University Press, Sage, Springer, T&F, Wiley	N/A
9	BRUR	Emerald, IEEE, Emerald, Cambridge University Press, McGraw-Hill, Oxford University Press, Pearson, Springer, T&F, World Scientific, Wiley	N/A
10	BOU	Emerald, IEEE, Emerald, Cambridge University Press, McGraw-Hill, Oxford University Press, Pearson, Springer, T&F, World Scientific, Wiley	N/ A

3.5 Population

The people being studied by the researcher are called collectively the population. According to Shukla (2020), the population is an aggregate of all units possessing the variable attribute under study, for which generalizable inferences can be made. The present study investigates two different groups, namely: Faculty Members and Research Students who access ERs within the UGC Digital Library Consortium and others ERs like Intuition repository, open access and etc. The inclusion and exclusion criteria for each population ensure that the study targets the relevant individuals, thereby enhancing the validity and reliability of the results.

3.6 Inclusion criteria

The specific criteria for including research participants are explained in this section. These criteria were established to ensure that the sample population is representative, relevant, and appropriate for achieving the research objectives. The following is an outline of the inclusion criteria:

- 3.6.1 *Engagement status:*** The eligible status of the faculty members was employed in one of the ten sampled public universities. At the same time, research students must enroll for any postgraduate study like Master's with thesis, MPhil, or PhD programs.
- 3.6.2 *Experience requirement:*** The faculty member must have at least one year of work experience in his professional field; a research student must have completed at least one semester, level, or segment in his academic program and be currently active in it.
- 3.6.3 *Academic disciplines:*** Participants should represent one of six specific academic disciplines: Science, Social Science, Engineering, Arts, Business and management, and Agriculture.

3.7 Exclusion criteria

The specific criteria for excluding research participants are explained in this section. These criteria were established to ensure a focus on individuals whose experiences and activities align closely with the research objectives. The following is an outline of the exclusion criteria:

3.7.1 Engagement status: Faculty members and research students who are on leave or not actively engaged in teaching or research during the study period will be excluded, along with research students who are on a break, not currently enrolled in courses, or have already completed their programs.

3.7.2 University selection: We focus exclusively on different types of public universities, such as general and science & technology institutions, and exclude private universities to narrow the scope of the study. Because of private university's admission criteria, and governance structures, budgeting, often differ significantly from public universities. By limiting our focus to public universities, we can provide clearer insights relevant to the sector's unique challenges and contributions to higher education.

3.7.3 Administrative roles: Faculty members who only hold administrative positions (e.g., Vice Chancellor, Pro Vice Chancellor, Registrar, Deans) without teaching duties may be excluded, as their interactions with research could vary significantly from those of teaching faculty.

3.8 Participant recruitment

The recruitment of participants for this study was carried out in several structured stages to ensure a comprehensive and effective outreach process.

Table 3.3: Participant recruitment for this study

Recruitment Stage	Description	Method
Initial Contact	Emails sent to targeted university Libraries	Digital communication
Invitation to Participate	Mode 1: Invitation via email, social media platforms i.e. WhatsApp with informed consent document Mode 2: Physical Approach	Online and printed consent
Follow-up	Reminders sent to non-respondents	Digital, physical approach and phone reminders

3.9 Sample and sampling

An adequate sample size is crucial for the reliability of research findings. There are two types of participants, faculty members and research students, with different characteristics and roles in academic settings; based on their teaching and research roles. This process includes several phases:

3.9.1 Phase One: University selection

The study focuses on ten universities with higher-than-average subscriptions to UGC Digital Library resources, ensuring insights reflect a diverse and active engagement with ERs among faculty members and research students.

3.9.2 Phase Two: Discipline-based clustering

Faculty participants are grouped within six primary academic disciplines: Science, Social Science, Engineering, Arts, Business and Management, and Agriculture. Each university contributes 10-30 faculty members per discipline, accommodating variations in availability and allowing for comprehensive academic perspectives.

3.9.3 Phase Three: Purposive cluster selection

Clusters (academic disciplines) within each university were purposively selected to identify Faculty Members (FMs) for participation in the study. This purposive sampling approach was employed to ensure fair representation across all disciplines and minimize selection bias. A total of 361 faculty members were included in the final sample. To determine an appropriate sample size for FMs, Morgan's formula was applied, which ensured statistical significance and representativeness.

For research students (RSs), purposive sampling was also used to recruit participants from 10 universities until the desired sample size was attained. Since the total population size of research students was unknown, Cochran's formula with finite population correction was utilized to estimate an appropriate sample size (Kotrlík & Higgins, 2001). This formula is particularly useful for survey research when the population size is finite and a specific confidence level is required.

The formula used is:

$$n = \frac{N \times Z^2 \times p(1 - p)}{e^2(N - 1) + Z^2 \times p(1 - p)}$$

Where:

n = required sample size

N = population size (assumed 500 for this study)

Z = Z-value (1.96 for 95% confidence level)

P = estimated proportion of the population (0.5 assumed for maximum variability)

e = margin of error (0.05)

Substituting the values:

$$\begin{aligned} n &= \frac{500 \times (1.96)^2 \times 0.5 \times (1 - 0.5)}{(0.05)^2 \times (500 - 1) + (1.96)^2 \times 0.5 \times (1 - 0.5)} \\ &= \frac{500 \times 3.8416 \times 0.25}{0.0025 \times 499 + 3.8416 \times 0.25} \\ &= \frac{480.2}{1.2475 + 0.9604} = \frac{480.2}{2.2079} \approx 217 \end{aligned}$$

Thus, the estimated sample size is approximately 218 (rounded up). To ensure adequate representation and practical feasibility, a final sample size of 250 research students was selected. The purposive sampling technique was applied to select research students based on predefined inclusion criteria relevant to the study, ensuring the selection of participants who could provide meaningful data.

3.10 Pilot survey

The pilot study is undertaken to test and refine the research instruments, such as the questionnaire, and to check the methods of data collection. First, the methodology of the study itself must be tested to ensure that the questions are understood, relevant, and yielding the information needed.

A pilot survey was conducted with a total of 30 respondents: 20 Faculty Members, accounting for 66.7%, and 10 Research Students, accounting for 33.3%, from various academic disciplines and institutions. This heterogeneous group was selected because they are proficient in ERs and willing to provide comments. The data collection aims to include most of the opinions on the use and effectiveness of ERs within the academic setting. These respondents were excluded from the final survey. The development of the questionnaire and the overall validity of this study are therefore strengthened.

The insights gained from the pilot survey helped in adjustments to the research design and questions to ensure a more robust and comprehensive exploration of the topic in the main study. The pilot study took place over one week, from April 20, 2023, to April 27, 2023. A draft version of the pilot survey questionnaire that includes:

- Demographic questions
- Questions about the usage of ERs (frequency, types, etc.)
- Questions on perceived benefits and challenges
- Open-ended questions for qualitative feedback

After completing the questionnaire, participants were invited to provide verbal or written feedback on their experience, focusing on

- Clarity of questions
- Time taken to complete the survey
- Any difficulties faced while answering specific items
- Suggestions for improvement

After analyzing the collected data, it was observed that several questions, particularly open-ended ones, were largely unanswered by many participants. To address this, the wording and

response options were revised with guidance from experts to enhance clarity and encourage more comprehensive responses. The feedback gathered was analyzed thematically to identify common issues, suggestions, and areas requiring refinement. Responses were reviewed for patterns and trends that could indicate the effectiveness of the survey items. The refined questionnaire was finalized and prepared for the final study, ensuring that it meets the research objectives effectively.

Yet, we have reviewed our questionnaire with two subject specialists and one library professional. One of the subject specialists (expert 1) is a Professor at Information Science and Library Management, University of Dhaka, Bangladesh and the other one (expert 2) is Professor of Statistics working at National University, Bangladesh. Our third expert (expert 3) is a Deputy Librarian of Dhaka University Library, who is responsible for ERs Acquisition and Management.

In addition to suggesting a few minor adjustments in sections B and C, expert 1 rated the questionnaire as appropriate overall. Expert 2 recommended a few grammatical changes, suggested a modification in the wording of a research objective, and proposed the removal of a couple of options from the research questionnaire's question number 2 and 3. Expert 3 advised merging two questions in section 1, rechecking the options for question number 2, and keeping an open comment option at the end of the questionnaire. After considering all of the expert recommendations, necessary amendments have been made to the questionnaire in consultation with the supervisor. The following is a list of the experts who have reviewed the questionnaire:

Table 3.4: List of the experts

Inclusion	Institute	Designation	Country
Expert 1	Information Science and Library Management, University of Dhaka	Professor	Bangladesh
Expert 2	Statistics, National University	Associate Professor	Bangladesh
Expert 3	Dhaka University Library	Deputy Librarian	Bangladesh

3.11 Data collection

This study employs a quantitative approach to systematically capture the perception of faculty members and research students regarding the usage of ERs. Structured surveys were used as the primary tool to collect data, allowing for the measurement of key variables such as frequency of ERs use, perceived benefits, and overall impact on scholarly activities. This method ensures consistency in responses, making it possible to generalize findings across a broad sample while accurately capturing diverse insights from participants across different academic disciplines and universities. The survey achieved a strong response rate of with 361 out of 450 faculty members (80.22%) and 250 out of 300 research students (83.33%) participating. The high response rates ensure that the data collected are valid and representative of ERs use in university in Bangladesh.

Table 3.5: Faculty members response rate overview

Category	Number Distributed	Number Returned	Response Rate (%)
Faculty Members (FMs)	450	361	80.22
Research Students (RSs)	300	250	83.33
Total	750	611	81.47

For this project, seven data collectors were assembled from different university in the study area. They received online training on all aspects, including survey methodology, ethical guidelines, the quality of data taken, and how to communicate efficiently. This ensured consistency and reliability in data collection, which improved the research's outcomes. The following provides an overview of research students:

Table 3.6: Research students response rate overview

Category	N	%
Masters (Thesis Group)	56	22.4%
MPhil	86	34.4%
PhD	108	43.2%
Total	250	100%

3.12 Data collection instrument

In this research, the standardized questionnaire survey was the tool used for data collection. This questionnaire contains closed-ended questions for quantitative analysis as well as scaled items designed to measure the frequency and perceived advantages and problems concerning consumption of these ERs. The instrument was developed following a review of relevant literature to ensure content validity and was refined through a pilot survey to confirm reliability. This structured approach provides consistency, facilitating the collection of accurate, comparable data from faculty members and research students across multiple disciplines.

3.13 Overview of questionnaire

The survey gathered data on faculty members' and research students' perceptions and practices regarding ERs usage, with a focus on accessibility, frequency of use, perceived benefits, and academic impact. This aligns with the study's objectives to understand the utilization of ERs within universities in Bangladesh. Although two separate questionnaires were developed one for faculty members (FMs) and one for research students (RSs) the aim was not to differentiate between the groups but to gain insights specific to each. The separate questionnaires were necessary for two main reasons:

3.13.1 *Distinct purposes:* Both groups use ERs, but their purposes differ. Faculty members and research students have distinct academic roles and responsibilities, requiring slight adjustments in questions to better address each group's specific needs.

3.13.2 *Insight from demographic information:* The design allowed us to explore deeper insights given variations in age, experience, and academic needs.

The items in each questionnaire were nearly identical in number, structure, and pattern, but some response options were tailored to capture the specific contexts and experiences of each group. The overview of the questionnaire is shown in Table 3.7.

Table 3.7: Overview of the questionnaire

Sections	Question Type	Question No.	Example Questions
Section: A	Multiple Choice	1-9	How often do you access ERs? Would you please indicate the purpose of using ERs?
Access and Utilization of ERs			
The research and scholarly activity and Impact of ERs	Open-ended questionnaires	10-11	In what ways have ERs contributed to your research productivity? How would you rate the improvement in your productivity, on a scale from 1 to 10, due to ERs?
Section: B	7-point Likert Scale	12-15	Would you please mention your Perception in the Accessibility of ERs? Would you please mention your perception in the usefulness of ERs?
Perception in Accessibility, Content Quality, Usefulness and Cost effectiveness of ERs			
Section: C	Yes/No	16-17	What are the perceived constraints of using ERs in scholarly activities and academic works? How libraries can overcome the constraints of using ERs?
Constraints and Recommendations on Usage of ERs			
Suggestions or Opinions for Improvement	Open-Ended	18	How do ERs can help in promoting scholarly research and academic activities?
Section: D Personal and Demographic Information	Multiple Choice, Yes/No	19-25	What is your academic discipline? Designation/ Higher Study

Although two questionnaires were developed to collect responses, the pattern and questions were the same, differing only in response options to account for variations in responsibilities.

3.14 Timeline

The data collection timeline comprises two key phases. The Pilot Survey took place from April 20 to April 27, 2023, involving 30 participants, including faculty members and research students, to refine the survey instruments and procedures. Feedback from this phase helped identify ambiguities and improve the clarity of the final survey.

Table 3.8: Data collection timeline

Phase	Description	Start Date	End Date
Pilot Survey	Refine survey instruments and procedures	April 20, 2023	April 27, 2023
Final Survey	Collect data from selected participants	May 1, 2023	October 30, 2023

The Final Survey was targeted to start on May 1, 2023, and run to October 30, 2023, to gather as much comprehensive data as possible from selected participants across 10 universities. This stage aimed to collect quantitative data about perceptions, usage patterns, and perceived effects of ERs on academic advancement, enriching the study's conclusion on the effectiveness of such tools in scholarly output.

3. 15 Types of survey

The study included online and offline questionnaires to enhance inclusiveness and response rates. This dual-mode strategy accommodated participants' access levels, improving reach and engagement.

3.16 Data analysis

The survey's quantitative data was analyzed with IBM®SPSS® Statistics Version 26 software, concentrating on ERs utilization among teachers and research students and its perceived influence on academic activities.

3.16. 1 Descriptive statistics

The results are presented in frequencies and percentages, through descriptive statistics using IBM®SPSS® Statistics Version 26 software, for the data in the seven-point Likert scale ranging 1 for strongly disagree and 7 for strongly agree.

3.16. 2 Inferential statistics

This research utilizes analysis of variance, i.e., ANOVA to explore highest frequency, chi-square tests, and T-tests to determine inferential statistics. Chi-square tests explored that frequency varied significantly by academic discipline ($p < 0.05$). T-tests revealed that the usage patterns of faculty members.

3.16.3 Correlation and regression analysis

Correlation analysis showed relationship between ERs usage frequency and perceived impact on academic progress. Regression analysis identified frequency of access and satisfaction with the quality of ERs as significant predictors of high scholarly output.

3.16.4 Reliability and validity of the research

Cronbach alpha scores were computed independently for each variable with IBM®SPSS® Statistics Version 26 software. The majority of statisticians suggest that the ideal Cronbach value should be between 0.7 and 0.8. According to Hair et al. (2013), the Cronbach alpha value should be more than 0.70. It is seen that all the scores are above 0.70. That means similar outcomes were gained if we repeatedly apply them in identical conditions. The following table represents the individual reliability scores of the variables:

Table 3.9: Internal consistency for the variables

Variables	No. of Items	Reliability (Cronbach's Alpha)
Research and scholarly activity and Impact of ERs	7	.736
Perception	12	.878
Challenges	5	.871
Recommendations	6	.803

All of the coefficients were higher than the traditionally accepted threshold of 0.70, confirming that the scales maintained good to excellent levels of internal consistency (George & Mallery, 2003). These results confirm that each set of items did consistently measure a consistent underlying factor.

3.17 Mitigating and avoiding research biases

To maintain accuracy and rationality within this quantitative study, a range of strategies were employed to mitigate and avoid potential research biases effectively:

3.17.1 Cluster selection: Cluster sampling methods were used to select faculty members. The selection bias was minimized by accumulating subjects from different academic fields and institutions.

3.17.2 Standardized survey instrument: The response variable was standardized to all respondents, and questions will mostly be closed. This helps reduce response bias and makes the data collection uniform. This was refined through the pilot survey to minimize ambiguous questions or misunderstandings.

3.17.3 Anonymity and confidentiality: Respondent anonymity reduces social desirability bias. The confidentiality of the data was ensured to receive genuine responses.

3.17.4 Data Cleaning and outlier analysis: The data have been meticulously checked for outliers and inconsistencies, thus avoiding any distortion in the results that may be caused by extreme values or abnormal responses that could potentially not be representative of the overall general findings.

3.18 Overview of the methodology

The table below outlines the relationship between each research objectives, and research design; its corresponding data collection techniques, and the study sections. This structured approach explains the investigation of each research question and guides readers to the detailed discussion and findings related to each question. This alignment ensures that all research questions are fully addressed in the study.

Table 3.10: Research objectives to research design

Research Objectives (RO)	Research Questions (RQ)	Research Design		Results
		Data Collection	Data Analysis	
RO1. To assess the current scenario of the usage and access to ERs in public universities of Bangladesh for academic and research purposes;	<i>SRQ1. What is the current state of ER usage and access at public universities in Bangladesh?</i>	Survey questionnaire	Descriptive statistics	Chapter Four
RO2. To analyze the variation in the use of ERs across demographic information such as academic discipline and age;	<i>SRQ2a. How does the use of ERs vary across different academic disciplines in different types of public universities in Bangladesh?</i>	Survey questionnaire	Descriptive and ANOVA	
	<i>SRQ2b. Is there a significant relationship between the utilization of ERs and the age demographic of faculty members and research students?</i>	Survey questionnaire	Descriptive and Chi-Square test	
RO3. To evaluate the impact of ERs on research productivity, quality of publications, and overall academic work;	<i>SRQ3. How do ERs impact the research output, publication quality, and academic activities of the respondents in public universities?</i>	Survey questionnaire	Descriptive, ANOVA and Correlation	
RO4. iv. To investigate the perceptions of the respondents on ER usage in terms of accessibility, effectiveness, utilization, and cost-effectiveness;	<i>SRQ4. What are the perceptions of faculty members and research students about the accessibility, effectiveness, utilization, and cost-effectiveness of ERs?</i>	Survey questionnaire	7-point Likert Scale MANOVA	
RO5. To recognize challenges faculty members and researchers face in using ERs for integrating ERs into public universities in Bangladesh;	<i>SRQ5. What challenges do faculty members and research students face in accessing and effectively using ERs into their scholarly activities?</i>	Survey questionnaire	Descriptive and thematic	

3.19 Ethical considerations

Ethical standards were considered for this research to protect the rights and welfare of all participants. Informed consent was obtained from each participant before data collection began, ensuring that they were fully aware of the purpose of the study, the procedures, and their roles. All participants were informed in detail of their right to withdraw from the study at any time without facing adverse consequences or punitive measures to ensure their autonomy. Confidentiality and anonymity were ensured through the process of the study. No personal identifiable information was collected, and data were handled with utter confidentiality, accessible only to the authorized members of the research team. This process ensured confidentiality for every respondent, as their responses were considered solely for scholarly purposes.

3.20 Chapter summary

This chapter has determined to critically present the methodological framework of this study investigating the attitudes and behaviors of faculty members and research students on ERs utilization and its implications on scholarly output and academic progress. This study was started by presenting a clear design or plans for a quantitative method, hence the investigation into the objective pattern of usage trends, advantages, and challenges about using ERs within Universities in Bangladesh. A pilot study was carried out with the questionnaire in order to guarantee that the data collection instrument is suitable, applicable, and valid. In ensuring that this study represents fields and demographic categories in its best interest, purposive and cluster sampling were utilized for the 10 selected institutions. This analytical approach shall employ descriptive and inferential statistics to investigate patterns, relationship, and determinants of ERs usage among faculty members and research students. This chapter found many ways to minimize possible biases of the study so that the validity and reliability of the results are ensured. Besides, the ethical issues on informed consent, participants' anonymity, and data confidentiality assurance were suggested to protect integrity in the research process.

Chapter Four: Data Analysis and Results

Part A: Data Analysis of Faculty Members

4.1 Introduction

This chapter presents the results and analysis of the data collected from faculty members (FMs) and research students (RSs) regarding their use of e-resources (ERs) for research and academic activities. The chapter is divided into three parts: Part A, Part B, and Part C. Part A and Part B explore the perceptions, practices, impact, and challenges of FMs and RSs regarding using ERs. In Part C, the findings are contrasted between the two groups to provide a complete understanding of ER adoption and its implications for academic progress. The findings are presented through tables, charts, and graphs to ensure clarity and comprehensiveness. This analysis addresses the study's objectives and research questions by examining the patterns of ER use, along with various factors influencing their adoption and effectiveness. The chapter synthesizes these findings to provide valuable insights into the role of ERs in enhancing the scholarly output of FMs and RSs at public universities in Bangladesh.

4.2 Demographic profile of the respondents (FMs)

Table 4.1 shows the demographic profile of the respondents, particularly the profile of FMs. The table represents a demographic analysis of the respondents (n = 361) and provides information about academic disciplines, designations, institutional affiliations, and gender distribution. The gender distribution reveals that there were more male (58.7%) than female (41.3%) among the respondents. The respondents in the survey are from various universities, with University of Rajshahi (RU) leading at 15.0% (n = 54) and University of Dhaka (DU) close behind at 14.7% (n = 53). These two universities comprise nearly 30% of the total respondents. Noakhali Science and Technology University (NSTU) (11.1%), Sylhet Agricultural University (SAU) (11.6%), National University (NU) 34 (9.4%) and Chittagong University (CU) (9.7%) are also well represented, contributing to a diverse sample from different regions and types of universities. Bangladesh Open University (BOU) 28 (7.8%), Begum Rokeya University Bangladesh (BRUB) have a (6.9%) and Jessore University of Science and Technology University

(JUST) (5.5%) presence in the overall distribution, reflecting diverse academic environments. The highest percentage of responders (24.4%) were from the Social Sciences, followed by Science (20.2%), Business and management (18.0%), Arts (15.8%), Engineering (11.9%), and Agriculture (9.7%). The FMs were divided into four groups Lecturers, Assistant Professors, Associate Professors, and Professors. Assistant Professors (34.9%) made up the largest group, followed by Lecturers (26.0%), Associate Professors (23.8%), and Professors (15.2%). The majority of respondents (49.0%) are aged among 31-40, followed by 24.7% in the 25-30 age group. Very few participants are in the 41-50 (19.7%), 51-60 (5.5%), and above 60 (1.1%) age groups.

Table 4.1: Demographic profile of the respondents

Demography of respondents (n= 361)	Items	Counts	Percentage
Gender	Male	212	58.7%
	Female	149	41.3%
Name of the University	RU	54	15.0%
	DU	53	14.7%
	NSTU	40	11.1%
	SAU	42	11.6%
	NU	34	9.4%
	CU	35	9.7%
	CUET	30	8.7%
	BRUR	25	6.9%
	BOU	28	7.8%
	JUST	20	5.5%
Discipline	Arts	57	15.8%
	Science	73	20.2%
	Social Science	88	24.4%
	Engineering	43	11.9%
	Agriculture	35	9.7%
	Business & Management	65	18.0%
Designation n=361	Professor	55	15.2%
	Associate Professor	86	23.8%
	Assistant Professor	126	34.9%
	Lecturer	94	26.0%
Age groups	25-30	89	24.7%
	31-40	177	49.0%
	41-50	71	19.7%
	51-60	20	5.5%
	>60	4	1.1%

4.3 Digital proficiency levels of FMs

Table 4.2 shows that out of 361 FMs, there are two distinct categories; 331 (91.7%) belongs to user category whereas 30 (8.3%) considered as non-user category. Among 331 respondents, 10.5% (38) are classified as Beginners, 39.9% (144) as Intermediate users, and 41.3% (149) fall into the advanced group. Conversely, however, 8.3% (30) were non-users, indicating the minimal portion of this population not applying these resources. The distribution of the table shows an intensive use for the respondents, who is, in most cases, an advanced and intermediary usage of ERs.

Table 4.2 Distribution of digital proficiency levels of FMs

FMs	User			Non-User
	Beginner	Intermediate	Advanced	
	38 (10.5%)	144 (39.9%)	149 (41.3 %)	30 (8.3%)
Total	331 (91.7%)			

4.4 Types of ERs used by FMs

Figure 4.1 demonstrates the percentage of responses for different types of ER usage among participants. Online journals are the most frequently used, accounting for 24.5% of responses. Following closely are e-books, which represent 21.0%. Scholarly databases comprise 14.6% of responses, while other websites contribute 16.7%. Institutional repositories are utilized by 10.2% of respondents, educational websites by 7.0%, and conference proceedings show the lowest usage at 6.0%. The display specifies a downward tendency in the percentage of responses as the usage type becomes less common.

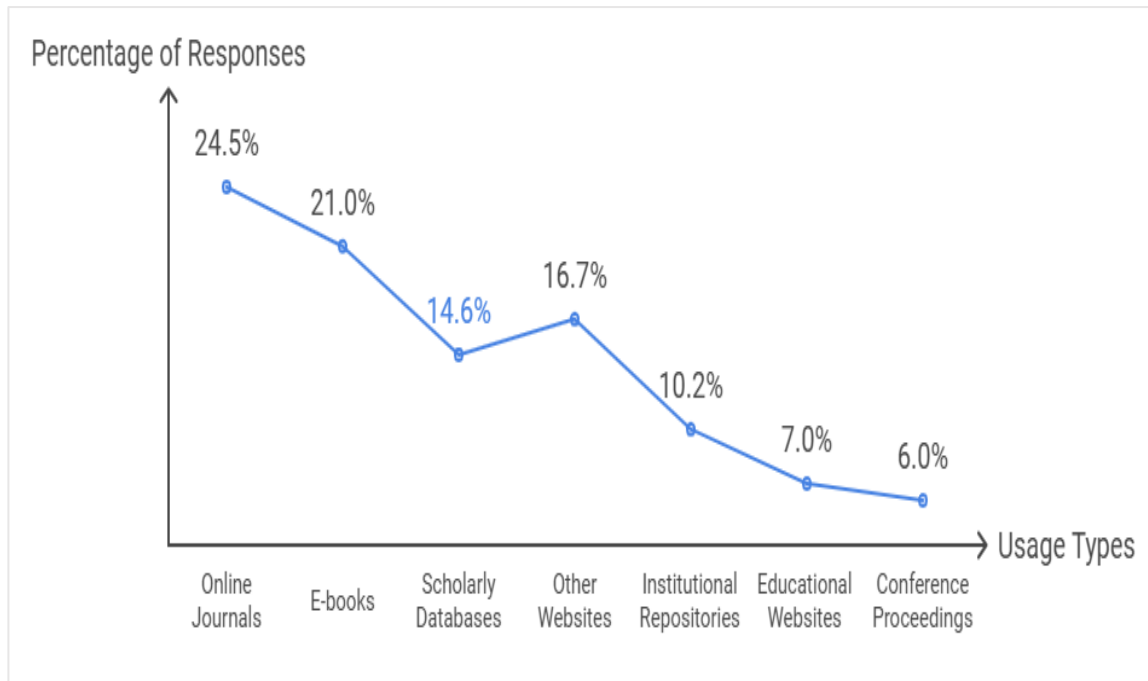


Figure 4.1: Types of ERs used by FMs

4.5 Sources of ERs used by FMs

Figure 4.2 shows the percentage of sources used to access ERs. The search engine is the most utilized source at 64.0% of FMs. The publisher databases follow at 56.2%, while journal databases follow at 46.8% and 30.2% access through the library website. Academic sources, social media, and referrals from colleagues or friends are referred less, with 24.7% and 21.9%, respectively. In addition to the foregoing, 22.7% of respondents said using "All of the above". Search engines and publishers' databases are highlighted on the chart as the main access channel to the academic ERs.

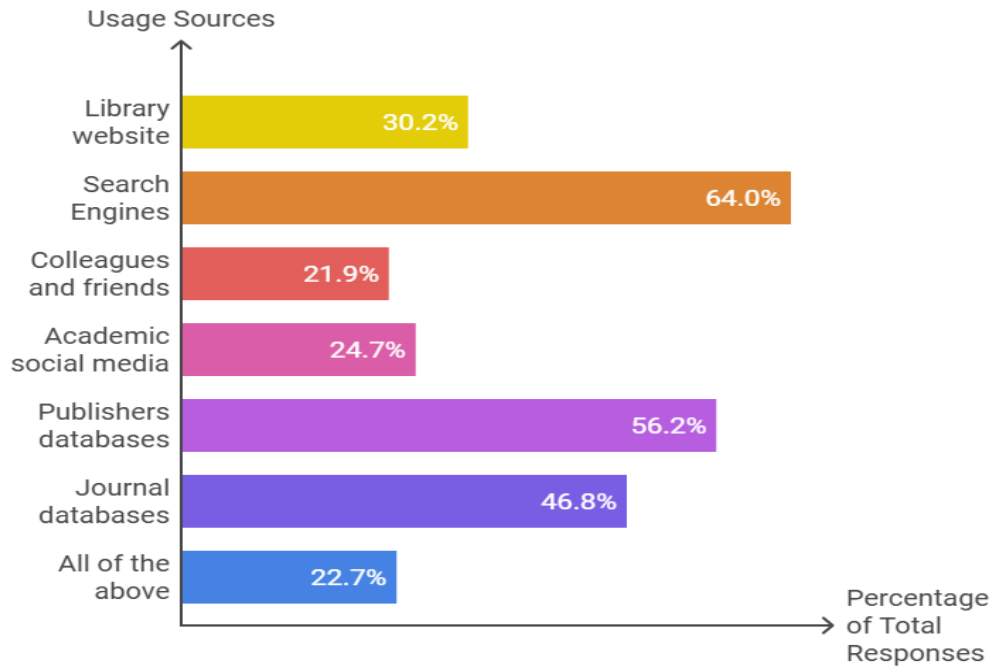


Figure: 4.2 Sources of ERs used by FMs

4.6 Purpose of using ERs by FMs

Figure 4.3 explains the various uses for ERs in a colorful presentation with corresponding percentages.

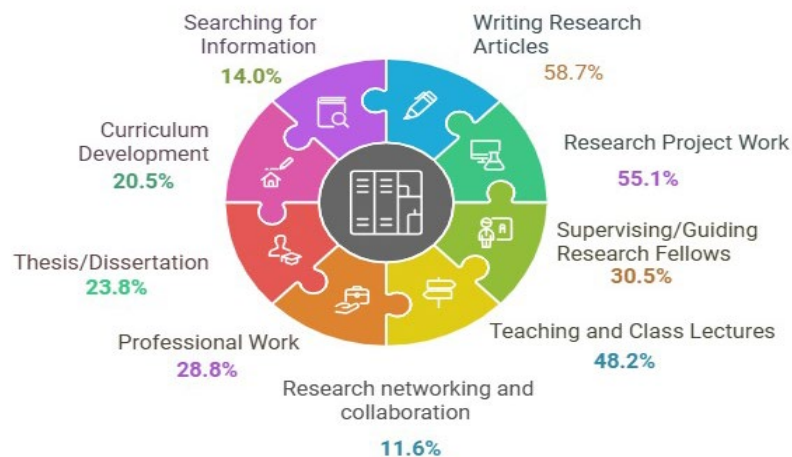


Figure 4.3: Purpose of using ERs by FMs

The top three uses are writing research articles at 58.7%, undertaking research project work at 55.1%, and teaching/class lectures at 48.2%. Other important uses are guiding research

fellows at 30.5%, professional works at 28.8%, and thesis/dissertation production at 23.8%. Other less frequent uses include curriculum creation 20.5%, searching for information 14.0%, and research collaboration/networking 11.6%. The structure indicates that many of these activities are interrelated, especially in academic and professional contexts.

4.7 Research and scholarly activities of FMs

The range and standard deviation (SD) of the different research and scholarly activities carried out by FMs are summarized in Table 4.3.

Table 4.3: Research and scholarly activities of FMs

Activities	Faculty Member			
	Min	Max	Mean	SD
Research Article	1	52	14.7	3.2
Editorial Book/Chapter	0	25	4.0	4.4
Thesis/Dissertation	1	4	1.6	5.7
Research Grants/Project	0	18	3.5	4.3
Conference Presentations	0	31	5.8	6.5
Fellowship	0	5	0.2	6.9

The respondents (FMs) reported that the research articles published range from 1 - 52 with a mean score of 14.7 with a standard deviation of 3.2, while for editorial books or chapters are ranging between 0 to 25, with a mean score of 4.0 having a standard deviation of 4.4. The average for thesis/dissertation is 1.6 points with a standard deviation of 5.7 points, and points range from 1 to 4. The research grants/project range between 0 to 18, with an average of 3.5 and a standard deviation of 4.3. The mean score for conference presentations is 5.8, with a standard deviation of 6.5, ranging from 0 to 31. Finally, the mean for fellowship activities is 0.2, with a substantial standard deviation 6.9. Their range is from 0 to 5. This table shows the range of FMs' engagement in the different scholarly activities. The most frequent activities are writing research articles and conference presentations, while fellowships are significantly less frequent.

4.8 Discipline wise average usage of ERs by FMs

Table 4.4 shows how many hours a week FMs from different disciplines use ERs on average.

Table 4.4: Discipline wise average usage of ERs by FMs

Discipline	Respondent	Count	Avg Usage (Hours/Week)	SD
Science	FMs	331	5.2	1.2
Engineering		331	3.9	2.7
Social Science		331	3.6	1.5
Business & Management		331	3.2	1.4
Agriculture		331	3.0	0.8
Arts		331	1.6	2.8

Science FMs used ERs for an average of 5.2 hours per week ($SD = 1.2$). The mean score for the Social Sciences FMs was 3.6 hours per week ($SD = 1.5$), while that for Engineering was 3.9 hours per week ($SD = 2.7$). For Business & Management, the mean score usage was 3.2 hours per week ($SD = 1.4$), while Agriculture FMs averaged 3.0 hours per week ($SD = 0.8$). The FMs in the Arts field reported the lowest average use, 1.6 hours per week ($SD = 2.8$). The above table shows the dispersion of ER usage frequency across academic disciplines, suggesting that FMs in the arts make the least use of these resources. In contrast, FMs in the sciences are the highest users of ERs.

4.9 Satisfaction levels of FMs with ERs

Figure 4.4 explains the satisfaction levels of 331 FMs regarding the use of ERs. The research indicates that ERs are predominantly regarded positively, with a significant proportion of respondents conveying satisfaction.

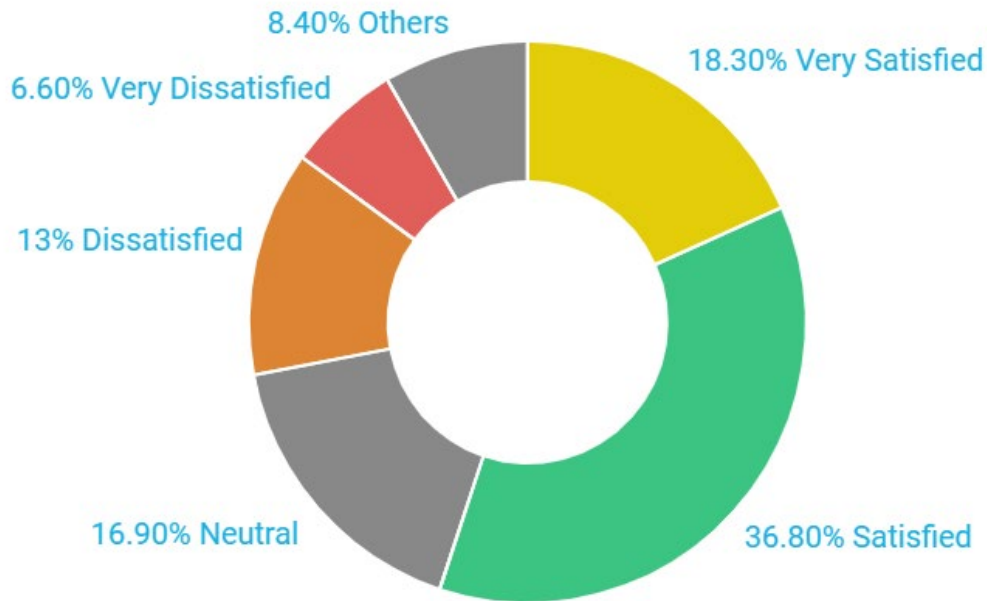


Figure 4.4: Satisfaction levels of FMs with ERs

A majority of FMs expressed their satisfaction levels with the available ERs, categorizing their responses as satisfied (133, 36.8%) and very satisfied (66, 18.3%). A significant proportion of respondents, (61, 16.9%), responded neutral satisfaction. A small but significant proportion expressed dissatisfaction, including 47 (13.0%) who described themselves as dissatisfied and 24 (6.6%) as very dissatisfied.

4.10 FMs' perceptions in accessibility, content quality, usefulness and cost effectiveness of ERs

The perceptions of FMs regarding the exploration of ERs provide insights into their usage and effectiveness in academic and scholarly contexts. This section explores respondents' perceptions through four key variables: accessibility, content quality, usefulness, and cost-effectiveness. Each of these dimensions plays a role in evaluating the overall perception of ERs on academic productivity and satisfaction.

Table 4.5 (A): Perceptions in accessibility of ERs

Statement	Respondent	Count	Mean	SD
ERs are easy to find and access	FMs	331	6.15	1.074
Available anytime and anywhere		331	6.20	1.003
Accessible on all devices		331	6.19	.901

Table 4.5: (A) presents the mean and SD of FMs' perceptions regarding the accessibility of ERs. The FMs assigned an average rating of 6.15 (SD = 1.074) to the statement ERs are easy to find and access. Accessible on all devices got a mean score of 6.19 (SD = 0.901), while available anytime and anywhere scored 6.20 (SD = 1.003). This table indicates that FMs' attitudes towards ER accessibility are generally positive. High mean ratings across these items suggest that FMs perceive ERs as widely accessible, easy to use, and accessible on many devices.

Table 4.5 (B): Perceptions in content quality of ERs

Statement	Respondent	Count	Mean	SD
Content is accurate and reliable	FMs	331	5.87	.881
Covers a wide range of topics		331	5.98	.931
High-quality multimedia resources		331	6.06	.829

Table 4.5 (B) shows the mean and standard deviation (SD) of the FMs' evaluations concerning the content quality of the ERs. Three hundred thirty-one FMs responded to the question. The statement content is accurate and reliable received an average rating of 5.87 (SD = 0.881) from FMs. The statements high-quality multimedia resources and covers a wide range of topics received the highest mean scores, 6.06 (SD = 0.829) and 5.98 (SD = 0.931), respectively. The chart indicates that the FMs regard the content of ERs as very good.

Table 4.5 (C): Perceptions in usefulness of ERs

Statement	Respondent	Count	Mean	SD
Keeps me updated with research	FMs	331	5.97	.901
Helps in academic performance		331	6.05	.841
Assists in organizing and citation management		331	2.87	1.222

Table 4.5 (C) represents, with Data from 331 FMs respondents, the statement, keeps me updated with research was ranked as 5.97 by the FMs (SD = 0.901). The statement, helps in academic performance rated a mean score of 6.05 (SD = 0.841). The data for the statement, helps to organize and manage citations with the mean score of 2.87 along with a standard deviation of 1.222. FMs reported that ERs helped enhance academic performance, keeping them abreast with the latest information in the research area; however, citation management comes out very low and may need an investigation.

Table 4.5 (D): Perceptions in cost effectiveness of ERs

Statement	Respondent	Count	Mean	SD
Save money compared to print materials	FMs	331	5.69	.999
Confident in using without support		331	5.72	1.227
Offer more value from traditional resources		331	6.17	1.033

Table 4.5 (D) illustrates the statement, save money compared to print materials was ranked with an average score of 5.69 (SD = 0.999), indicating that FMs regard ERs as cost-effective. The FMs demonstrate a mean score of 5.72 (SD = 1.227) for confident in using without support, indicating a reasonable degree of confidence in using ERs independently. The statement provide more value than traditional resources got the highest mean score of 6.17 (SD = 1.033), which means that FMs strongly believe ERs are more valuable than traditional print materials. This table demonstrates that FMs find ERs a valuable and economical substitute than print materials and are confident in their ability to access and use them independently.

4.11 Challenges faced by FMs in using ERs

Table 4.6 presents the various problems encountered by 331 FMs in using ERs, by response frequency and the percentage of users in each problem category. Percentages total more than 100% since respondents could select multiple challenges.

Table 4.6: Challenges faced by FMs in using ERs

Challenges (FM)	Responses (n= 331)	Percentage (%)	Rank
Inadequate infrastructural facilities	266	73.7%	2
Difficulty in accessing relevant resources	226	72.9%	4
Lack of training on effective use of ERs	263	62.6%	3
Limited access to full-text documents	290	80.3%	1
Lack of skilled personnel in the library	186	51.5%	6
Limited subject coverage	201	55.7%	5

The most significant problem reported was inaccessibility to full-text documents, at 290 responses, and that was 80.3% of the sample. This means that most of the users could not access all the material they needed. The second problem highlighted was inadequate infrastructural facilities, with 266 responses, or 72.9%. This means that weak or slow internet

connectivity hampered the effective utilization of ERs to a great extent. The third rating was lack of training on effective use of ERs, with 263 (62.6%) indicating that more user education and training in effectively accessing and using ERs is required. A concern mentioned by 186 respondents (51.5%) was the lack of qualified persons in the library, indicating that users needed more guidance or assistance from the library staff in using ERs. Other concerns that 226 respondents brought forward, 72.9%, were difficulty in accessing relevant resources, meaning the users experienced problems finding what they wanted. Lastly, limited subject coverage was mentioned by 201 respondents, 55.7%, meaning the technological issues the user experienced with efficient use of the ERs. The result underlines several major challenges for the FMs restricted accessibility to the full text, low internet bandwidth, and lack of training.

4.12 Recommendations provided by FMs

Table 4.7 lists recommendations from FMs', based on a sample size of 331, for improving the use of ERs. The table shows the top suggestions by number of responses and percentages.

Table 4.7 : Recommendations provided by FMs

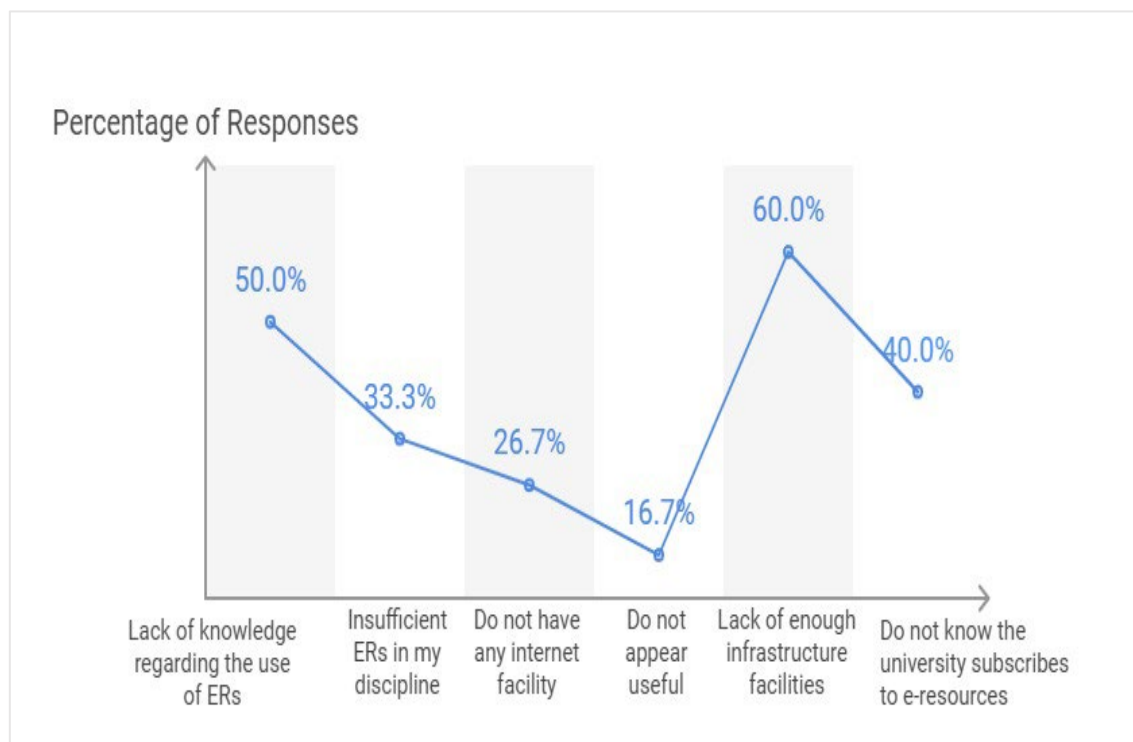
Recommendations from FMs	N	(%)	Rank
Assume an educational campaign for users	200	55.4%	5
Notification to user for new ER services	205	56.8%	4
High infrastructural facilities	309	85.6%	1
Skilled the staff for helping users	188	52.1%	6
Subscribe as far as user preference	237	65.7%	3
Continuous training and workshops for both users and staff	290	80.3%	2

Among the FMs, 309 (85.6%) indicated the statement, 'high infrastructural facilities' scored the top rank or rank 1. Then 'continuous training and workshops for both users and staff' was preferred by 290 respondents (80.3%) with rank 2. This was followed by 'subscribing as far as user preference' supported by 237 respondents (65.7%) rank 3. Additionally, 205 respondents (56.8%) expressed the importance of 'notification to user for new ER services' rank 4. The most significant way to improve use and understanding of ERs 'assume an educational campaign for users' was supported by 200 respondents (55.4%) rank 5 while 'skilled the staff for helping

users' with 188 respondents (52.1%) ranked 6. These recommendations by FMs indicate that improving ER usage requires a strong emphasis on infrastructure, training and customization.

4.13 Reasons for not using ERs by FMs

Figure 4.5 Shows the reasons for not using ERs as stated by 30 non-users. The infrastructural facilities are not sufficient, being the primary cause at 60%, lack of awareness of the University's ER subscriptions at 40%, and lack of understanding in using ERs at 50%. Other factors include the insufficiency of ERs 33.3%, inability to access the internet 26.7%, and perception of ineffectiveness of ERs 16.7%. This can be ascertained when one looks at a line graph that represents the comparative importance of each contribution in a non-user group.



*Non-Users=30

Figure 4.5: Reasons for not using ERs by FMs

4.14 Actionable opinions for the effective utilization of ERs by FMs (Data Source: Qualitative Part)

To achieve the greatest academic and scholarly outcomes, disseminating FMs with suitable support and training is vital. Thus, the survey contributors were invited to recommend ways to provide opinions to support and training for using these resources easily and efficiently.

Table 4.8: Actionable opinions for the effective utilization of ERs by FMs

Themes	Descriptions
Accessibility of Databases and High-Impact Journals	The FMs require specific database subscriptions and high-impact publications to stay abreast in their respective fields. It is recommended that subscriptions be made first and foremost for ScienceDirect in the scientific and medical fields, IEEE Xplore in the engineering and technological fields, and JSTOR in the humanities and social sciences. Such tools will ensure easy access and, as such, enhance the research, publication, and curriculum development work undertaken by the faculties.
Support for Advanced Search and Research Tools	The FMs usually need more advanced research tools to conduct comprehensive data analysis. They also need training in advanced search methodologies, such as Boolean operators and citation searches. For statistical analysis, SPSS, Stata, and R programming are available. Providing access to these technologies allows professors to conduct extensive research and work with weighty datasets.
Customized Resources for Curriculum Development	The FMs require specialized resources in order to create a curriculum and teach courses. Libraries must provide subject-specific collections that match the curriculum taught and curriculum-related e-books, case studies, and teaching tools for faculty to assist student learning.
Collaboration and Resource Sharing	The FMs routinely collaborate with other academicians at other universities and often conduct interdisciplinary research. Libraries should collaborate with publishers to offer remote access to faculty who are travelling or working abroad and explore ways to share resources through interlibrary loan

	or consortium access to expand the range of materials available.
Training and Support on Research Metrics	Such training on ER usage, necessary to measure research impact, encompasses an understanding of citations, the h-index, journal impact factors, how to track citation data, and other ways to enhance research visibility through resources such as Web of Science or Scopus.
Professionals' assistance	Consistent training sessions, both online and offline, must also be organized; publishers or relevant specialists should teach the staff the precise use of ERs.
Research Tools	Training in information literacy, electronic resource utilization, research methodology, and interpretation of scientific papers will be essential.
Ethical Standards	Ethical training can create an inclusive, respectful, and accountable environment within the library. It might include training in intellectual property rights, privacy, equitable access, responsible resource utilization, and professional ethics to help library personnel and their customers better effectively address many of the ethical dilemmas of the contemporary information era. By upholding these ethical values, libraries will be assured of being respected, inclusive, and welcoming institutions within their respective communities.

As a result, universities may significantly improve their usage of ERs by conducting customized undertakings that address the varied requirements of distinct user groups. This may be accomplished by intended advances in accessibility, usability, and user engagement to ensure ERs are systematically structured, effectively maintained, and easily accessible to all users. Through the adoption of user-centred techniques, universities may enhance ER platforms, offer tailored training programs, and establish supporting policies that ensure effortless access and efficient usage, considering users' diverse academic and research requirements.

Part B: Data Analysis of Research Students

4.15 Demographic profile of the respondents

The demographic profile of the participants particularly the researcher students (RSs) profile is shown in Table 4.9. It represents demographic analysis of the participants (n = 250) provides information about academic disciplines, professional designations, institutional affiliations, and gender distribution of the RSs who took part in the study.

Table 4.9: Demographic profile of the respondents by RSs

Variables	Items	Counts	Percentage
Gender	Male	154	61.6%
	Female	96	38.4%
Name of the University	RU	29	11.6%
	DU	25	10.0%
	NSTU	27	10.8%
	SAU	22	8.8%
	NU	28	11.2%
	CU	26	10.4%
	CUET	22	8.8%
	BRUR	25	10.0%
	BOU	21	8.4%
	JUST	25	10.0%
Discipline	Arts	22	8.8%
	Science	42	16.8%
	Social Science	47	18.8%
	Engineering	51	20.4%
	Agriculture	38	15.2%
	Business & Management	50	20.0%
Higher Degree n=250	Post-doctoral	14	5.6%
	PhD	95	38.0%
	MPhil	67	26.8%
	Mater's	74	29.6%
Age Groups	25-30	75	30.0%
	31-40	124	49.6%
	41-50	35	14.0%
	51-60	11	4.4%
	>60	5	2.0%

The majority of respondents were male, numbering 154 respondents (61.6%), while there were 96 female participants (38.4%). National University had the most number among the respondents, having 28 participants (11.2%) of the total. This was followed by RU, with 29 respondents, 11.6%, and NSTU, with 27 respondents or 10.8%. Other universities, such as JUST, DU, BRUB, and CU, provided more than 25 replies each, which is approximately 10% of the total. BOU had the lowest number, with 21 respondents (8.4%), while both SAU and CUET had the same frequency of 22 respondents (8.8%). Among the respondents, 51 respondents (20.4%) were from Engineering and 50 (20.0%) from Business and management to make up the most prominent groups. The Social Sciences comprised 47 respondents, 18.8% of the responses, and the Sciences 42 or 16.8%. The least represented discipline was the Arts, with 22 respondents, 8.8%, followed by Agriculture, 38 respondents, 15.2%. Among the 250 respondents, 95 (38.0%), were pursuing a PhD. The next largest group were MPhil candidates, 67 respondents, 26.8%, and master's degree holders, 74 respondents (29.6%). Only 14 post-doctoral researchers were among the responses, 5.6% of the total. The table also shows the distribution of RSs in different age groups. The age group category for 31-40 years is the dominant category for RSs and accounts for 49.6%, which means that most respondents in this age bracket considered as research students. The second demographic distribution within the age category of 25-30 years, making up 30.0% of the sample. The 41-50 age group makes up 14.0% of the research students. The evidence indicates that research participation decreases as age increases. The 51-60 age group is 4.4%, and those over 60 are 2.0%, with fewer RSs. Most importantly, a more significant number of RSs fall within the 31-40 and 25-30 age groups.

4.16 Digital proficiency levels of RSs

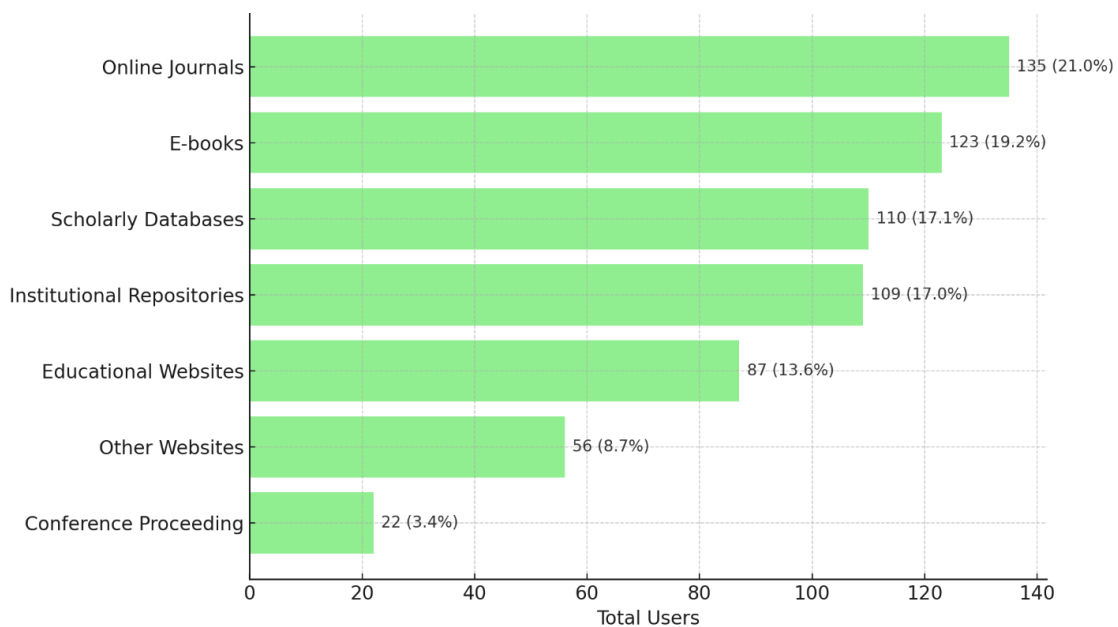
Table 4.10 describes the types of ER users and the digital proficiency level of RSs, ranging from beginner to intermediate and advanced. The results show that among 250 respondents, 222 (88.8%) reported being users, while 28 (11.2%) were non-users. A large group of 109 respondents, 43.6%, described themselves as an advanced user. Nineteen respondents (7.6%) reported being beginners using ERs for the first time. Ninety-six respondents (37.6%) reported being intermediate users.

Table 4.10: Digital proficiency levels of RSs

Type of Respondent	User			Non-User
Research Student	Beginner	Intermediate	Advanced	28 (11.2%)
	19 (7.6%)	96 (37.6%)	109 (43.6%)	
Total		222 (88.8%)		

4.17 Types of ERs use by RSs

Figure 4.6 represents types of usage for ERs by RSS (n = 222) and their usage statistics.

**Figure 4.6: Types of ERs use by RSs**

Online journals at the top of the chart with 135 users, (21.0%), followed by e-books with 123 users, (19.2%). The next on the list are scholarly databases, with 110 users, (17.1%), followed by institutional repositories, with 109 users, (17.0%). Educational websites are utilized by 87 (13.6%), while other websites account for 56 users (8.7%). Conference Proceedings have the lowest accessibility, with only 22 users (3.4%). The data indicate that online journals are the most accessed ERs by RSs, and conference proceedings are hardly used.

4.18 Sources of ERs used by RSs

Figure 4.7 displays the different ways respondents' access to ERs and states the most common strategies.

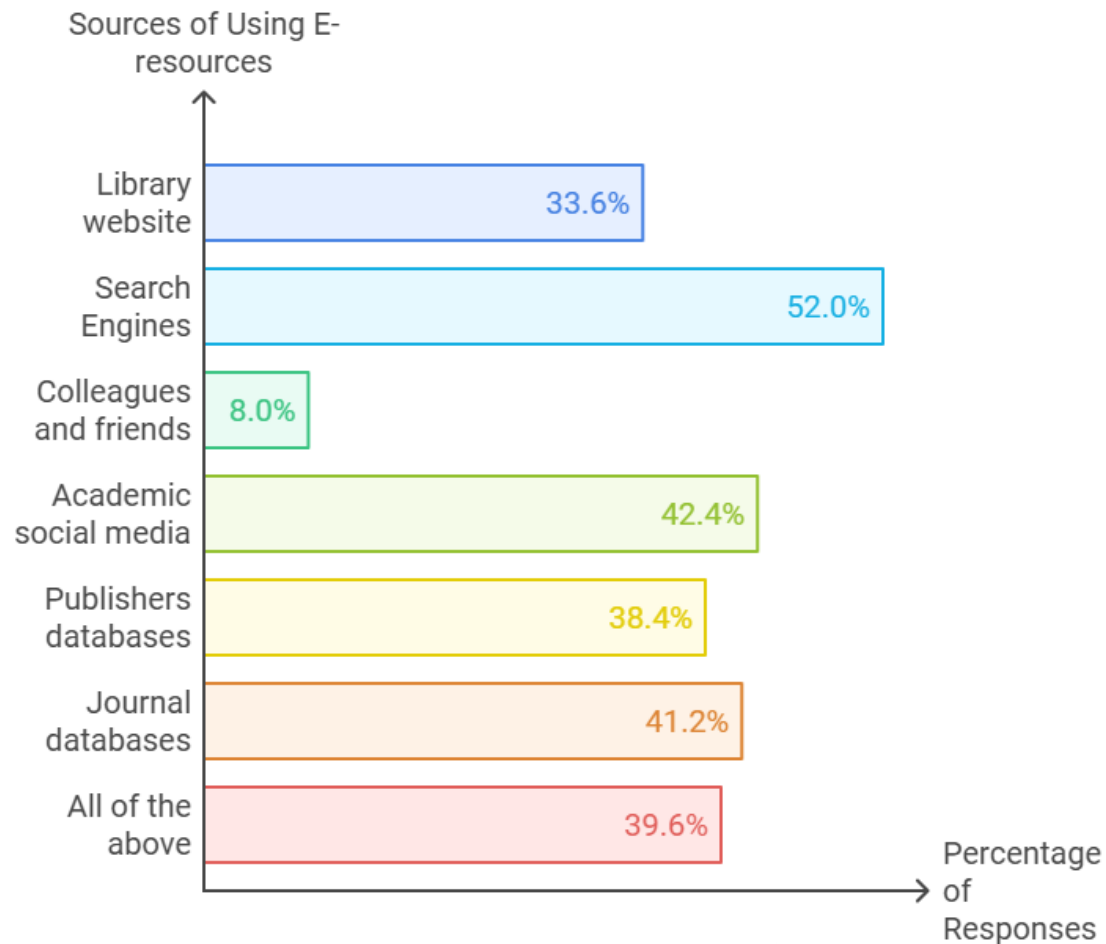


Figure 4.7: Sources of ERs used by RSs

Search engines are the most mentioned facilities for ERs access, followed by 130 representing 52.0% of the total. The following source used was from library websites, adopted by 83 respondents or 33.6%, which almost shares the same rate as academic and social media adopted by 106 respondents, accounting for 42.4%. These sources impress the importance of institutional platforms and social networks that allow academics to collaborate and share resources. For publisher databases, 96 respondents (38.4%) used them, while 103 respondents (41.2%) accessed them for journal databases. A minority of the respondents, 20

(8.0%), mentioned colleagues and friends and 99 (39.6%) use all of the above as their source for using ERs.

4.19 Purpose of using ERs by RSs

Figure 4.8 explains the purposes of RS's use of ERs. The primary objective is for thesis/dissertations, with (24.5%) followed by academic work (17.0%) and writing research articles (14.7%). Following research (13.7%) and searching for information (13.0%) are also significant purposes. Coursework (12.2%) is another notable reason, while general research (5.0%) is the least reported purpose. This distribution highlights the dominance of thesis and academic-related activities in RSs' ER usage.

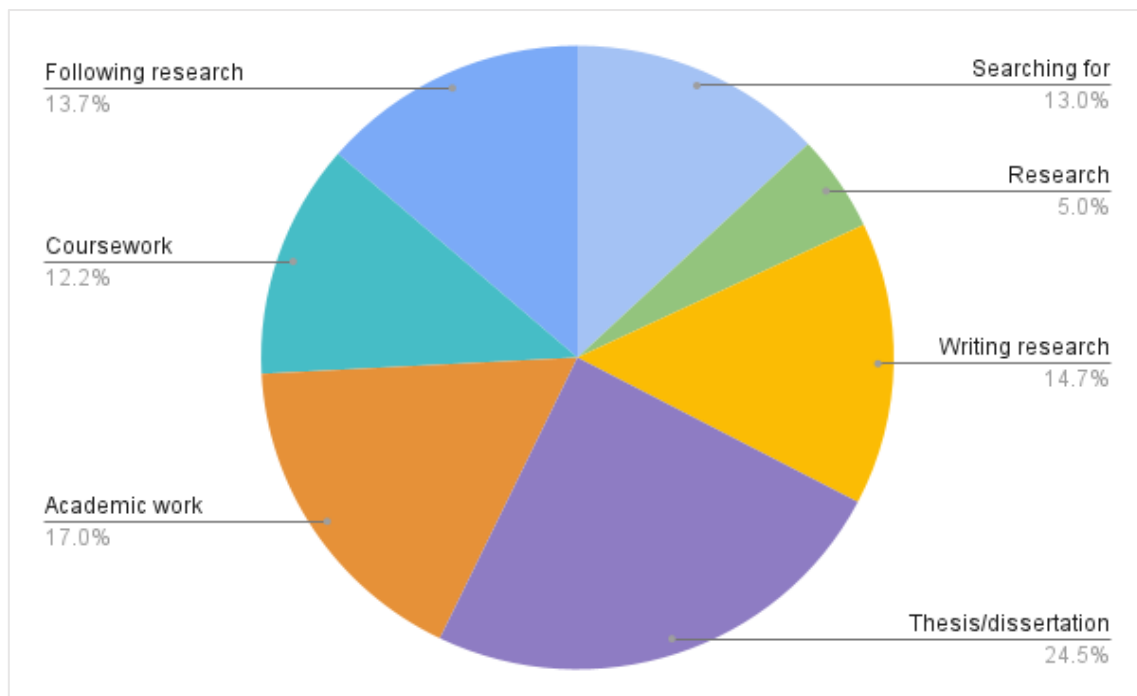


Figure 4.8: Purpose of using ERs by RSs

4.20 Research and scholarly activities of RSs

Table 4.11 highlights the RS's (n = 222) research and academic activities, ranging from minimum to maximum, mean, and standard deviation.

Table 4.11: Research and scholarly activities of RSs

Activities	Research Students			
	Min	Max	Mean	SD
Research Article	0	8	0.5	1.2
Editorial Book/Chapter	0	2	0.1	4.4
Thesis/Dissertation	0	1	0.1	2.7
Research Grants/Project	0	2	0.1	3.3
Conference Presentations	0	8	1.1	8.5
Fellowship	0	2	0.1	4.9

The purpose of research articles ranges from 0 to 8, with a mean score of 0.5 and a standard deviation of 1.2. While in RSs, the contribution to editorial books or chapters contribution ranges from 0 to 2 with a mean score of 0.1 and a high standard deviation of 4.4, which shows to the low level of average involvement, the rating for the thesis/dissertation completion varies from 0 to 1 with the mean score 0.1 and standard deviation of 2.7, which shows that few students have passed this point. Research grants/project ranged from 0 to 2, with a mean score of 0.1 and a standard deviation of 3.3; students' presentations at conferences range between 0-8, while the average is 1.1 presentations with a substantial standard deviation of 8.5; regarding participation in fellowships, it ranges between 0 and 2, where the mean is 0.1, and the SD is 4.9.

4.21 Discipline wise average usage of ERs by RSs

Table 4.12 shows the frequency of ER use by discipline, including the SD for each discipline and the average number of hours of RSs spend per week using ERs. The RSs in Science and Social Science report the highest use of ERs, averaging 3.8 hours per week. However, Social Science usage is more consistent, with a lower standard deviation (0.9) than Science (1.4). Business & Management follows with an average of 3.1 hours per week (SD = 1.2), indicating moderate use.

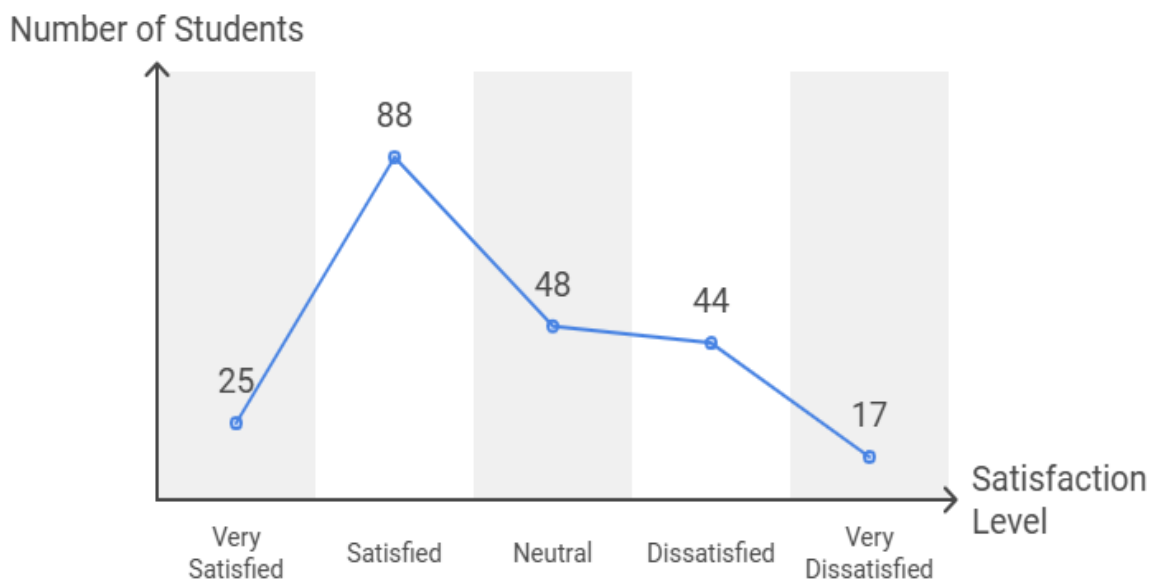
Table 4.12: Discipline wise average usage of ERs by RSs (n=222)

Discipline	Respondent	Avg Usage (Hours/Week)	SD
Science	RSs	3.8	1.4
Engineering		2.2	1.3
Social Science		3.8	0.9
Business & Management		3.1	1.2
Agriculture		2.6	1.4
Arts		0.7	1.9

The RSs in Agriculture occupies 2.6 hours per week on ERs, with a standard deviation of 1.4. Engineering RSs have a lower usage rate, averaging 2.2 hours per week (SD = 1.3). The Arts discipline shows the least involvement, with an average of 0.7 hours per week and a high variability (SD = 1.9). Overall, the most significant users of ERs are RSs in the Social sciences and Sciences; the least are those in the Arts.

4.22 Satisfaction levels of RSs with ERs

Table 4.10 illustrates the levels of satisfaction that 222 RSs expressed concerning ERs. The level of satisfaction for ER use has five categories: very satisfied, satisfied, neutral, dissatisfied, and very dissatisfied.

**Figure 4.10: Satisfaction levels of RSs with ERs**

Among RSs, the largest group, 35.2% (88), reported being 'satisfied' with the availability of ERs, followed by 19.2% (48) who remained 'neutral', and 17.6% (44) who expressed 'dissatisfaction'. 10% (25) of respondents reported being 'very satisfied', while the smallest group, 6.8% (17), indicated 'very dissatisfied' with using ERs. This distribution shows that while most RSs are satisfied, a notable portion remains neutral or dissatisfied.

4.23 RSs' Perceptions in accessibility, content quality, usefulness and cost effectiveness of ERs

The Respondents' perceptions of ERs reveal insights into their usage and effectiveness in scholarly contexts. This section explores RSs' perceptions through four key variables: accessibility, content quality, usefulness, and cost-effectiveness. Each of these dimensions plays a role in evaluating the overall perception of ERs on academic productivity and satisfaction.

Table 4.13 (A) shows the responses of RSs about the accessibility of ERs. The responses to three different statements about accessibility, availability and compatibility with devices are presented in terms of mean and SD for 222 RSs. ERs are accessible and available by RSs estimated the accessibility of ERs by an average of 6.17 with a standard deviation of 0.839, which showed that most of the RSs believed that the ERs were generally accessible. The statement, available anytime and anywhere reached the highest mean score of 6.27, with a standard deviation of 0.797, showing that RSs find ERs accessible anytime and anywhere. Accessible on all devices, with a standard deviation of 1.157 and a mean score of 5.88 for device accessibility, signifies greater variety in student experiences.

Table 4.13 (A): Perceptions in accessibility of ERs

Statement	Respondent	Count	Mean	SD
ERs are easy to find and access	RSs	222	6.17	.839
Available anytime and anywhere		222	6.27	.797
Accessible on all devices		222	5.88	1.157

Table 4.13 (B) presents the perceptions of RSs about the effectiveness of material in ERs. Three statements that are most relevant in content quality are reflected in the table, and the following results are presented. The statement, content is accurate and reliable was rated by 222 RSs with an average of 5.77 and a standard deviation of 1.031. The statement, covers a wide range of topics received an average rating of 6.22, with a standard deviation of 0.828. The relatively higher mean and lower standard deviation indicate that research students agree that ERs cover a wide range of topics. The statement high-quality multimedia resources have a mean score of 6.16, with a standard deviation of 0.821. The results also suggest that students perceive the multimedia elements of ERs as high quality since their responses showed minimal deviation.

Table 4.13 (B): Perceptions in content quality of ERs

Statement	Respondent	Mean	SD
Content is accurate and reliable	RSs	5.77	1.031
Covers a wide range of topics		6.22	.828
High-quality multimedia resources		6.15	.821

Table 4.13 (C) reflects the perceptions of RSs about the importance of ERs. The following points verify the three main statements mentioned in the table concerning ERs facilitating students' academic work. The statement keeps me updated with research had a mean of 6.19 and an SD of 0.879. The statement helps in academic performance was answered by an average score of 6.32 with a lower standard deviation of 0.785. As for the statement, helps manage citations and organization, the highest rating was an average score of 6.37 with an SD of 0.866. Finally, RSs find ERs very helpful, especially in managing citations, organizing research, improving academic performance, and keeping up to date with the latest news.

Table 4.13 (C): Perceptions in usefulness of ERs

Statement	Respondent	Mean	SD
Keeps me updated with research	RSs	6.19	.879
Helps in academic performance		6.32	.785
Assists in organizing and citation management		6.37	.866

Table 4.13 (D) measures the judgment of RSs concerning the cost-effectiveness of ERs. It has three statements related to value, savings, and trust in consumption compared to traditional

resources. The RSs rated the statement, save money compared to print materials, with a mean of 6.47 and a standard deviation of 0.677. The statement regarding being confident in using without support earned a mean score of 6.48 with a standard deviation of 0.664. The respondents also rated the statement offer more value than traditional resources, with a mean score of 6.38 with a standard deviation of 0.756. Although there is some diversity in their judgments compared to the other two claims, RSs overwhelmingly believe that ERs offer better value than traditional resources. RSs commonly perceive ERs as cost-effective, economically advantageous, offering superior value, and user-friendly without further support.

Table 4.13 (D): Perceptions in cost effectiveness of ERs

Statement	Respondent	Mean	SD
Save money compared to print materials	RSs	6.47	.677
Confident in using without support		6.48	.664
Offer more value from traditional resources		6.38	.756

4.24 Challenges faced by RSs in using ERs

Table 4.14 shows that 52.8% of RSs with the highest percentage reported a need for further training in the effective use of ERs. About 48.4% of RSs indicated slow internet speed as a problem. 45.6% of respondents reported they encountered technical problems using the ERs. 43.6% of the RSs, reported that inadequacy of subject coverage with the available ERs. 37.6% of RSs felt that library staff provided inadequate assistance. Lastly, 29.2% of respondents indicated that the limited availability of full-text resources was an issue, implying that while RSs can access full-text materials, many still need help obtaining complete documents for their information needs.

Table 4.14: Challenges faced by RSs in using ERs

Challenges	Responses (n=222)	Percentage (%)	Rank
Slow internet speed	121	48.4%	2
Inadequacy of subject coverage	109	43.6%	4
Lack of training on how to use ERs	132	52.8%	1

Limited access to full-text documents	73	29.2%	6
Inadequate support from library staff	93	37.6%	5
Technical issues with accessing ERs	114	45.6%	3

4.25 Recommendations given by RSs

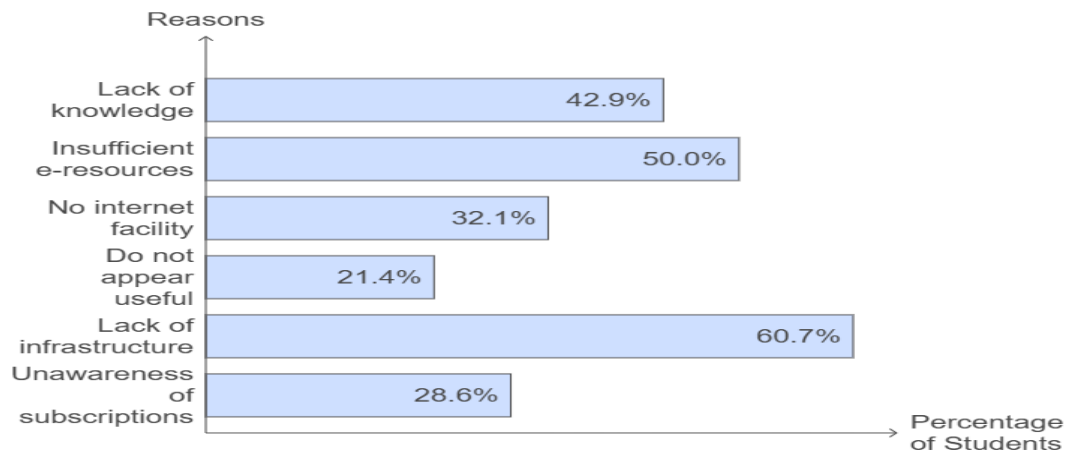
Table 4.15 shows the research students' suggestions on utilising the ERs better based on the percentages and numbers. Have uninterrupted power supply took the lead with 206 responses or 82.4%. Continuous training/workshops had 187, (69.6%), indicate that the RSs recognise that continuing education is important in improving ERs utilisation skills. The third position is held by qualified experts who can assist the users, who have received 174 responses with 78.8%. The creation of awareness regarding the benefits of ERs comes fourth with 150 (60.0%), indicating that the RSs believe that much more needs to be done to educate the users about the benefits and potentials of ERs. With 148 responses, representing 59.2%, which means students want to know about new ERs services. The statement 'know the user requirements and feedback' is in sixth position with 134 responses and a percentage of 53.6, and they believe that service providers should always solicit feedback and understand the changing needs of users.

Table 4.15: Recommendations given by RSs

Recommendations from R.S.	RS(N)	(%)	Rank
Raise awareness about the impact of ERs	150	60.0%	4
Skilled professionals for helping users	174	78.8%	3
Ensure uninterrupted power supply	206	82.4%	1
Display new services	148	59.2%	5
Continuous training and workshops	187	69.6%	2
Know the user requirements and feedback	134	53.6%	6

4.26 Reasons for Not Using ERs by RSs

Table 4.10 reflects the reasons for not using ERs as expressed by 28 respondents.



**Non- Users=28*

Figure 4.10: Reasons for not using ERs by RSs

Figure 4.10 shows the highest stated reason, 'inadequate infrastructure facilities', with 17 respondents, which account for 60.7%, have mentioned this as an obstacle for not accessing ERs. The second highest number of responses was 'insufficient e-resources' with 14(50.0%), meaning some RSs feel the ERs available are inadequate for their fields of study. 'Lack of knowledge' about ERs hinder their use, as evidenced by 12 (42.9%) respondents. That is followed by 'inadequate access to the internet' as reported by the response of 9 RS, representing 32.1% of those without internet facilities. Another barrier is the 'unawareness of ERs subscription'; 8 RS (28.6%) stated that they are unaware of the university's subscriptions to ERs. The least mentioned and, therefore, the least frequent reason is perceived as a 'do not appear useful', reported by six students, or 21.4%. In short, the leading causes of not using ERs include a lack of infrastructure, limited relevant resources, and unfamiliarity with accessing digital devices and using ERs.

4.27 Actionable opinions for the effective utilization of ERs by RSs (Data Source: Qualitative Part)

The respondents need adequate support and training to achieve the best research and academic results. Therefore, all survey participants were asked to provide their suggestions.

Table 4.16: Actionable opinions for the effective utilization of ERs by RSs

Themes	Descriptions
Orientation Programs for Freshmen	Most times, fresher RSs need to be educated on the innumerable ERs. Libraries, hence, need to provide induction courses to help pupils identify the most useful databases. They also have to inculcate an information literacy program to help the pupils learn the basic skills of acquiring and searching ERs.
Access to Core Academic Journals	Graduate students need access to core publications to establish a foundation in their discipline. Libraries should provide students with access to necessary discipline-based journals and e-books. Provide online access to databases of theses, such as ProQuest Dissertations & Theses, to enable students to contribute to the existing scholarship in their own discipline.
Hands-On Training in Advanced Search Techniques	The RSs often have to do extensive literature reviews. Libraries should provide students with hands-on practice in advanced searching skills, including refining search results using filters, Boolean operators, and database-specific tools. Instruct students to set up alerts for newly published material in their fields so that they can keep up with the latest scholarly output.
Mentorship and Professional Guidance	Professional development and mentorship allow researchers to easily access and utilize ERs effectively. Libraries should liaise with academics by offering mentorship sessions that help students maximize the utilization of ERs for their studies. They should liaise with publishers and experts to offer specialist training on navigating publishing processes and understanding journal standards.
24/7 Remote Access and Mobile Compatibility	The libraries should ensure the 24/7 availability of the ERs to the users and provide remote user authentication using either Open Athens or Epoxy. The platforms for ERs must be changed for compatibility with mobile use to facilitate resource accessibility for students easily through smartphones or tablets, thereby promoting easy research on the go.
Citation Management	Citation management is one of the most frequently requested services by RSs. Libraries must provide citation management software such as Mendeley, EndNote, and Zotero, as well as full usage guidelines.
Guidance on Plagiarism	It is essential that the RSs understand what academic integrity is, how to use ERs, and cite in places using APA, MLA, and Chicago formats.

Universities may optimize the usage of ERs by addressing the individual perspectives and distinct requirements of research students (RSs) through targeted methods and user-centered enhancements. By improving the navigation, accessibility, and general usability of ERs,

institutions might ensure that all users effectively access these resources, irrespective of their academic or research needs. This entails creating user-friendly search interfaces, offering specialized support services, and employing adaptive technology that supports various user preferences. Furthermore, organizations may create structured training programs, provide multilingual assistance, and implement feedback systems to consistently enhance ER accessibility and usability, thus promoting a more inclusive and efficient digital learning environment.

Part C: Data Analysis of FMs and RSs (Both Groups)

4.28 Demographic profile of the respondents (both FMs and RSs)

Table 4.17 shows that the demographic profile of the sample population differs according to a few key categories of the 611 respondents of both groups. The gender breakdown showed that 59.90% (n = 366) of the participants were males, while 40.09% (n = 245) were females. The respondents were drawn from various educational backgrounds. DU had 78 participants (24.7%), NSTU had 67 participants (21.9%), and RU had the highest number of participants at 83 (26.6%). NU, and SAU exhibited participation percentages between 20.1% and 20.6%. CUET, BRUB and BOU) showed relatively weaker representations, while JUST had the least at 15.5%. As for the academic subject of their study, Social Science was dominant with 135 responders, 42.8% of the sample, 37% (115) participants in the scientific area and 38% participants (115) had Business and Management as their subject. In the Engineering area, there were 94 responses, 32.3% in Agriculture, 73 respondents, 24.9%, and the fewest in the arts with 79 respondents, 24.6%. The FMs comprised 86 associate professors, 23.8%; 55 professors, 15.2%; the majority assistant professors, 126, 34.9%; and 94 lecturers, 26.0%. The largest segment of RSs included PhD candidates, 95, 38.0%, followed by master's degree seekers, 74, 29.6%. Out of the total 250, sixty-seven responses, or 26.8%, were MPhil students, while fourteen, 5.6%, were post-doctoral researchers. The distribution was balanced since there are 361, 59.09%, representing academic staff; for research students, the figure stood at 250, which is 40.91%. Contrasts between the age distributions of FMs and RSs would provide the details of their population. It, therefore, sets that the most significant percentage, 49.0% of the FMs, fall in the 31-40 age bracket, while 24.7% are aged between 25-30 years, meaning that the majority are either in the early or mid-tenure phases. Meanwhile, the age brackets between 41-50, or 19.7%; between 51-60, 5.5%, represent FMs considered older or senior, while those above 60 years are a meagre proportion at 1.1%. A similar trend is observed for RSs, with a majority of 49.6% lying in the 31-40 age group. A more significant proportion of the RSs, 30.0%, lie in the age group 25-30 than FMs, reflecting a more diverse population of individuals conducting research. The breakdown of the number of RSs in age groups 41-50 and 51-60, with 14.0% and 4.4%, respectively, indicates that many older

adults pursue research degrees, although these percentages decrease with increased age. More than their faculty member counterparts, 2.0% of research students are over 60. The statistics shows that FMs and RSs are dominated by the age brackets 31-40 and 25-30, meaning they are highly active and dedicated to their work from early to mid-career phases. On average, the RSs are a little younger and have a broader age range that also includes older persons.

Table 4.17: Demographic profile of the respondents

Variable	Items	Counts	Percentage
Respondents	Faculty	361	59.09
	Research Students	250	40.91
Gender	Male	366	59.90
	Female	245	40.09
Name of the University	RU	83	26.6
	DU	78	24.7
	NSTU	67	21.9
	SAU	64	20.4
	NU	62	20.6
	CU	61	20.1
	CUET	52	17.5
	BRUR	50	16.9
	BOU	49	16.2
	JUST	45	15.5
Discipline	Arts	79	24.6
	Science	115	37
	Social Science	135	42.8
	Engineering	94	32.3
	Agriculture	73	24.9
	Business & Management	115	38%
Designation (FMs) n=361	Professor	55	15.2%
	Associate Professor	86	23.8%
	Assistant Professor	126	34.9%
	Lecturer	94	26.0%
Age groups (FMS)	25-30	89	24.7%
	31-40	177	49.0%
	41-50	71	19.7%
	51-60	20	5.5%
	>60	4	1.1%
Higher Degree (RSs)	Post-doctoral	14	5.6%

n=250	PhD	95	38.0%
	MPhil	67	26.8%
	Mater's	74	29.6%
Age groups (RSs)	25-30	75	30.0%
	31-40	124	49.6%
	41-50	35	14.0%
	51-60	11	4.4%
	>60	5	2.0%

4.29 Proficiency levels of digital literacy of FMs and RSs

Table 4.18 displays the proficiency levels of digital literacy of both groups. Among the respondents of both groups, 553 reported as a user category, and 58 considered as non-user. In this regard, the FMs reported 10.5%, $n = 38$, as beginners; 39.9%, $n = 144$, as intermediate; and 41.3%, $n = 149$, as advanced users and non-users who responded to the survey participation amounted to 8.3%, $n = 30$. Among the RSs, 7.6% ($n = 19$) were beginners, 37.6% ($n = 94$) were intermediate, 43.6% ($n = 109$) were advanced users, and 11.2% ($n = 28$) were non-users. In all, 9.3% ($n = 57$) of respondents were classified as beginners, 39% ($n = 238$) as intermediate users, and 42.2% ($n = 258$) as advanced users, while 9.5% ($n = 58$) reported not using ERs. The results indicate that most FMs and RSs have reached the intermediate to advanced level regarding digital literacy competency. However, the minority consider themselves beginners or non-users of ERs.

Table 4.18: Proficiency level of digital literacy of FMs and RSs

Type of Respondent	User (553)			Non-User (58)
	Beginner	Intermediate	Advanced	
FMs	38 (10.5%)	144 (39.9%)	149 (41.3%)	30 (8.3%)
RSs	19 (7.6%)	94 (37.6%)	109 (43.6%)	28 (11.2%)
Total	57 (9.3%)	238 (39%)	258 (42.2%)	58 (9.5%)

4.30 Types of ERs used by both groups

Figure 4.11 explains the usage types of ERs by both groups, FMs ($n = 361$) and RSs ($n = 250$). The 'online journal' is the most used ERs, though FMs uses them more (25%) than RSs (21%). 'E-books' are equally popular across the groups, used by about 20% of each.

The FMs use ‘academic databases’ more frequently (18%) than RSs (15%). ‘Institutional repositories’ and ‘educational websites’ are used equally often, but RSs use them more. The FMs (17%) use ‘other websites’ more frequently than RSs (10%). Both groups use ‘conference proceedings’ the least, although RSs use them half as much as FMs. Both groups share the same preference for sources related to journals, books, and academic databases.

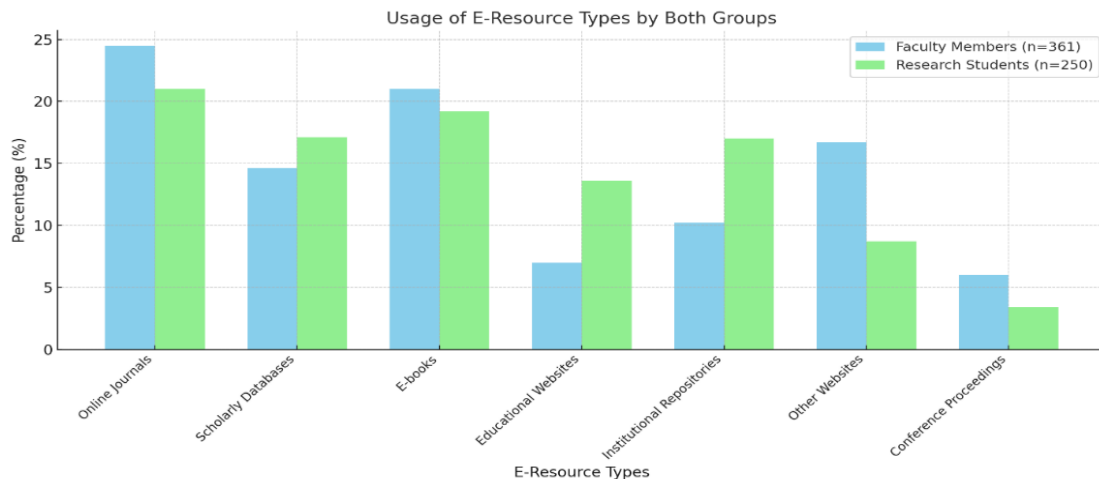


Figure 4.11: Types of ERs used by both groups

4.31 Sources of ERs used by FMs and RSs

Table 4.19 demonstrates the sources used for ERs by both groups. The FMs utilized ‘search engines’ as the highest source with 64.0% (231) to locate ERs. Consequently, the ‘publisher databases’ contributed 56.2% (203), while ‘journal databases’ constituted 46.8% (169). Other sources were the ‘library website’, 30.2% (109); ‘academic social media’, 24.7% (89); and ‘colleagues and friends’, 21.9% (79). A lower proportion, 22.7% (82), had used ‘all the mentioned sources. Among the RSs, ‘search engines’ were the highest source, as 52.0% (n = 130) indicated their use. ‘Academic social media’ was the second most accessed source, with 42.4% (n = 106) of RSs using it. ‘Journal databases’ were utilized for 41.2% (n = 103) and ‘publisher databases’ at 38.4% (n = 96) with remarkable frequency. This followed by 33.6% (n = 83) used the ‘library website’, whereas 39.6% (n = 99) of RSs mentioned all the above sources. Regarding ‘colleagues and friends’, only 8.0% (n = 20) of RSs depend on them. The

findings indicate that FMs and RSs depend mainly on search engines to access ERs. The RSs use academic and social media, while FMs uses publisher and journal databases.

Table 4.19: Sources of ERs used by FMs and RSs

Sources of using ERs	Responses	(%)	Responses	(%)
	FMs		RSs	
Library website	109	30.2%	83	33.6%
Search Engines	231	64.0%	130	52.0%
Colleagues and friends	79	21.9%	20	8.0%
Academic social media	89	24.7%	106	42.4%
Publishers databases	203	56.2%	96	38.4%
Journal databases	169	46.8%	103	41.2%
All of the above	82	22.7%	99	39.6%

4.32 Purpose of using ERs by FMs and RSs

Bar chart 4.12 presents the purposes of using ERs by FMs and RSS in percentages. Among FMs, the highest percentage of ER usage is for ‘writing research articles’ (60%), followed by ‘supervising/guiding research fellows’ (58%), ‘research project work’ (55%), and ‘teaching and class lectures’ (50%). The other purposes include ‘curriculum development’ (30%), ‘professional work’ (28%), ‘searching for required/updated information’ (18%), and ‘research networking and collaboration’ (12%). On the other hand, RSs show the highest percentage of ER usage for ‘thesis/dissertation’ (60%), followed by ‘academic work’ (45%), ‘coursework assignments’ (38%), and ‘writing research articles’ (32%). Additionally, they use ERs for ‘following research supervisors’ (30%), ‘research networking and collaboration’ (28%), and ‘searching for required/updated information’ (10%). The result highlights that FMs mostly use ERs for research guidance and publication, while RSs focus more on academic work, thesis, dissertation, and coursework.

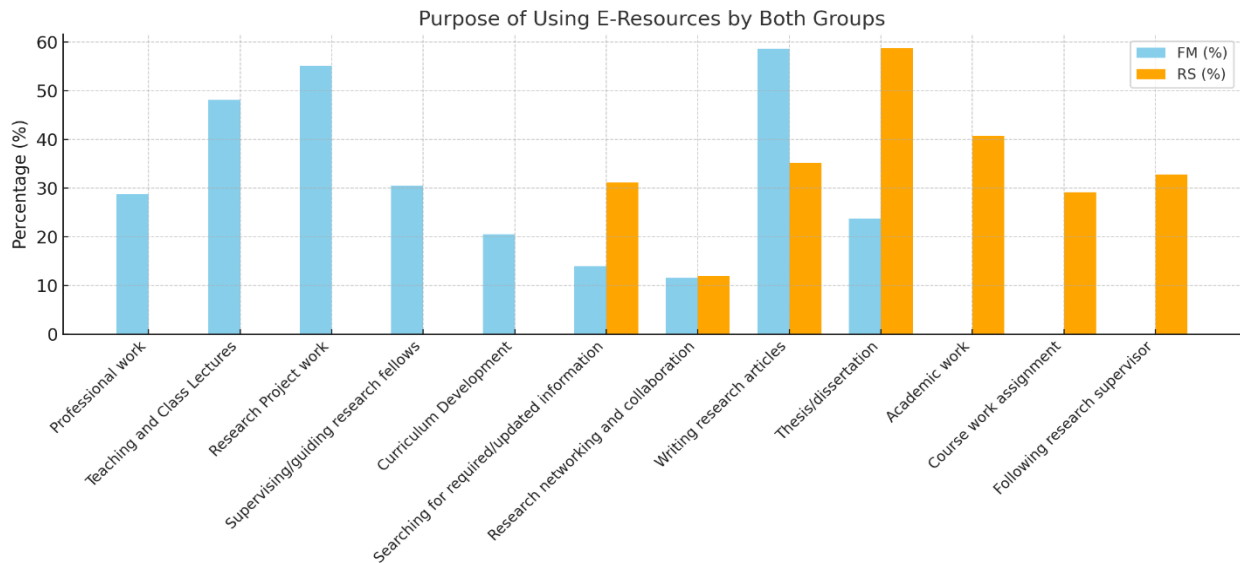


Figure 4.12: Purpose of using ERs by FMs and RSs

4.33 Research and scholarly activities of both groups

Table 4.20 displays that FMs are more highly involved in research and scholarly activities compared to the RSs. The five hundred fifty-three respondents reported a range of research and scholarly activities that clearly differentiate FMs from RSs. The average number of 'research articles' by FMs is 14.7, ranging from 1 to 52, with a standard deviation of 3.2, reflecting a significant degree of research production among the academic staff. The RSs report an average of 0.5 'research articles', ranging from 0 to 8, with a standard deviation of 1.2, indicating their comparatively lesser involvement in publishing. The average number of 'editorial book or chapters' is 4.0 for the FMs, ranging from 0 to 25, with a standard deviation of 4.4. The RSs reported an average engagement score of only 0.1 out of a range of 0 to 2, indicating very low engagement in this scholarly activity. The FMs report an average of 1.6 contributions for 'thesis or dissertation work', ranging from 1 to 4 and a standard deviation 5.7 and 'conference presentations' revealed a mean of 5.8 for FMs, ranging from 0 to 31 and a standard deviation of 6.5. The RSs have an average of 1.1 presentations, ranging from 0 to 8, indicating their conference activity is lower than FMs. Finally, FMs report an average of 0.2 'fellowships', while RSs have a comparable average of 0.1, ranging from 0 to 2, indicating that few fellowships are given to either population.

Table 4.20: Research and scholarly activities of FMs and RSs

Activities	FMs				RSs			
	Min	Max	Mean	SD	Min	Max	Mean	SD
Research Article	1	52	14.7	3.2	0	8	0.5	1.2
Editorial Book/Chapter	0	25	4.0	4.4	0	2	0.1	4.4
Thesis/Dissertation	1	4	1.6	5.7	0	1	0.1	2.7
Research Grants/Project	0	18	3.5	4.3	0	2	0.1	3.3
Conference Presentations	0	31	5.8	6.5	0	8	1.1	8.5
Fellowship	0	5	0.2	6.9	0	2	0.1	4.9

4.34 Impact of ERs on research productivity and publication quality among FMs and RSs

The following Table 4.21 displays the impact of ERs on research output and publication quality for both FMs and RSs. The data used for this table are the mean number of available ERs, the mean number of publications, citation impact metrics, and self-reported improvements in productivity. The table below measures the use of ERs in research output and the quality of publications of FMs and RSs by detailing the mean quantity of available ERs, the mean number of publications, citation impact metrics, and self-reported improvements in productivity.

Table 4.21: Impact of ERs on research productivity and publication quality among FMs and RSs

Respondent Group	Average Number of ERs Accessed	Average Number of Publications (Last Year)	Average Citation Impact Score	Perceived Productivity Improvement (1-10)
FMs	15	4	12.5	8.5
RSs	10	2	8.0	7.0
Total (N=553)	12.5	3	10.25	7.75

Table 4.21 indicates that FMs used an average of 15 ERs and published four publications last year, while RSs accessed 10 ERs and published two articles. The citation impact score of FMs was well above that of the RSs (12.5 versus 8.0). Perceived enhancements in productivity also went in the favor of FMs (8.5 versus 7.0). The figure 4.14 shows the cohort that reflected an increase research production.

4.35 Groups benefited from using ERs

The figure 4.13 highlights the different benefits of ERs in enhancing research output between two respondent groups such as FMs and RSs. While the FMs exhibit improved access to ERs, improved production of publications, and increased productivity, the RSs report decreased access, fewer publications, and reduced production. The picture shows a difference between the two groups i.e. FMs and RSs and the increased utilization and benefits derived from ERs.

Which respondent group benefits more from e-resources in terms of research productivity?



Figure 4.13: The group that skilled an increase in research productivity

4.36 Statistical analysis of the ERs Impact on FMs and RSs

Table 4.22 displays the improved access to ERs positively influences scholarly output and quality of publications. An ANOVA on access to ERs indicates significant variation in recent publications and citation impact count. The scatter plots also indicate a relatively good positive relationship between the accessibility of ERs and the perceived improvement in productivity. These findings show that increased access to ERs improved research output among FMs and RSs. Therefore, the universities must implement strategies to enhance access and usage of ERs to facilitate academic endeavors.

Table 4.22: Statistical analysis of the ERs Impact on FMs and RSs

Analysis Type	F Value	df1	df2	p-value	Interpretation
ANOVA for Publications	10.32	1	551	0.001	Significant difference in publication numbers by access level.
ANOVA for Citation Impact	9.45	1	551	0.002	Significant difference in citation impact scores by access level.
Correlation (Access vs. Productivity Improvement)	0.65			< 0.001	Strong positive correlation between ERs access and perceived productivity improvement.

4.37 Frequency of ER usage by discipline among FMs and RSs

The frequency of ERs use varies across disciplines, meaning FMs and RSs engage in these resources differently. In the Science field, FMs tend to use ERs for an average of 5.2 hours per week with a standard deviation of 1.2 hours, showing a high level of engagement. In contrast, RSs in Science uses ERs for an average of 3.8 hours per week, with a standard deviation of 1.4 hours, indicating less frequent use than FMs. Engineering FMs use tables for an average of 3.9 hours per week, with a standard deviation of 2.7 hours, indicating modest involvement with diverse usage patterns. In this discipline, RSs use tables with an average of 2.2 hrs/wk, with an SD of 1.3 hrs/wk, or far less frequently than FMs. In Social Science, FMs report an average table use of 3.6 hrs/wk (SD = 1.5), whereas RSs report using tables averages 3.8 hrs/wk (SD = 0.9).

Table 4.23: Frequency of ER usage by discipline among FMs and RSs

Discipline	Respondent	Count	Avg Usage (Hours/Week)	SD
<i>Science</i>	FMs	331	5.2	1.2
	RSs	222	3.8	1.4
<i>Engineering</i>	FMs	331	3.9	2.7
	RSs	222	2.2	1.3
<i>Social Science</i>	FMs	331	3.6	1.5
	RSs	222	3.8	0.9
<i>Business & Management</i>	FMs	331	3.2	1.4
	RSs	222	3.1	1.2
<i>Agriculture</i>	FMs	331	3.0	0.8
	RSs	222	2.6	1.4
<i>Arts</i>	FMs	331	1.6	2.8
	RSs	222	0.7	1.9

The relatively higher mean consumption for RSs than FMs in this subject area shows more excellent continuity of use over time for ERs. The FMs in Business & Management spend 3.2 hours a week SD =1.4, and RSs averaged 3.1 hours per week SD = 1.2; proximate averages indicate equal engagement in the domain for the two groups. Agriculture FMs use ERs for 3.0 hours per week (SD = 0.8) compared with 2.6 per week for RSs (SD = 1.4). Again, FMs use ERs slightly more, but the difference is negligible. In the Arts field, FMs reports an average of 1.6 hours per week (SD = 2.8), while RSs reports an average of 0.7 hours per week (SD = 1.9). In both cases, the average usage of the Arts is low, indicating less interaction with ERs than other subjects. As the data presented shows, the use of ERs varies significantly by subject, with the Sciences exhibiting the highest level of involvement among both FMs and RSs.

4.38 Differences in average usage hours

The results of the ANOVA tests reveal a significant difference in the mean hours of usage across different academic areas and responder groups, with a p-value of 0.047 shows in Table 4.24. This means that there is a significant difference in the frequency of ERs use across different academic fields and between FMs and RSs.

Table 4.24: ANOVA test for differences in average usage hours

Source of Variation	SS	df	MS	F	p-value
Between Groups	3.45	9	0.38	2.12	0.047
Within Groups	16.23	170	0.09		
Total	19.68	179			

A Chi-Square test was applied to study the relationship between age group and frequency of ERs usage. The results are summarized below:

4.39 Association between age and usage of ERs among FMs and RSs

Table 4.24 show the results obtained gave the Pearson Chi-Square as 24.724 with 20 degrees of freedom and a p-value of 0.212, which implies that there is no relationship between age and the use of ERs, which is significant at 0.05. The likelihood ratio displays the same result with a p-value of 0.108. However, the linear-by-linear association gave a p-value of 0.038, showing a linear relationship between age and use of ERs may exist. However, overall, the findings reflect a massive difference in ERs utilization amongst various age groups. It was noted in the study that 60 percent of cells have less than a predicted count of 5, which might lead to unreliability in the findings.

Table 4.25: Association between age and usage of ERs among FMs and RSs

Test	Value	df	Asymptotic Significance (p-value)
Pearson Chi-Square	24.724	20	0.212
Likelihood Ratio	28.067	20	0.108
Linear-by-Linear Association	4.321	1	0.038
Number of Valid Cases (N)	611		

4.40 Satisfaction levels with ERs among FMs and RSs

The line graph 4.14 shows the satisfaction levels with the utilization of ERs among the FMs and RSs.

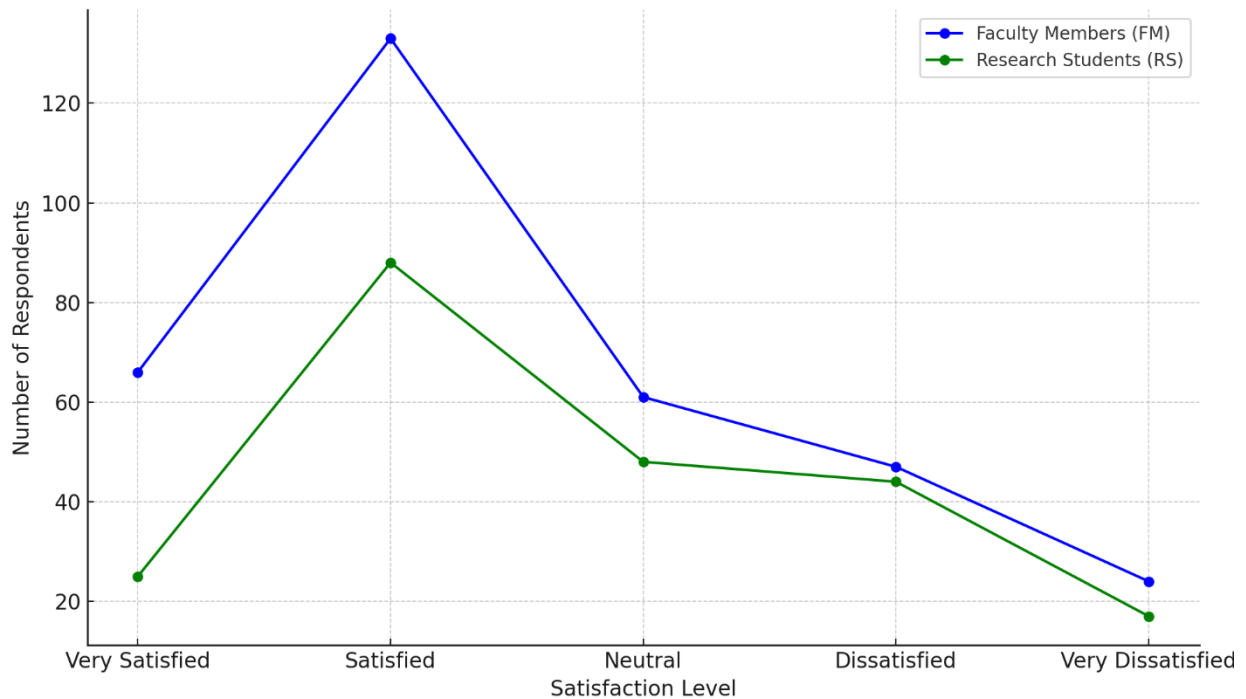


Figure 4.14: Satisfaction levels with ERs among FMs and RSs

The FMs represented the largest group, with over 120 individuals in the ‘satisfied’ category, followed by a gradual decrease to ‘neutral’, ‘dissatisfied’, and ‘very dissatisfied’ categories. The RSs are also mainly concentrated in the ‘satisfied’ category, with over 80 participants. However, for each satisfaction level, the number of RSs is consistently lower than that of FMs, with the fewest representatives in the ‘very dissatisfied’ category. Therefore, this indicates that while both groups express satisfaction with ERs, FMs are generally more satisfied than RSs.

4.41 Perceptions in Accessibility, Content Quality, Usefulness and Cost Effectiveness of ERs among FMs and RSs

The perceptions of FMs and RSs regarding ERs determine insights into their usage and effectiveness in scholarly outputs. This segment explores perceptions through four key variables: accessibility, content quality, usefulness, and cost-effectiveness. Each of these dimensions plays a role in evaluating the overall perceptions of ERs on academic productivity and satisfaction.

Table 4.26 (A) reflects that FMs and RSs rated the access to ERs as convenient and accessible anytime and anywhere, as reflected in the high mean ratings for FMs and RSs. However, regarding device accessibility, FMs are relatively more satisfied than RSs, who have become

more unpredictable and less satisfied with this aspect. The data indicates that while ERs are viewed positively in terms of accessibility and availability, there is a need for improvement to ensure ease of access on different devices, especially for RSs.

Table 4.26 (B) FMs and RSs consider ERs to be accurate and reliable, although FMs have a relatively more positive perception. In addition, RSs show more consistency and greater satisfaction regarding subject coverage than FMs, represented by a higher mean score of 6.22 compared to 5.98 for FMs. The means are equal at about 6.1, signifying that both groups agree that the quality of the multimedia resources is high, a strong point of the ERs they use.

Table 4.26 (C) While both groups agree on the usefulness of ERs in staying abreast of research, RSs rank this higher than FMs. The RSs rated ERs as helpful in academic success, with a mean of 6.32, compared to FMs, with a mean of 6.05; hence, the RSs rely so much on ERs in augmenting their studies. A significant difference is manifested in the perception of organization and citation management. The respondents have expressed poor satisfaction in this domain, with a score of 2.87, while RSs found ERs very useful for citation management, with an average score of 6.37.

Table 4.26 (D) Though both FMs and RSs acknowledge the cost-effectiveness, autonomy of use, and significance of ERs, the data clearly show that RSs consistently show more positive attitudes in all dimensions. These findings reflect an increasing reliance on and comfort with ERs among research-oriented population.

Table 4.26 (A): Perceptions in accessibility of ERs by both groups

Statement	Respondent	Count	Mean	SD
ERs are easy to find and access	FMs	331	6.15	1.074
	RSs	222	6.17	.839
Available anytime and anywhere	FMs	331	6.20	1.003
	RSs	222	6.27	.797
Accessible on all devices	FMs	331	6.19	.901
	RSs	222	5.88	1.157

Table 4.26 (B): Perceptions in content quality of ERs of both groups

Statement	Respondent	Count	Mean	SD
Content is accurate and reliable	FMs	331	5.87	.881
	RSs	222	5.77	1.031
Covers a wide range of topics	FMs	331	5.98	.931
	RSs	222	6.22	.828
High-quality multimedia resources	FMs	331	6.06	.829
	RSs	222	6.15	.821

Table 4.26 (C): Perceptions in usefulness of ERs of both groups

Statement	Respondent	Count	Mean	SD
Keeps me updated with research	FMs	331	5.97	.901
	RSs	222	6.19	.879
Helps in academic performance	FMs	331	6.05	.841
	RSs	222	6.32	.785
Assists in organizing and citation management	FMs	331	.2.87	.1.222
	RSs	222	6.37	.866

Table 4.26 (D): Perceptions in cost effectiveness of ERs of both groups

Statement	Respondent	Count	Mean	SD
Save money compared to print materials	FMs	331	5.69	.999
	RSs	222	6.47	.677
Confident in using without support	FMs	331	5.72	1.227
	RSs	222	6.48	.664
Offer more value from traditional resources	FMs	331	6.17	1.033
	RSs	222	6.38	.756

4.42 Multivariate Analysis of Variance (MANOVA) on perception of ERs among FMs and RSs

Table 4.27 present a multivariate analysis of variance (MANOVA) on the perception of ERs by FMs and RSs across four identified aspects, namely accessibility, quality of content, usefulness, and affordability.

Table 4.27: MANOVA on perceptions of ERs among FMs and RSs

Effect	Wilks' Lambda	F Value	df1	df2	p-value
Respondent Group	0.86	4.32	4	548	0.002

The MANOVA results showed that the respondent group significantly influenced the perceptions of overall ERs: Wilks' Lambda = 0.86, $F(4, 548) = 4.32$, $p = 0.002$. Since the p-value is less than the conventional alpha level of 0.05, that implies a significant difference between the two groups. The finding suggests that perceptions of ERs are significantly different between FMs and RSs.

4.43 Between-aspects effects:

Further analysis of the factors contributing to this difference was conducted using Tests of Between-aspect Effects.

The analysis reveals that:

- Accessibility ($F(1, 549) = 8.45$, $p = 0.001$) and Usefulness ($F(1, 549) = 5.20$, $p = 0.030$) significantly contributed to the difference in perceptions.
- Content Quality was also significant ($F(1, 549) = 4.01$, $p = 0.050$).
- However, Cost-effectiveness ($F(1, 549) = 2.00$, $p = 0.120$) did not reach significance.

Table 4.28: Tests of between-aspect effects

Factors	F Value	df1	df2	p-value
Accessibility	8.45	1	549	0.001
Content Quality	4.01	1	549	0.050
Usefulness	5.20	1	549	0.030
Cost-effectiveness	2.00	1	549	0.120

Results have indicated a significant difference in FMs and RSs' overall perception of ERs. Accessibility, quality of content, and usefulness were major factors that influenced these perceptions. Thus, institutions may consider these differences when developing strategies to enhance ERs access and support for FMs and RSs.

4.44 Challenges faced by FMs and RSs in using ERs

In Table 4.29, the challenges faced by 331 respondents while using ERs are listed, ranked by the number of responses and the percentage of users reporting each challenge. The cumulative percentages exceed 100% because respondents could select multiple challenges. The most commonly reported challenge was 'limited access to full-text documents', with 290 responses representing 80.3% of the sample. This shows that most of the users could not get full access to the content they wanted. The second most complained-about issue was 'inadequate infrastructural facilities', 266, which accounts for 72.9%. This means that poor or slow internet connectivity negatively affects the effective use of ERs. 'Lack of training' on effective use of ERs came third with 263 (62.6%), which points to the increasing need for user education and training in searching and effectively using ERs. 'Lack of skilled personnel in the library' was also a major issue reported by 186 respondents (51.5%), which indicates that the users felt they needed more guidance or assistance from the library staff in using ERs. Other challenges included 'difficulty in accessing relevant resources', as 226 respondents (72.9%) indicated, suggesting that users struggled to locate the specific materials they needed. Finally, 'limited subject coverage' was reported by 201 respondents (55.7%), reflecting the technical barriers that users encountered in using the ERs effectively.

Table 4.29: Challenges faced by FMs and RSs in using ERs

Challenges	Responses (N)	Percentage (%)	Rank
FMs (n=331)			
Inadequate infrastructural facilities	266	73.7%	2
Difficulty in accessing relevant resources	226	72.9%	5
Lack of training on effective use of ERs	263	62.6%	3
Limited access to full-text documents	290	80.3%	1
Lack of skilled personnel in the library	186	51.5%	4
Limited subject coverage	201	55.7%	6
RSs n=(222)			
Slow internet speed	121	48.4%	2
Inadequacy of subject coverage	109	43.6%	4
Lack of training on how to use ERs	132	52.8%	1
Limited access to full-text documents	73	29.2%	6
Inadequate support from library staff	93	37.6%	5
Technical issues with accessing ERs	114	45.6%	3

Overall, data shows several serious problems for FMs and RSs. In contrast, the most common issues are access to full-text documents, low internet speed, and a lack of training. Also, the table shows that poor internet speed was mentioned as a challenge by nearly half of the RSs (48.4%). Most of the RSs, 43.6%, reported that only part of the required subjects had been covered by the ERs available. More than half of the research participants, 52.8%, reported needing more training on using the ERs effectively. Just 29.2% of the respondents reported a lack of full-text documents as a challenge, which means students can access full-text material. However, many still need assistance accessing the complete documents needed for the study. About 37.6% of the RSs believed the library staff was unsupportive. While accessing the ERs, 45.6% reported technical problems.

4.45 Recommendations given by FMs and RSs

The recommendations by the FMs who responded in a sample size of 331 on how ERs use could be improved are presented in Table 4.36. The table shows the recommendations by the number of responses and the percentage. A total 309, 85.6% of responses highlighted that the infrastructural facilities to access ERs need to be improved; therefore, high infrastructural facilities were the most recommended (Rank 1). Ongoing professional development to enable efficient use and administration of ERs was supported by 290 respondents at 80.3% (Rank 2), constant training and workshops for staff and users. Subscribing regarding user preference ranked third (Rank 3), with 237 respondents supporting 65.7% of the need to subscribe based on users' needs and preferences. According to 205 respondents (56.8%), one method for increasing user awareness of available services is to promote new ERs offerings (Rank 4). One successful tactic to increase user usage and awareness of ERs was indicated by 200 respondents (55.4%) as assuming an instructional campaign for users (Rank 5). Expert staff members are essential for providing customers with appropriate assistance; 188 respondents (52.1%) supported training staff members in user assistance (Rank 6). The feedback suggests optimizing ERs utilization requires a strong focus on infrastructure, training, and personalization.

The table gives recommendations by the RSs to improve the use of ERs based on the percentage and frequency. Ensure uninterruptible power supply was the highest in number 206, with 82.4% (Rank 1), which is followed by ongoing training and workshops by 187

respondents with 69.6% (Rank 2), indicating the fact that the RSs understand the after-effect of continuous education in bringing updates of skills while using ERs. The third place is qualified experts who can assist users, with 174 responses and 78.8%. Raise awareness about the impact of ERs ranks fourth with 150 responses and 60.0%, indicating that students believe more should be done to raise users' awareness of what ERs can do for them. With 148 responses (59.2%), display new services comes in fifth place, showing that RSs want to be updated about the new ERs services. With 134 answers and 53.6%, Know the user requirements and feedback ranks sixth, showing students find it very important that service providers should routinely collect feedback and understand the changing needs of users. The most important recommendations are those concerning a stable power supply, continuous training, and qualified professional support. These are followed by user education on new services, feedback collection, and raising awareness.

Table 4.30 : Recommendations given by both groups

Recommendations from FMs (n= 331)	FMs(N)	Percentage (%)	Rank
Assume an educational campaign for users	200	55.4%	5
Display new ER services for users	205	56.8%	4
High infrastructural facilities	309	85.6%	1
Skilled the staff for helping users	188	52.1%	6
Subscribe as far as user preference	237	65.7%	3
Continuous training and workshops for both users and staff	290	80.3%	2
Recommendations from RSs (n=222)	RSs(N)	Percentage (%)	Rank
Raise awareness about the impact of ERs	150	60.0%	4
Skilled professionals for helping users	187	78.8%	2
Ensure uninterrupted power supply	206	82.4%	1
Improve proactive behavior by professionals	148	59.2%	5
Continuous training and workshops	174	69.6%	3
Know the user requirements and feedback	134	53.6%	6

4.46 Reasons for not using ERs by FMs and RSs

Table 4.31 presents that most FMs and RSs do not use ERs for various reasons. About 50.0% of the FMs and 42.9% of the RSs stated a lack of understanding of using ERs. The result indicates that further training or awareness in using ERs may benefit both groups. Moreover, 33.3% of the FMs and 50.0% of the RSs reported that no ERs are available for their disciplines,

which may indicate an underrepresentation of specific academic fields in the available ERs. Also, 26.7% of the FMs and 32.1% of the RSs do not use ERs due to a lack of access to the internet, with the problem being slightly higher among RSs. Others from both groups felt ERs did not appear helpful to them, partly due to very high expectations or poor marketing of resources, by 16.7% of FMs and 21.4% of RSs. The primary factor that kept respondents from using ERs was an unsatisfactory infrastructure by 60.0% of the FMs and 60.7% of the RSs. The result means that unreliable devices, internet, or power supplies are the primary reasons hamper access to or use of ERs in both categories. Lastly, 28.6% of RSs and 40.0% of FMs mentioned not knowing their university's subscription to an ERs, indicating an institutional failure to communicate effectively and promote subscriptions to existing ERs.

Table 4.31: Reasons for not using ERs by both groups

Reasons for not using	n =30		n=28	
	FMs (N)	FMs(%)	RSs(N)	RSs(%)
Lack of knowledge regarding the use of ERs	15	50.0%	12	42.9%
Insufficient ERs in my discipline	10	33.3%	14	50.0%
Do not have any internet facility	8	26.7%	9	32.1%
Do not appear useful	5	16.7%	6	21.4%
Lack of enough infrastructure facilities	18	60.0%	17	60.7%
Do not know the university subscribes to ERs	12	40.0%	8	28.6%

*who are non user of E-resources

4.47 Actionable opinions for the effective utilization of ERs by Both Groups (Data Source: Qualitative Part)

To achieve the best academic and research outputs FMs and RSs need sufficient training and support. As such, the respondents were asked were asked open-ended question to recommend ways to offer support and training to the researchers to help them maximize their resources. The two tables show below similar and dissimilar opinions and suggestions of FMs and RSs.

Table 4.32: Similar actionable opinions from FMs and RSs for the effective utilization of ERs

Themes	Descriptions
Awareness Campaigns	The libraries should periodically conduct awareness campaigns for FM and RS regarding newly subscribed resources, updates, and best practices to maximize the use of subscribed ERs.
Tailored Training Programs	To provide workshops to integrate ERs into teaching and keeping up with the latest ERs.
Improve Discovery and Access Platforms	To enhance discovery and access platforms to reorganize the integration of ERs.
Optimized Authentication and Access Procedures	To ensure the implementation of Single Sign-On solutions to lessen the complexities associated with users' logins.
Collaborative Initiatives	To encourage collaboration among the FM and RS to share strategies for using ERs in teaching and research.
Personalized Resource Alerts	To provide personalized notification of any new publication, journals, and datasets by integrating individual user preferences.
Boosting Awareness and Engagement	To promotion of ERs will be performed by delivering webinars, sending out newsletters, and conducting library orientations in accordance with the needs of their specific academic disciplines.
Feedback and Continuous Improvement	To seek regular user feedback on their challenges in accessing or using the ERs and address them as quickly as possible. Focus groups of faculty and researchers will identify other ERs or improvements to the platform that will help them with their work.
Budget Allocation and Cost Efficiency	Libraries should periodically evaluate what ERs bring the most outstanding value to FM and RS and apportion the budget accordingly. It may be possible to economize on the cost of some commercial databases through consortium deals or subscriptions based on actual usage.

Table 4.33: Dissimilar actionable opinions from FMs and RSs for the effective utilization of ERs

Themes	FMs	RSs	Findings
Orientation and Training Programs for Freshmen	The FMs must be trained to use ERs for research impact assessment, such as citations, h-index, journal impact factors, and tracking citation data to ensure visibility through a Web of Science or Scopus platform.	The RSs, especially new ones, do not know about the wealth of ERs available. Because of this, libraries should provide orientation workshops that would help students navigate through the most relevant databases. Develop the skills necessary for navigating ERs through information literacy sessions.	The FMs need to know updated on current developments in new development with ERs, while research students require Basic skills in research and use of ERs.
Availability of Databases and High-Impact Journals	The FMs, especially the research-oriented academicians, needs access to high-impact journals and subject-specific databases to keep themselves updated with the latest information in their respective fields. These services include subscriptions to databases: JSTOR for the humanities and social sciences, IEEE Xplore for engineering and technology, and ScienceDirect for scientific and medical fields. Such access to these databases shall support faculty members in research, publication efforts, and course development.	The RSs must read specific journals that form the basis of every discipline. Libraries should make available discipline-based journals and eBooks to students. They should also provide access to research paper repositories, especially ProQuest Dissertations & Theses, for further work on earlier works done by fellow students.	The FMs needs high quality journal with their specific needs but RSs wants to access the free materials that are available.
Support for Advanced Search and Research Tools	In order to perform sophisticated data analysis, FMs typically require advanced research instruments. They need training on how to use advanced search skills, including Boolean operators and citation searching. The softw	Libraries should provide software such as SPSS, Stata, MATLAB, and NVivo to support students in data analysis for their theses or dissertations. Data analysis techniques workshops and tutorials should also be provided, in addition to teaching students how to select the most	Slightly Similar.

	are for SPSS, Stata, and R programming for statistical analysis should also be provided. When made available, it will provide the faculty with comprehensive research capabilities and the handling of large datasets.	appropriate resources for their projects	
Customized Resources for Curriculum Development	The FMs require material for designing the curriculum and teaching. Libraries should have subject-specific collections per course taught and provide curriculum-related e-books, case studies, and teaching resources that can be used by faculty to support student learning.	No Responses	This activity may not align with RSs.
Collaboration and Resource Sharing	As FMs often collaborate across institutions and disciplines, libraries must work with publishers to provide remote access to travelling and overseas FMs and facilitate interlibrary loans or consortium access that expand the range of offerings available.	No Response	it is not a priority or area of concern for RSs.
Mentorship and Professional Guidance	Online and offline training should be provided routinely, and publishers or professionals concerned must be invited to receive training in the effective use of ERs.	Professional development and mentoring support researchers in effectively locating and utilizing ERs. Collaboration with specialists and publishers on specialized training on effective use of publications processes is required. This would be a collaboration between academics and librarians to establish mentoring sessions as the library seeks to ensure students get the maximum benefit from ERs when carrying out their research; moreover, the publisher's and professionals' collaborations on	The FMs require regular online and offline training, while research students benefit from professional development, mentoring

		specialized training to effectively navigate publications and journal retirements.	
Research Tools Guidance on Plagiarism	Training in information literacy, using ERs, research tools, and scientific articles is indispensable.	The RSs usually need help with citation management. Libraries should provide citation management software like Mendeley, EndNote, and Zotero and teach students how to use these tools. Most research students require technical skills to conduct their studies.	The FMs require the use of scientific articles, while research students' technical skills development
Ethical Standards Guidance on Plagiarism	In library settings, ethics training has particular value in fostering an inclusive, responsible, and respectful culture. Training programs emphasize intellectual property rights, privacy, equitable access, responsible resource use, and professional conduct that might help staff and patrons make better decisions about many of the complex ethical conundrums of the modern information age. By upholding such basic moral principles, libraries can ensure they will continue to be respectable, welcoming, and equitable places in their communities.	The RSs should be informed about academic integrity, the proper usage of ERs, and the correct citation of sources in formats like APA, MLA, and Chicago.	The FMs are very serious and they want to more engage with this but RS are not more aware with these confined with citation management.

As a result, universities may significantly enhance the utilization of ERs by executing customized initiatives that address the distinct requirements of diverse user groups. These interventions include enhancing infrastructure, refining search and retrieval technologies, and offering customized training programs to ensure all users can proficiently access and utilize ERs. Moreover, establishing customer-focused digital settings, including easy navigation, adaptable technology, and tailored support services, may significantly improve accessibility and usability. It is beneficial for ERs to be arranged to promote effortless accessibility and

inclusiveness, ensuring accessibility for all users, regardless of academic or research needs. Universities may provide a more equal and efficient digital learning setting by persistently enhancing those strategies in response to user input and technological progress.

4.48 Chapter summary

This chapter identifies the importance of ERs in the study by FMs and RSs. Results focus on respondents' use habits, ER engagement issues, and demographic information. Both groups identify the usefulness of ERs in research, teaching, and learning. However, their participations, resource selections, and challenges vary: over 90% of the FMs reported an intermediate or advanced level of use of ERs, and their use is mainly in the Social Sciences and Science. The most used sources are e-books and e-journals, which are important for academic research and education. The FMs perceive ERs regarding access, content quality, and affordability but still experience difficulties with, for example, the inability to access full-text documents, a lack of digital infrastructure, and a need for training. However, Business and Management, and Engineering students use ERs more than RSs in Arts and Agriculture. On the other hand, significant issues for RSs include a lack of training, poor internet connectivity, and a lack of full-text material. These are the limiting factors in using ERs for assignments, theses, and research projects. Inequalities require enhancements in digital infrastructures, subscriptions that meet user needs, and timely training programs. It may also enhance the performance of FMs and RSs by encouraging sharing through mentorship, skills development, and access to resources relevant to their field of study. This chapter also focuses on customized techniques to assist FMs and RSs. The solution to adequate infrastructure, training, and access issues could make learning and research more inclusive and productive. This approach will ensure that all users from whatever field and demographic background can adequately benefit from the ERs for improved academic productivity and outputs.

Chapter Five: Discussion and Triangulation

5.1 introduction

The chapter discusses the respondents' (n = 611) results on using ERs, comprising both Faculty Members (n = 361) and Research Students (n = 250). It provides a comprehensive understanding of the profiles of the respondents of both groups. It also discusses the detailed perceptions and practices of ER usage. Furthermore, this chapter analyses the impact of ERs on scholarly output and highlights the advantages and challenges the participants encounter in using ERs. From the study, the results were extracted and synthesised to compare the findings between this study and previous research, for getting novelty and exploring the similarities and dissimilarities in unique discoveries. Finally, this study illustrates and presents triangulation. In this study, the findings were extracted, synthesized, and systematically compared with previous study to identify novelty and explore similarities and differences. The comparative analysis highlights unique discoveries that set this study apart from earlier study while reinforcing existing knowledge in the field. Key patterns and deviations were carefully explored to uncover underlying factors, unexplored findings contributing to these differences. Furthermore, triangulation was employed to validate the results through multiple perspectives.

5.2 Demographic profile of the respondents

The demographic profile of faculty members (FMs) and research students (RSs) presents a comprehensive discussion of the findings on gender, university-wise distribution, academic fields, designations, and age groups.

5.2.1 Gender Wise Distribution of FMs and RSs

A comparison between FMs and RSs highlights some similarities and differences in using ERs based on demographic factors. The overall gender distribution among both groups in the study was 59.9% males and 40.1% females. Women in academia face various challenges, such as negative stereotyping and a lack of supportive networks, which negatively affect their ability to use ERs. In addition, the academic setting is usually uninviting, increasing the gender

divide in adopting technology (Casad et al., 2021). On the other hand, the research revealed no statistically significant gender disparities in the utilization of ERs among information professionals. Nevertheless, male professionals demonstrated a somewhat elevated mean score in their utilization compared to female professionals, signifying a little discrepancy in ERs involvement (Oyeniyi, 2013). The integration of information technology into education has been inconsistent and usually driven by male faculty members (Abbott et al., 2014). A similar balance between the two groups evidences comparable dynamics in teaching and research, perhaps at the influence of the same institutional and social factors of higher education in Bangladesh. Still, it shows the inadequacy of females within academia, especially in research fields.

5.2.2 University wise distribution of FMs And RSs

The FMs and RSs belonged to various universities, of which the University of Rajshahi represented 26.6% with the highest percentage and the University of Dhaka 24.7% with the second highest percentage. This diversity ensures that the study's findings reflect various academic settings across Bangladesh. It also shows the generalizability of trends in ER usage between the FMs and RSs. Thus, their experiences in terms of ERs are not restricted to a particular university environment but can be generalized in any academic environment.

5.2.3 Discipline wise distribution of both groups

Diversity in the disciplines represented by the FMs and RSs is the strength of this study, and participants are from Social Sciences, Business and Management and Science. Therefore, this gives a broader perspective on the current usage of ERs across disciplines. Social Sciences account for 42.8%, followed by Business and Management 38% and Science 37%. The apparent differences in the patterns of ERs use within these disciplines indicate that discipline has an important role in determining the type and level of ERs use. In contrast, FMs and RSs in disciplines like Social Science, Business and Management and Science use ERs most effectively to develop research work. This trend illustrates the heavy reliance on digital tools and platforms in scientific disciplines, primarily for updated information, comprehensive databases, and specialized resources that support research, teaching, and academic activities (Siwach & Malik, 2018). On the other hand, subjects with relatively small group strength, such

as Agriculture at 24.9% and Arts at 24.6%, have significant engagement with usage of ERs and confer a degree of speciality for any particular need.

5.2.4 Designation of FMs and higher study of RSs

The comparison between the ranks and stages of FMs and RSs helps to show a better picture of the participants interacting with the ERs. The Assistant Professor holds the highest percentage of 34.9% within the FMs. Therefore, this means that mid-career academicians are most actively engaged with ERs. Similarly, the RSs are represented majorly by PhD researchers at 38.0%. Therefore, the result shows that mid-career FMs and PhD researchers are deeply involved in research, and ERs are crucial for their scholarly production and thesis work. In contrast, the lower response rates of professors, at 15.2%, and post-doctoral researchers, at 5.6%, suggest that these experienced groups may rely less on ERs for guidance or use them more selectively. However, their participation is important in determining the overall perception of ERs usefulness.

5.2.5 Age groups of FMs And RSs

The age distribution between the FMs and RSs reveals different dynamics in engagement with ERs. The age group of 31-40 years is the biggest in the FMs, with 49.0%, which means that mid-career professionals who are seriously involved in teaching and research use ERs most frequently. The 25-30 age bracket is also quite significant, with 24.7%, and this group might be very willing to adopt the digital platform for their research and teaching activities because they grew up with technology. Among the RSs, the 31-40 age group contributes the highest percentage, which accounts for 49.6%. Since these students pursue advanced degrees such as PhDs, they must rely heavily on ERs to refer to the latest publications and develop their dissertations. Younger research students, aged between 25-30 years, constitute 30% of the major users of ERs, reflecting the digital shift in higher education.

5.3 Proficiency levels of digital literacy among FMs and RSs

The study explored the differences and similarities in the digital proficiency levels of both groups when using ERs. It identifies digital literacy as essential in determining what resources each group will use. Indeed, it evidences that it significantly influences how FMs and RSs

interact with ERs and evidences important differences and harmonies in their proficiency levels. Digital literacy has played a significant role in reinforcing users' effective use of ERs. Hence, it has become an important factor for academic success (Bulger, Mayer & Metzger, 2014). In the study, both user groups actively use ERs, over 90%, a sizeable minority, especially among non-user RSs, constitutes about 11.2%, as opposed to 8.3% of FMs, which indicates limited access or unfamiliarity with ERs for some respondents. Conversely, a high level of digital literacy can effectively promote access, navigation, and use of ERs. Besides academic success, proficiency enables them to critically select among a range of tools, platforms, and sources of information to facilitate their learning, research, and critical thinking activities per their learning goals (Yusuf & Song, 2024).

5.4 Types of ERs usage among FMs and RSs

In both FMs and RSs, the most used ERs are online journals and e-books, reflecting their important role in facilitating scholarly work and spreading knowledge. Online journals list 24.5% of FMs and 21.0% of RSs. E-books are in high demand, as 21.0% for FMs and 19.2% for RSs are noted using them. This further establishes the importance of these peer-reviewed sources for credible and high-quality information necessary for research and scholarship. Online journals allow the researcher to access articles, reviews, and data, which is necessary for a broad academic analysis and up-to-date findings towards an evidence-based approach in the field of specialization. Similarly, a study by Sudhier (2016) online journals were the most applied ERs for academic and scholarly works. E-books allow content flexibility; hence, users can access structured academic information that supports teaching and learning objectives. Their growing usage as a resource appears to a shift toward more adaptable and accessible formats in academic settings, serving a large multitude of research and instructional needs (Ndou and Chilimo, 2021).

Results also indicates that RSs are more likely to use scholarly databases than FMs with the percentages 17.1% and 14.6%, respectively. That means that research scholars find certain organized, topic-oriented information on which academic databases thrive, which is crucial at the foundation of their studies and for further specialized research areas. Through all these databases and websites, accessibility is assured for ERs among FMs and RSs (Bamidele et al., 2019). Similarly, RSs relies on institutional repositories more than FMs, which is 17.0% and

10.2%, respectively. This reflects their dependence on open-access platforms hosting various types of academic output for free, from dissertations to reports to publications related to the topics. These will undoubtedly improve RS's access to critical research outputs that they would otherwise not have access to, supplementing their academic work with insights and locally generated research (Bhat, Ganaie & Khazer, 2015). Moreover, RSs use more educational websites, 13.6%, than FMs, 7.0%. These portals offer facilities for noticing and learning, tutorials, and data gathering, which may help research scholars attain relevant skills and information towards their research goals. Preference for learning-based websites would indicate that RSs had to develop competencies and keep abreast with various methodological developments in respective fields.

In contrast, FMs use other websites more, at 16.7%, compared with RSs, at 8.7%. This greater breadth of use may suggest that FMs, due to teaching and mentoring responsibilities, would access ERs for a broader range of academic and professional purposes. Though conference proceedings are constructive to tracing recent, even cutting-edge research, their use is represented only by 6.0% of FMs and 3.4% of RSs. This could indicate the underutilization of these materials, which could be of value in keeping informed about recent developments and innovative methodologies within their respective fields.

Although FMs and RSs both strongly prefer online journals and electronic books, there are differences between FMs and RSs in their use of other electronic resources. The RSs relies mainly on scholarly databases, institutional repositories, and educational websites for its information needs, which reflects its research orientation. On the other hand, FMs relies on a broader range of resources, including other websites, to perform its many academic and professional tasks. The emerging trends give an idea of the distinctive needs and priorities of the two groups regarding their use of technological resources.

5.5 Sources of ERs used by FMs and RSs

The results reveal the main sources through which FMs and RSs access ERs. In this regard, search engines are the main access points for both groups. A total of 64.0% (231) of the FMs and 52.0% (130) of the RSs identified search engines as their source for finding ERs. This reflects the tremendous appeal these sites generate for quick and thorough information retrieval. This preference supports the findings of (Sharma 2019), which confirm that access

and search tools should be user-friendly to offer quick ways for the end-user to identify quality, relevant content. Search engines provide broad, immediate access and constitute a popular choice amongst FMs and RSs.

The FMs heavily relies on ERs, with leading use falling toward publisher databases 56.2% (203), and journal databases 46.8% (169). The FM's reliance on the same depicts reliance on peer-reviewed and reliable sources that add value to the scholarly work. According to Sharma (2019), the availability of reputed databases such as but not limited to JSTOR and Scopus indicates that FMs prefer the source of specialized and credible materials with which they can carry out efficient and quality research. These resources have been helpful for FMs who are often into writing, teaching, and guiding research since they often require detailed and updated research findings.

The second most utilized source was academic social media for RSs, with a usage rate of 42.4% (106). This depicted that besides ERs, students are looking for interactive platforms to network, follow the latest research, and get updated on academic trends. The growing popularity of academic social networking sites for RSs, such as ResearchGate, evidences this. They illustrate the overall trend for more collaborative, network-based learning environments. Online platforms can help early-stage researchers check the current status of ongoing research works in their respective fields. Library Websites and Journal Databases are indispensable to the both groups of FMs and RSs.

However, FMs use more formal resources such as publisher's databases or institutional access points. This means they rely on available peer-reviewed material about teaching and research activities. On the contrary, RSs are flexible in their choices: they use social media and general search engines. This approach reflects the need for diverse, accessible, and collaborative platforms as they build their academic foundation. The findings indicate that ERs are helpful to FMs as well as RSs. Moreover, they prefer different access points, indicating that any institution should support various access methods. The FMs uses specialized databases, while RSs use social media for academic purposes. It is, therefore, important that institutions continue investing in high-quality databases and promoting digital literacy to enhance the usage of academic social media. Recognizing and supporting these various use patterns will go a long way toward improving the FMs and RS's academic and research experience.

5.6 Purpose of using ERs by FMs and RSs

The purpose of FMs and RS's use of ERs, which reflects their main academic and professional responsibilities. In this regard, writing a research article was the major reason, as shown by 58.7% (212) among the FMs, reflecting the FM's demand to publish regularly since scholarly output is an important ingredient in academic circles. Apart from writing articles, the FMs used ERs in their research projects 55.1% (199) and for preparing lectures in class 48.2% (174). Such activities signify that ERs are highly supportive of FMs responsibilities to be updated about new developments in their fields, and such resources support the improvement of teaching contributions by presenting current information (Teguh et al., 2024; Siwach & Malik, 2018). Other major uses of ERs are to supervise or guide research fellows 30.5% (110), to perform professional duties/style 28.8% (104), and to keep updated with current knowledge in their particular disciplines 23.8% (86). These findings hint that FMs produce research output and have multiple roles within an academic setup, such as mentoring young scholars, for which ERs are a key tool. The other less-mentioned purposes are curriculum development at 20.5% (74), searching for specific information at 14% (54), and research networking and collaboration at 11.6% (42). Results generally prove that this study shows how ERs ensure that relevant information is available to update and go through the latest trends to perform varied professional assignments. Teguh et al., 2024; Siwach and Malik (2018) thought that this might have a positive impression on updated research material becoming readily available through ERs, thereby increasing scholarly productivity and enhancing work quality. Thus, ERs can let RSs and FMs to locate information rapidly and act as an imperative factor in continuous development, enabling them to continuously carry out useful contributions toward academia.

On the other hand, RSs relies mostly on ERs for thesis and dissertation work since 58.8% (147) depend on electronic materials for such an important academic milestone. This dependence underlines the importance of ERs in carrying out extensive literature reviews for data collection and producing comprehensive research output. In 2023, Faustino and Kaur proved that ERs are of fundamental importance in graduate research since, up to a great extent, digital material has replaced traditional paper-based resources in academic activities. Excluding thesis work, 35.2% (88) of the respondents reported that a major section of RSs utilize ERs in writing research articles, whereas 40.8% (102) use these resources to fulfil

academic works, which thereby establishes a trend that the RSs not only strive to complete the formal research projects but also depend on ERs for overall academic growth and knowledge enhancement. Besides, 32.8% (82) access the ERs to keep in line with their supervisor's works regarding updated academic freshness and expectations within the sphere of operations: Access to updated research regarding supervisor work provides an avenue to expose understanding projects by teaching their students. Hence, 31.2% of the RSs use ERs for information retrieval, whereas the smaller percentages account for research networking and collaboration 12% (30) and coursework assignments 29.2% (73). It shows that the resources are not put to work for just one or two aspects but rather contribute to the educational path at each step: the coursework, assignments and even academic networking. As justified by Faustino and Kaur, graduate students have become increasingly dependent upon ERs because of their easy access, variety of resources, and fast but critical aid for immediate purposes, which in turn aid the accomplishment of long-term research objectives.

Lastly, the various purposes of the FMs and the RSs in using the ERs hint towards the variety of their roles within academia. The FMs tend to utilize ERs more toward project work, teaching, and writing of research articles, while the main uses of ERs by RSs are for thesis and dissertation work, followed by assignment work. The important implications of these findings are the institutional recognition of these differing needs and the provision of appropriate targeted support to ensure that such use of ERs will ensure maximum utilization of this potential for FMs productivity, including improving the academic success of RSs.

5.7 Comparison of research and scholarly activities between FMs And RSs

The total of 553 respondents who participated in the research and scholarly activities indicated a vast difference in the research and scholarly activities between the FMs and RSs. The FMs had a high mean of 14.7 published research articles ranging from 1 to 52 with a standard deviation of 3.2, indicating high research and scholarly activities. In contrast, RSs are relatively early in academic publishing, with an average of only 0.5 research articles ranging from 0 to 8 with a standard deviation of 1.2. The editorial book/chapter further underlines the excellent experience of the FMs in scholarly contributions. Their means are 4.0, ranging from 0 to 25 chapters or editorial contributions, while RSs only have a mean of 0.1. These reflect the difference in academic role and maturity, for which FMs are more

interested in publishing editorial books or chapters. In addition, FMs report more conference presentations at an average of 5.8, ranging from 0 to 31, compared with the RS's average of 1.1, showing that FMs engage more academically and professionally in presenting their findings. The fellowship is similarly low for both groups, at 0.2 for FMs and 0.1 for RSs. The role of ERs in enhancing academic productivity is well-documented in similar contexts in different countries. For example, research output at Centrally Funded Technical Institutes in India surged 14-fold from 2015 to 2020 compared to 1991 to 1995 (Chavan and Keshava, 2024). Nigerian universities exhibit similar trends, with FMs reporting that ERs significantly contribute to their research productivity and efficiency (Bamigboye et al., 2018). This suggests that ERs have become important tools for enhancing academic productivity, particularly on the part of FMs who report using ERs to facilitate high-level research and publication efforts. However, the findings also point to the need for institutional support for RSs in maximizing ERs use to increase research output and scholarly engagement for RSs as they progress through their academic careers.

5.7.1 Impact of ERs on research productivity and publication quality between both groups

The influence of ERs on the productivity and quality of research by FMs and RSs is immense. It has been stated that, on average, the FMs accessed 15 ERs and published about four papers in the last year, while RSs accessed around 10 ERs and published only two papers. Again, the average citation impact factor for the FMs is very high, (12.5), compared to the (RSs), 8.0. The FMs also reported a higher increase in productivity, with a score of 8.5, while RSs scored 7.0. ERs allow for easier access to diverse information, which significantly boosts the ability of researchers to create new ideas and improve the quality of their work (Teguh et al., 24; Bhat 21). Statistical analysis indicates that increased access to ERs improves research productivity and the quality of published output. As determined by the ANOVA, significant variance of publication numbers and citation impact scores point toward positive impacts associated with ERs access. Moreover, it repeats the positive relationship between the availability of ERs and perceived productivity for FMs and RSs. The findings are supported by the fact that in other studies, an increased availability of ERs has significantly increased research productivity (Bamigboye et al., 2018). For example, research output in Centrally Funded Technical

Institutes of India has increased 14 times from 2015 to 2020 compared to 1991 to 1995, as per the reports by Chavan and Keshava (2024). The reasons are mainly due to access to better ERs. With such decisive evidence of the positive correlation between access to ERs and productivity in research, it is expected that institutions will emphasize policies directed at expanding access and active use of these resources. These may include subscriptions to databases, training related to the use of ERs, and general digital literacy initiatives, each of which holds promise for improving academic productivity across various disciplines.

5.8 Frequency of ERs usage by discipline among FMs and RSs

The various disciplines showed noticeable differences in the frequency of ER usage between the FMs and RSs. The FMs in the Science discipline have the highest ER engagement, with the overall usage hours being 5.2 and 3.8 hours for the RSs. This level of engagement underlines that research work is an intensive process that requires fast access to new information to continue working on projects. The standard deviation of 1.2 hours for FMs indicates they utilize many resources concerning their publication and research needs. However, ER usage has other tendencies in FMs and RS's rest of the discipline. The FMs averages 3.9 hours per week in Engineering, while RSs averages 2.2 hours. The significant standard deviation of 2.7 hours for FMs may reflect different research focuses or a difference in access to specialized resources. Within the Social Sciences, the surprising trend is that the RSs uses the ER an average of 3.8 hours, whereas FMs uses an average of 3.6 hours. This submits that RSs in this discipline may depend more on ERs to access data and conduct a literature review for their thesis and dissertation. Business & Management and Agriculture have moderate levels for using ERs, at 3.0 to 3.2 hours per week for FMs and RSs, from 2.6 to 3.1 hours per week.

The Arts, however, show low use levels where FMs averages 1.6 hours and RSs averages 0.7 hours. This minimal level of use likely reflects differing information needs or the use of traditional research methods commonly found in the humanities. These findings agree with Angadi and Krishnamurthy, 2017, who observed that familiarity and dependence on ER vary among academic roles, career stages, and fields. Therefore, This context would indicate that discipline-specific strategies are beneficial and key in promoting effective ER use, addressing the differing needs across fields, and offering significant enhancement in scholarly productivity and quality of academic work.

5.8.1 ANOVA test for the differences in average usage hours

ANOVA test result shows the differences in ER usage across academic disciplines and academic roles of the respondents. The overall results demonstrate that there are disparities in the use of ERs across academic disciplines and categories of respondents. The findings is significant, since the p-value is 0.047. That would indicate engagement with the ERs is varies significantly according to disciplinary needs and respondents' type i.e. FMs and RSs.

The FMs have more utilization rates due to their requirements for research and supervision, as shown by the observed disparities, which show that academic responsibilities impact the frequency and extent of ER involvement. Some disciplines, particularly those that require access to the most recent technical and scientific information (for example, Science and Engineering), rely far more on ERs than others, such as the Humanities or Arts, which frequently emphasize traditional resources. This is because of the differences between the various fields of study. Average statistics across disciplines support this tendency: for example, the average for applied hard disciplines is 23.6%, while applied soft disciplines average 24.6% (Babarinde, 2022). In light of these findings, institutional support and resource allocation must be adjusted to match the unique demands of various academic disciplines and consumer groups. This will ensure that RSs and FMs have equitable and effective access to ERs

5.8.2 Chi-square tests: age and usage frequency of ERs

The chi-square test results show significant association between age groups and the frequency of ER usage. Pearson Chi-square = 24.724 df = 20 p = 0.212 revealed no significant association between age group and use of ERs frequency. The likelihood ratio test had a p-value of 0.108. There is no statistically significant difference in the test statistic. Although the linear-by-linear association test indicates a possible trend with p = 0.038, representing a significant linear relationship between the variables. The overall analysis shows there is a difference in ER usage across age groups. However, the reliability of the results is declining since 60% of the cells have expected counts less than 5. These findings counter more general research evidence of age-related trends in usage of ERs. For instance, Crouch and Gordon 2019 found that internet access was highly utilized among the middle-aged adult population, 96%, while this rate

decreased to 76% among the older senior population, who often cannot easily use ERs themselves. However, such low involvement among older people is conditioned by variables like lower educational attainment levels and chronic conditions, perceived resource accessibility, and perceived usability. There are also specific digital behaviours common among older adults. According to Frishammar et al. (2023), in the case of older adults, the perceived usefulness of technology and perceived ease of use have been reported to make them use digital platforms more. These findings indicate that, while equal use of ERs across age brackets does not change, factors related to ageing-digital literacy, health, and perceptions about accessibility-become significant in shaping the usage patterns. To increase the comprehensive use of ERs, institutions should receive strategies that take age into account, particularly recognizing that older users may require further help to improve their digital involvement.

5.9 Satisfaction with ERs: FMs vs RSs

The satisfaction levels of FMs and RSs highlight their knowledges with using ERs. Results show that, in general, FMs are more satisfied with ERs than RSs. Whereas 55.1% of the FMs are very satisfied, the number of dissatisfied RSs is 24.4%, compared with 19.6% of the FMs. This means that familiarity with ERs, increased access, and a strategic understanding of how to use the resources lead to better experiences among the FMs. The FMs may be more aware of the broader range of ERs available and receive more institutional support to enable them to navigate and consume the resources more effectively. The relatively lower level of satisfaction of RSs is due, for example, to the inability to access some resources or identify relevant materials. These findings also support Sritharan's 2018 study at the Postgraduate Institute of Medicine, which highlighted that 60.2% were delighted with the accessibility to the Internet and 56.8% with e-journal availability. With this high satisfaction, it becomes apparent that the comprehensiveness and ease of access to a specific resource are important to users' overall experience. Satisfaction regarding ERs is also associated with social and environmental issues. Addressing the specific needs of the RSs by improving access, targeted training, and peer support will likely result in improved satisfaction of FMs and RSs and effective use of ERs.

5.10 Perceptions in accessibility, content quality, usefulness and cost effectiveness of ERs among FMs and RSs

The perceptions of FMs and RSs regarding ERs differ, shaped by their diverse academic requirements and priorities. This section explores perceptions through four key variables: accessibility, content quality, usefulness, and cost-effectiveness. Each of these factors contributes to the overall evaluation of ERs by FMs and RSs.

5.10.1 Perceptions in accessibility

The results clearly compare the perceptions of FMs and RSs on three statements: ease of finding and accessing, availability anytime and anywhere and accessibility across different devices of ERs. Both FMs and RSs give a mean score of 6.15 (SD=1.074) and 6.17 (SD=0.839), respectively, indicating that they find them easy to locate and use. The little deviation between the two groups reveals that ERs are not challenging for FMs and RSs according to access. The prevalence of easily searchable academic databases, search engines, and institution-wide access to ERs might have caused this. The results also correspond to earlier studies showing that ERs are easy to find and locate (Angadi & Krishnamurthy, 2017).

Regarding availability anytime and anywhere, the response mean score for FMs was 6.20 with an SD of 1.003, while RSs rated it higher at 6.27 (SD=0.797). Such a high degree of agreement would point to a common belief that ERs are available anytime and anywhere. Information is readily accessible at any time and from any location, allowing individuals to obtain the knowledge they need whenever they need it (Kasymaliev, Ibraev & Ongarbaeva, 2023). The effectiveness of resource availability is now considered a significant feature that accommodates reasonable access to information in this digitized century (Finch, 2015).

Accessibility across different devices presents a noticeable difference in perceptions between FMs and RSs. The average for the FMs was relatively high at 6.19 (SD=0.901), indicating that they found ERs accessible across devices like laptops, tablets, and smartphones. On the contrary, the RSs are less agreeable with this question, as it leads to a mean score of 5.88 (SD=1.157). This inconsistency may happen by inadequate infrastructural facilities or lack of technical support challenged by RSs. Institutions should minimise these gaps by developing

compatibility from device and arranging targeted training for RSs to expand their experience with ERs.

5.10.2 Perceptions in content quality

The results reflect the perceptions of FMs and RSs on three statements like content is accurate and reliable, covers a wide range of topics and high-quality multimedia resources. The RSs rated the accuracy and reliability of the content of ERs as somewhat lower compared to FMs. The FMs ratings a mean score of 5.87 with SD=0.881 and a mean score of 5.77 with SD=1.031 for RSs. The higher standard deviation for RSs reflects more variability in their opinion, even as both groups show high confidence in the reliability of ERs. That does not mean, however, that both trusted the ERs' accuracy and that even some of the RSs often confront content quality or reliability-related problems. Marouane and Rhihil (2023) highlighted quality assessment of ERs in Education helps to judge the credibility of ERs and underlines the pedagogical quality and reliability, while Kumari (2017) advocates for using specific criteria to evaluate e-content in academia. Tools such as DISCERN used to assess ERs' quality, demonstrate that although most sources are credible, inaccuracies still occur, especially on commercial sites (Lee, Nguyen & O'Leary, (2022). These insights raise serious concerns about the need for appropriate credibility assessment practices for ERs, thereby benefiting the two groups in their access to digital content of acceptable quality.

Regarding a wide range of topics of ERs, RSs showed an average score of 6.22 (SD = 0.828) and an average score of 5.98 from FMs, with an SD of 0.931. This indicates that RSs perceive ERs as covering a wider range of subjects, possibly because they use these resources extensively to explore various topics at the preliminary stages of their research. The FMs may require specialized content and thus find the range of topics covered less relevant to their needs. The high ratings in this category identify a good collection of ERs in both exploratory and specialized materials to support a wide spectrum of academic interests. Teguh et al. (2024) indicated that ERs can provide the latest information necessary for innovation and ethics in research. Faustino and Kaur (2023) said, e-journals, e-theses, and e-books help in writing papers and remain current in the field; hence, these three are considered important. These shall facilitate basic and specific research together and be useful for both groups.

According to the quality of multimedia resources in ERs it was noted that both RSs and FMs were satisfied. The average rating of 6.15 by RSs with an SD of 0.821 against the FMs' 6.06 with an SD of 0.829. This means that multimedia content, videos, infographics, and interactivities are highly attributed to greater use wherein such will be a requisite for conceptual understanding. (Kasymaliev, Ibraev & Ongarbaeva, 2023) indicated a high contribution to interactive e-books, video tutorials, and virtual simulations by multimedia content that make learning more engaging and varied. The components in this category contribute highly because they improve research and learning; therefore, these ratings are high. According to Marichamy and Thangamariappan (2014) and Bhat (2021), full-text databases and peer-reviewed journals would be required to support high-value academic research. On the other hand, Finch (2015) believed that digital libraries may support significant collections, including theses and dissertations, in expanding the capability to engage in research in all associated fields. Through continued investment in excellent multimedia resources, a wide range of subject topics, and credible content, the educational institution should ensure that the ERs have continued worth to the FMs and RSs. The overall perception of the value of ERs is positive, while FMs and RSs differ in their appreciation in various dimensions.

5.10.3 Perceptions in usefulness

The results demonstrate the perceptions of ERs by FMs and RSs on three statements, keeps updated with research, helps in academic performance and assists in organizing and citation management. The FMs have scored an average of 5.97 (SD = 0.901), whereas the RSs rated the ERs to keep up-to-date of the latest research as relatively higher with a rating of 6.19 (SD = 0.879). A possible explanation might be the network and framework of research the FMs usually must use to keep them up to date with their particular area of study. Conversely, it can be assumed that at least in the initial periods of the thesis work, RSs rely much on ERs in keeping up-to-date of the latest in these current studies and emerging areas of interest. Bhat (2021) presented that ERs enable worldwide access to research outcomes, developing invention and enhancing quality of research work. According to Dutta (2020) also described the role of ERs in effective data management, benefitting both RSs and FMs.

Moreover, RSs felt that ERs would greatly help in improving academic performance, with a mean rating of 6.32 and an SD of 0.785, while FMIs rated these resources at a mean of 6.05 with an SD of 0.841. Perhaps this difference arises because, unlike the FMIs, the RSs depend on the ERs for various academic works such as assignments, projects, and research; whereas FMIs normally rely on ERs for references and instructional purposes. Dulaney, Davlin & Cagle (2023) observed the relationship between resource planning and successful academic output, particularly in area like statistics, where planning use of ERs improves performance and self-directed learning.

The role of ERs in helping with the organization and management of citation was rated as very high among the RSs (mean = 6.37, SD = 0.866), while much lower among the FMIs (mean = 2.87, SD = 1.222). The result indicates FMIs may choose other citation management methods, whereas RSs depend on the features of ERs like reference managers. Chhatwal (2018) showed the stable contribution of citations in ERs, specially in fields like medicine, emphasizing the value of ERs. Overall, while both groups recognize the effectiveness of ERs in citation management, RSs rate these resources essential to their academic and research work compared to FMIs, who may have used other resources for specific demands.

5.10.4 Perceptions in cost effectiveness

The results indicate the cost-effectiveness of ERs on three statements of ERs like save money compared to print materials, confident in using without support and offer more value from traditional resources from the perspective of RSs and FMIs. The RSs rated the cost-saving advantages of ERs much higher (mean = 6.47, SD = 0.677) than the FMIs (mean = 5.69, SD = 0.999). The observed difference may indicate that the RSs are more price-sensitive because they often operate on limited budgets and frequently cover their expenses for print materials. In contrast, the FMIs usually enjoys institutional support that eliminates direct economic burdens, thus weakening their notion of cost-effectiveness. Cintiaraa, Syahada and Majdudin (2023) emphasized the importance of large benefits that ERs have towards financially constrained students affordable access to information. Binu (2020) explained that although ERs provide financial benefits, clear opportunity costs exist for institutions considering a full shift to digital formats. These might include licensing fees and the potential loss of access to certain materials if managed badly (Kowalsky, 2015). Overall, ERs play an important role in

facilitating access to increasingly affordable education. However, effective management of costs associated with this resource type remains fundamental to universal access.

The RSs expressed higher confidence in using the ERs as they scored an average of 6.48 (SD = 0.664). In contrast, the FMs showed a lower rating of 5.72 (SD = 1.227). This may be because the younger generation is more familiar with digital tools and technologies; hence, they can use electronic platforms more skillfully without support. On the other hand, FMs, especially those who are not as familiar with new technologies, may need more assistance or guidance in using ERs effectively. This could be the reason for their low scores and high variance in ratings. According to Teguh et al. (2024), improving digital literacy among the user community is essential to make them move and search ERs confidently and critically. Kantharaj et al. (2012) pointed out that the training program is essential in enhancing user confidence to access ERs independently. Therefore, targeted training could benefit FMs by allowing them to access ERs without difficulties.

In responding to their perceived value of ERs compared to traditional print resources, FMs and RSs agreed that ERs were better. The mean scores demonstrated this, with FMs averaging 6.17 (SD=1.033) while RSs averaged 6.38 (SD=0.756). The ratings from the RSs could be slightly higher because they use these ERs more frequently for performing different types of academic activities like assignments and research-based work, which adds to its value. Finally, whereas both groups perceive ERs as cost-effective, for RSs in particular, cost-saving and usability features get higher ratings consistently than FMs. This might be because students are more comfortable with digital tools and rely more on ERs as the main study material. On the other hand, even though FMs acknowledge the advantages, they might use ERs only selectively, or perhaps they have other resources that reduce their felt need to be cost-effective. The shift from traditional to ERs in education has brought many benefits, including increased access, flexibility, and affordability. Kasymaliev, Ibraev and Ongarbaeva, (2023); Krupko (2022) highlighted that online courses, e-books, and multimedia tutorials offer students opportunities to learn from anywhere, at their comfort and speed, transforming the learning experience. Such views indicate how ERs change the pattern of work in academia, making the learning process adaptable according to different needs and encouraging us to explore the full potential of these resources.

5.10.5 MANOVA on perceptions of ERs among FMs and RSs

A MANOVA was therefore conducted to identify significant differences in the perceptions of FMs and RSs on ERs based on four factors: accessibility, quality of content, usefulness, and cost-effectiveness. The findings showed that there is a significant difference between the perceptions of FMs and RSs about ERs. Key factors that positively influence these perceptions include, but are not limited to, accessibility, content quality, and usefulness. Therefore, institutions must make considerations in developing strategies toward improving access and support in ERs for both the FMs and RSs with regard to their differences. The FMs use more ERs than RSs, showing strong preferences for e-journals and databases such as Science Direct and Springer Link (Siwach & Malik, 2019; Siwach & Malik, 2018). The RSs typically rely on basic search strategies, while FMs utilize more advanced techniques, including Boolean operators and wildcards.

5.11 Challenges faced by FMs

The challenges faced by FMs in attempting to utilize ERs differ such as the institutional and technological obstacles that prevent them from being utilized ERs efficiently.

5.11.1 Limited access to full-text documents

The inadequacy of full-text availability is the most serious access problem, reported by 80.3% of FMs. Indeed, this has consequently placed a great barrier to research productivity since complete research papers and articles are required for in-depth academic work. While ERs have many advantages, limited access to full text documents hinders their effective utilization (Teguh et al., 2024; Ding et al., 2018).

5.11.2 Inadequate infrastructural facilities

The second most crucial challenge related to inadequate infrastructural facilities identified by 73.7% of the FMs. Some of the FMs which may be included in this are inaccessibility to computers, poor internet connectivity, and lack of essential tools for accessing the ERs. This gap should be addressed by improving universities' physical and technological infrastructure. The deficiency in infrastructure hinders the capacity to exploit the advantages of ERs

completely, therefore constraining their optimal utilization by research scholars (Ansari & Naushad Ali, 2019).

5.11.3 Inadequate training in the effective use of ERs

The third most mentioned problem by FMs is inadequate training in the effective use of ERs and 62.6% of respondents reported it. This suggests that even though ERs are available, most FMs may not have the necessary skills. The assistance of training programs and workshops on advanced search techniques, usage of databases, and citation management would greatly assist the FMs in producing better research output. A study conducted among health professionals in Srilanka found that almost all trainees emphasized the need for training in information literacy skills, especially in search techniques (Sritharan, 2023). Similarly, research scholars at Osmania University highlighted the importance of hands-on training in utilizing ERs (Lakpathi, Vivekavardhan & Kumar, 2019).

5.11.4 Difficulty in accessing relevant resources

The further challenge noted is difficulty in accessing relevant resources (72.9%). This is mainly attributed to the lack of library support in accessing ERs (Nazir, 2017). These findings imply that while the FMs have access to ERs, they cannot find material for specific needs due to difficulty in search mechanisms or lack of library assistance. Libraries should ensure the availability of competent staff to facilitate the FMs in effective searching and accessing relevant material.

5.11.5 Limited subject coverage

The following problem of limited subject coverage, reported by (55.7%), highlights a barrier to the practical usage of ERs. This limitation reflects gaps in the extent and depth of content in ER collections, which often fail to comprehensively address the diverse research needs of users. Sharma (2019) suggested that institutions must prioritize collecting resources that address the diverse interests of their academic communities. Additionally, limited subject coverage often worsens existing dissimilarities in resource availability, especially in developing countries, where access to a wide range of academic resources is already constrained (Akmad & Abatayo, 2024).

5.11.6 Lack of skilled personnel in the library

The shortage of skilled library personnel, reported by 51.5% of respondents, highlights a significant barrier to effectively utilizing ERs. This issue is primarily caused by inadequate library provision for navigating and accessing ERs efficiently (Nazir, 2017). These findings imply that while the FMs have access to ERs, they cannot find material for specific needs due to a lack of library assistance. Libraries should ensure the availability of competent staff to facilitate the FMs in effective searching and accessing relevant materials.

5.12 Challenges faced by RSs

The challenges faced by RSs in struggling to utilize ERs vary such as the institutional and technological obstacles that prevent them from being utilized ERs efficiently.

5.12.1 Lack of training on how to use ERs

The highest factor reported by RSs is the lack of training on using ERs, identified by 52.8%. This result is consistent with the faculty members' responses and thus suggests a large-scale need for improved training programs on ERs among the academic community. As much as RSs are digital natives, they still need guidance on using these resources. According to Sharma (2019), increasing training programs effectively remedy access-related issues.

5.12.2 Slow internet speed

The second most frequent challenge faced by the RSs is slow internet speed, as 48.4% of them reported this problem. Good and speedy internet connectivity is essential for downloading large academic files. This might abruptly disrupt research processes, particularly in developing regions with poor internet infrastructure. Poor internet connectivity, characterized by slow speeds, significantly hinders efficient access to ERs. This limitation not only prolongs the time required to retrieve necessary information but also disrupts workflow, causing delays in research activities, academic task submissions, and overall productivity (Akmad & Abatayo, 2024).

5.12.3 Technical issues with accessing ERs

The third rank among the issues related to ERs usage is technical difficulties while accessing; 45.6% of RSs were affected by this. These could be login problems, issues with specific databases, or compatibility with certain software. Therefore, upgrading the usability and accessibility of ERs platforms may reduce these technical obstacles. Tabassum (2023) studied several problems, including insufficient library facilities and a lack of guidance in accessing ERs, which negatively affect students' capacity to get important resources.

5.12.4 Inadequacy of subject coverage

Other challenges reported include a lack of sufficient subject coverage by 43.6%. The RSs feel that the resources available do not cover their research interests comprehensively enough. Inadequate subject coverage increases resource disparity, particularly in developing countries where access to diverse academic resources has already been limited (Akmad & Abatayo, 2024).

5.12.5 Inadequate support from library staff

A significant number of the participants (37.5%) do not receive sufficient assistance from the library in getting the most of its resources. Better subject coverage and enhanced library support would cater more fully to the varying research requirements of RSs. The study identified that libraries are managed by unqualified staff, considerably affecting the quality of services provided. The absence of knowledge may result in unsuccessful resource management, unsatisfactory user support, and an inability to address the varied requirements of library users (Hussain & Saddiqa, 2024).

5.12.6 Limited access to full-text documents

Surprisingly, restricted access to full-text documents the major problem faced by the FMs is only at sixth position in the RSs' ranking list, with a percentage of 29.2%. This may be due to the nature of the resources each group requires, with FMs needing more specialized or advanced materials that are not as readily available. Faculty members and research students have major problems with access to and use of ERs, though their challenges are somewhat

different. Many scholarly articles are not accessible because of subscription fees, and institutions vary in how much access they have to these articles (Boudry et al., 2019).

5.13 Recommendations provided by FMs

Faculty members play a dynamic role in academic and research activities. Based on the study findings, they recommend improving ER access, usability, and training to enhance effectiveness. The recommendations by FMs are as follows:

5.13.1 High infrastructural facilities

The recommendations regarding improving the use of ERs by FMs and RSs. Regarding FMs, the highest recommended variables were high-quality infrastructural facilities at 85.6%. This indicates a strong belief in having infrastructure that supports the effective use of ERs for maximum accessibility and usability by all groups within the academic community. The FMs' further propose that the management invest in infrastructures and platforms to ensure ease of access to ERs (Sundararajan & Balasubramanian, 2018).

5.13.2 Continuous training and workshops

Enhancing skills among end-users and support employees is an ongoing need, with 80.3% of respondents suggesting ongoing training and seminars (Teguh et al., 2024; Aregbesola & Oguntayo, 2014). Training programs boost users' confidence and familiarity with ERs, improving their access and utilization (Frandsen et al., 2017). Implementing mandatory user education and orientation programs is strongly recommended to ensure users can effectively navigate and utilize these resources (Anyim, 2021). Regular workshops and seminars can also be arranged to keep the FMs abreast of recent ERs and their search techniques (Konappa, 2020).

5.13.3 Subscribe as far as user preference

The FMs further showed users subscriptions to resources by preference, indicating that 65.7% are willing to subscribe to resources for actual users' needs. The recommendations include improving library infrastructural facilities and continuous subscription to necessary ERs (Sivakumaren, 2018).

5.13.4 Display new ER services for users

New ER services ranked fourth with 56.8%, indicating that updating and publicity of new services are in great demand for users.

5.13.5 Assume an educational campaign for users

An educational campaign for the awareness of resources was also presented, with 55.4% reinforcing the need for continuous engagement and user education. Establishing networks for sharing best practices in ERs utilization can improve research quality and promote innovation (Konappa, 2020).

5.13.6 Skilled the staff for helping users

Finally, at fifth rank was training staff to support the users, with 52.1% showing professional development of staff supporting the navigation of ERs by an academic community (Konappa, 2020).

5.14 Recommendations given by RSs

The RSs are key users of ERs for their academic and scholarly work. Based on the study findings, they have provided several recommendations to improve ER accessibility, usability, and training. The recommendations by RS are as follows:

5.14.1 Ensure uninterrupted power supply

The RSs identify an uninterrupted power supply of 82.4%, which reflects their interest in the stability of access to resources required to keep them productive in research work. Most research scholars are affected by poor connectivity and a lack of permanent access to resources (Yadav & Sahu, 2024; Sivakumaren, 2018).

5.14.2 Skilled professionals for helping users

The RSs, just like FMs, indicate that skilled professionals should be available to assist users 78.8%, reflecting the need for competence and knowledge in support staff. A study showing

professionals competence helping the navigation of ERs for scholarly community (Konappa, 2020).

5.14.3 Continuous training and workshops

Third among RSs is continuous training and workshops, at 69.6%, again matching FMs's interest in skill development opportunities. This suggests that both groups consider training relevant to maximize the use of ERs (Li et al., 2017; Konappa, 2020).

5.14.4 Raise awareness about the impact of ERs

Sensitization of the use of ERs 60% is also an area of interest to research students, suggesting that the students want to be made aware of how such resources will contribute to their success. Similarly, a study recommends increasing the availability and raising awareness regarding using ERs helps to advance research outcomes (Uddin, Mamun & Rahman 2019).

5.14.5 Improve proactive behavior by professionals

Other suggestions of great importance relate to increasing proactive behaviour from support staff 59.2%, where students want more interactive personnel who should anticipate user needs. A recurring point by the FMs and RSs was 'accompanying personnel skills' and 'follow-up training', meaning professional development of users and user education. The FMs indicates that the overall infrastructure is relevant with subscription process. At the same time, the stability of access-power supply and proactive supporting staff concerns of RSs (Teguh et al., 2024; Sivakumaren, 2018).

5.14.6 Know the user requirements and feedback

Finally, RSs recognize that the 'institutions should perceive users' needs and make provision to receive feedback 53.6 denotes additional input is needed concerning selection and utilization of ERs. Personalized recommendation systems will also help guide students towards relevant resources that best fit their learning contexts and preferences (Li et al., 2017).

5.15 Reasons for non-using of ERs

The result presents a comparative analysis of the reasons cited by both groups for not using ERs. While FMs and RSs encounter overlapping challenges, the extent and specific distribution of these barriers vary significantly.

5.15.1 Lack of knowledge regarding the use of ERs

A significant barrier for both FMs (50%) and RSs (42.9%) is a lack of knowledge about using ERs effectively. This points to the urgent need for targeted training and continuous professional development for both groups, which could effectively address this issue (Ahmed, 2013).

5.15.2 Insufficient ERs in my discipline

Interestingly, half of the RSs reported a shortage of ERs in their fields, a higher percentage than that of FMs. This may be due to their research's specific and constantly evolving nature, which requires more specialized and up-to-date resources. In contrast, FMs might have broader access to traditional materials relevant to their established disciplines. A study revealed, insufficient subject coverage causes resource inequity, particularly in poor countries where the utilization of various academic resources is already restricted (Akmad & Abatayo, 2024).

5.15.3 Do not have any internet facility

Both groups also experienced difficulties due to a lack of internet access, with 26.7% of FMs and 32.1% of RSs reporting this issue. This reveals ongoing infrastructural challenges in academic institutions, particularly impacting research scholars who often work off-campus. A study shows that most developing nations still face serious issues like low internet diffusion and other deficits in ICT infrastructure, which narrow access to ERs. These challenges hinder progress in education, research, and the application of modern technologies, exacerbating a digital divide and further compromising socio-economic development (Rosa & Lamas, 2013).

5.15.4 Do not appear useful

A smaller percentage of FMs (16.7%) and RSs (21.4%) indicated that they did not find ERs useful. This may reflect a misalignment between the available resources and the users' needs,

or it could indicate a lack of awareness of the full potential of these resources. Targeted outreach and demonstrations of the relevance of ERs to academic work could help address this perception (Sokolov & Serzhan, 2022).

5.15.5 Lack of enough infrastructure facilities

Both groups identified inadequate infrastructure as a significant barrier, with 60% of FMs and 60.7% of RSs perceiving this issue. Challenges such as insufficient computer labs, slow internet, and a lack of devices need to be addressed to enhance the use of ERs in academia. Poor internet connectivity and unreliable electricity supply are significant obstacles in developing regions ("Low Utilization of Online Research Resources by Lecturers: Causes and Remedies," Omumu & Alordiah (2022).

5.15.6 Do not know the university subscribes to ERs

Moreover, a concerning percentage of FMs (40%) and RSs (28.6%) were unaware of their universities' subscriptions to ERs, indicating a communication gap. Many users are simply uninformed about the availability of ERs at their institutions, which severely limits their usage (Sokolov & Serzhan, 2022). Thus, improving communication strategies to ensure that academic communities are well-informed about available ERs is critical. While FMs and RSs face similar challenges, such as inadequate infrastructure, limited internet access, and a lack of awareness regarding university subscriptions, their differing perceptions regarding resource sufficiency and usefulness suggest that their expectations and needs may vary.

To overcome these barriers, implementing targeted training, enhancing infrastructure, and improving communication could significantly increase the adoption of ERs among FMs and RSs. Additionally, social support and encouragement are often lacking, deterring individuals from engaging with ERs (Lee, 2022). Furthermore, many users lack the necessary searching skills to navigate ERs, leading to frustration and disengagement (Sokolov & Serzhan, 2022).

5.16 Major findings

The major findings of the analysis were discussed regarding the use of ERs by two groups i.e. FMs and RSs. The Results from FMs and RSs were analyzed and interpreted regarding the research questions.

MRQ: How do faculty members and researchers at public universities utilize ERs and perceive their role of ERs in enhancing their scholarly outputs?

The FMs and RSs in the public universities of Bangladesh are committed to utilizing ERs to increase scholarly output and academic development. The FMs use ERs mainly for research articles, teaching materials, and professional activities, whereas the RSs use ERs for thesis/dissertation, course work assignment, and research articles. The FMs and RSs have an extensive knowledge of digital technology, which enables them explore ERs with comfort and give an appearance that people using them are competent. Also, there is a high variation in the use pattern within disciplines; Science and Engineering showed a higher level of use than the arts. Younger users are more active; therefore, older age groups should receive specialized training on access and usage of ERs. Moreover, A Chi-Square test was performed to determine whether there was a relationship between age and the frequency of ER use between FMs and RSs. There was no significant correlation between age and usage of ERs pattern ($p > 0.05$), as shown by the Pearson Chi-Square value of 24.724 with 20 degrees of freedom and a p-value of 0.212. In general, the views about the accessibility and usefulness of ERs are positive from both groups. However, full-text availability, slow internet, and a lack of training are some of the obstacles to their optimal use.

SRQ1. What is the current state of ER usage and access at public universities in Bangladesh?

The study results indicate that FMs and RSs demonstrate intense and frequent usage with ERs, particularly online journals and e-books. According to the study, the most common purposes for FMs to use ERs include writing research articles, research project work, and developing teaching materials. They also reported engaging in professional activities and mentoring research fellows. However, they use ERs less frequently to update information and networking. Similarly, the primary uses of ERs by RSs are for thesis and dissertation work, while other significant uses include writing research articles and coursework assignments.

In both cases, the primary access to ERs is through search engines and publishers' databases. The FMs and the RSs possess intermediate to advanced levels of digital literacy, allowing them to browse through and use ERs efficiently and convincing the audience that the users are competent. This level of competence testifies that they can use digital tools for research and academic purposes. Distinct patterns in user demographics have been observed based on age. The 31-40 age bracket is the biggest category of users, which may indicate that this age group is most actively involved in their research and studies. On the other hand, a smaller percentage of the users are over 50, indicating a reduced need or reluctance to use ERs. Therefore, training and access for older FMs and RSs must be tailor-made.

In all, the current state of ER use and access in public universities greatly relies on ERs by FMs and RSs. A good level of digital literacy and positive perceptions of accessibility facilitate this. However, differences in satisfaction levels and a need for targeted support, especially for older users, indicate that efforts toward increasing familiarity with and accessibility to ERs should be continued. Tailored training initiatives could help enhance scholarly output and academic progress across all demographics, promising the future of academic research and progress in public universities.

SRQ2a. How does the use of ERs vary across different academic disciplines and respondent types in various public universities in Bangladesh?

In the Science discipline, FMs generally use ERs for an average of hours per week, followed by Engineering, Social Science, Business and Management, and Agriculture. However, both groups of Arts did not use these resources. The results of the ANOVA test show a significant difference between the mean hours of usage from different academic disciplines and categories of respondents, as the p-value is 0.047. This, therefore, means that ERs usage frequency varies significantly between academic disciplines and respondents' type. This means there is a substantial difference in the level of ERs utilization between diverse academic disciplines, FMs and RSs.

On the other hand, RSs in science use ERs for an average of hours per week, followed by Social Science, Business and Management, Agriculture, Engineering, and Arts students. The ANOVA test results show significant differences in average usage hours across distinct academic disciplines and respondent categories, as indicated by the p-value of 0.047. This submits that

the frequency of ERs usage differs significantly among different academic disciplines and between FMs and RSs. This suggests that the frequency of use of ERs would vary across academic disciplines and between the FMs and RSs.

SRQ2b. Is there a significant relationship between the utilization of ERs and the age demographic of faculty members and research students?

A Chi-Square test was conducted to identify whether any association existed between the age group and the frequency of ER usage. The results showed that the Pearson Chi-Square was 24.724 with 20 df, p-value of 0.212, which stated that there is no significant relationship between age and the usage pattern of ERs (p-value > 0.05). The likelihood ratio also showed no significant difference; hence, $p = 0.108$. However, the linear-by-linear association test gave a p-value of 0.038, thus showing the possibility of a linear trend between the variables of age and usage of ERs. The overall findings show that there is no significant difference in the use of ERs among different age groups. The analysis also said that 60% of cells had less than an expected count of 5, which may have given serious effect reliability.

SRQ3. How do ERs impact the research output, publication quality, and academic activities of the respondents in public universities?

The FMs are productive in writing research articles, ranging from 1 to 52. Conference presentations, on average, come to 5.8 for the FMs; the minimum was 0, and the maximum was 31, while the standard deviation was 6.5, which also shows considerable variation in this activity. The average number of editorial books or chapters for FMs was 4.0, ranging from 0 to 25, with a standard deviation of 4.4, indicating significant variability in this activity. The FMs reported an average of 3.5 research grants or projects, ranging from 0 to 18 with a standard deviation of 4.3, once more indicative of variation in the level of engagement in research funding. The average number of theses or dissertations supervised is 1.6, with a minimum of 1, a maximum of 4, and a standard deviation of 5.7; this reflects a relatively moderate dispersion around the average for this activity. Fellowships are very low on average: 0.2; minimum 0, maximum 5, and standard deviation 6.9; hence, fellowships are somewhat less common for FMs. The FMs are very productive in research articles, conference presentations, and contributing to editorial books or chapters. They have, on average, engaged in research

grants or projects. More importantly, FMs engage significantly more in research and scholarly activities than RSs.

Conversely, RSs produce 0.5 articles on average, ranging from 0 to 8. The standard deviation (SD) of 1.2 suggests a narrow spread in their research article production. RSs give an average of 1.1 conference presentations, ranging from 0 to 8 and an SD of 8.5, indicating some engagement in this activity, though less frequent than FMs. The mean is very low at 0.1, with the range from 0 to 2 for RSs on this activity, and with an exceptionally high SD of 4.4, RS never engage in this sort of scholarly output. This minimal engagement extends to the thesis or dissertation supervision in the form of a very small mean of 0.1 with a range of 0 to 1 and an SD of 2.7 for RSs. Like other activities, RSs report an average of 0.1 research grants or projects ranging from 0 to 2 and an SD of 3.3. Like FMs, RSs also report a low mean of 0.1 scholarships ranging from 0 to 2 and an SD of 4.9. The RSs usually publish an average number of research articles, present papers at conferences, contribute minimally to books and chapters, and supervise theses or dissertations. There is less involvement in research grants, projects, or fellowships.

Another outcome has been used to test the influence of ERs on research productivity and publication quality among FMs and RSs. Data on the average number of ERs accessed, average number of publications, citation impact scores, and perceived improvements in productivity. This population accordingly reported accessing an average of 15 ERs and publishing four pieces over the last year, while 10 ERs were accessed with publication results of 2 papers presented. These result in a much higher citation impact score for FMs over RSs, 12.5 to 8.0, respectively, or for a perceived productivity gain, 8.5 to 7.0. The further result shows that increased access to ERs positively influences research productivity and publication quality. Results from the ANOVA show significant differences in the number of publications and citation impact scores based on access to ERs. There is also a strong positive correlation between the accessibility of ERs and perceived productivity improvement. These findings have shown that increasing access to ERs may improve FMs and RSs' research outcomes. Therefore, universities should focus on increasing access and enhancing the use of ERs to support academic work.

SRQ4. What are the perceptions of faculty members and research students about the accessibility, effectiveness, utilization, and cost-effectiveness of ERs?

The MANOVA test was conducted to examine the perception of the FMs and RSs regarding four key statements of ERs such as accessibility, quality of content, usefulness, and affordability of ERs. Thus, MANOVA indicates that the respondent group significantly impacts the perception of using ERs, Wilks' Lambda = 0.86, $F(4, 548) = 4.32$, $p = 0.002$. Since the p-value is below the conventional alpha level of 0.05, it determines statistical significance. There is adequate evidence to advocate a significant difference between FMs and RSs regarding their perceptions of ERs.

Tests of between-aspect effects were further analyzed to determine what factors contributed to this difference. The results showed significant differences in the overall perception of ERs among FMs and RSs. Accessibility, quality of content, and usefulness have been identified as significant factors influencing perceptions. Thus, institutions may consider these differences while developing strategies to enhance ERs access and support for FMs and RSs.

SRQ5. What challenges do faculty members and research students face in accessing and effectively using ERs into their scholarly activities?

The FMs faced some serious challenges in accessing the ERs, the inability to access the full text of documents due to a lack of high-speed internet that can allow uninterrupted access. It was also difficult to locate resources, which might delay research work. Another major problem the respondents reported was a lack of training, reflecting a lack of experience with the ERs platforms, technical problems, and a lack of assistance from the library staff. The RSs faced some significant issues when using ERs. Most RSs required assistance due to a lack of training on using ERs and slow internet. Most of them claimed to have technical problems while accessing ERs. Finding the relevant resources was difficult, support from the library staff was inadequate, and access to full-text documents was limited. These factors increase barriers to students' accessing and using ERs for academic purposes. It was recommended that infrastructure facilities be improved through continuous training and workshops, subscription to ERs according to user's preferences, and increasing awareness about new services. Further, educational campaigns for users and the need for skilled staff to assist them were recommended. These recommendations emphasize infrastructure, training, and user-

centered services. The most supported suggestion made by RSs was that the power supply be uninterruptable. In addition, the presence of knowledgeable professionals at the service helps the students. They also expressed a need for more regular training sessions and workshops to be more informed about ERs, create awareness of the advantages of using ERs, and encourage supportive staff to be proactive. Finally, there is a need to collect user feedback to adjust the services properly.

5.17 Triangulation of findings

In this chapter, the findings derived from the analyses of FMs and RSs are synthesized and examined through triangulation. Triangulation facilitates the combination of many perspectives, using the distinctive but interrelated opinions of FMs and RSs. This chapter aims to reveal key patterns, trends, and contrasts by comparing and contrasting answers across research questions, which may not be evident when examining each group independently. This method enhances comprehension of how various groups perceive and employ technological resources while emphasizing their similarities or differences.

The chapter comprehensively analyses the attitudes, practices, and issues associated with using ERs in academic endeavours, providing an integrated perspective on their influence on scholarly productivity and academic advancement. This methodology uses triangulation to provide a more robust and credible interpretation of the data by integrating various views, offering a comprehensive picture of the research findings. This chapter seeks to elucidate the elements affecting the utilization of ERs, contributing to the main discourse on improving academic practices and cultivating an informed research culture within Bangladesh's higher education system. The following table presents the triangulation of findings according to the research questions:

Table 5.1 Triangulation of findings by FMs and RSs

Research Questions	FMs	RSs	Key Findings	Practicle Application
SRQ1. What is the current state of ER usage and access at public universities in Bangladesh	The FMs in public universities frequently engage with ERs, where online journals and e-books are the predominant retrieval modes for research articles, project work, teaching materials, and professional activities such as mentoring research fellows.	RSs also use ERs, primarily online journals and E-books, for their theses, coursework assignments, and research articles, but comparatively less for research and academic activities.	ERs are widely used by both FM and RS, with FM using them more frequently, especially for research, teaching, and academic tasks. RS use them mainly for thesis work but face challenges like limited access and training.	Libraries should promote a wider range of ERs, such as E-theses, databases, and open-access journals, to encourage RS and FM to incorporate these in their research activities. FMs should also be encouraged to use ERs in class lectures and teaching materials to enhance academic productivity.
SRQ2a. How does the use of ERs vary across different academic disciplines and respondent types in various public universities in Bangladesh?	The FMs in Science, Engineering, Social Science, Business, Management, and Agriculture use ERs for several hours each week, with science being the highest user. However, Arts disciplines report very low usage of ERs	The RSs in Science, Business, Management, Social Science, Agriculture, Engineering and Arts use ERs for several hours each week, but their usage is lower than that of FMs. Social Science shows the highest usage, while arts have the lowest.	Overall, RSs use ERs less frequently than FMs across all disciplines. Significant difference in ER usage across academic fields, with Science and Business fields showing higher usage than Arts. ANOVA test p-value = 0.047.	Libraries should tailor their support for different academic disciplines, focusing on promoting ERs in disciplines with lower usage, such as the Arts, and enhancing access and training for high-use fields like Science and Business & Management. Library should training and encourage interdisciplinary resource sharing.
SRQ2b. Is there a significant relationship between the utilization of ERs and the age demographic of faculty members and research students?	Chi-Square analysis showed no significant relationship between age and ER usage (Pearson Chi-Square = 24.724, p = 0.212).	Similar findings for RSs; no statistical relationship between age and ER usage (Pearson Chi-Square = 24.724, p = 0.212).	No significant relationship was found between age and ER usage for both FMs and RS (p = 0.212), indicating that age does not influence the usage of ERs.	Personalized interventions should focus on increasing digital literacy across all age groups. Focus on usability improvements rather than age-specific interventions.

SRQ3. How do ERs impact the research output, publication quality, and academic activities of the respondents in public universities?	The FMs utilize an average of 15 ERs, resulting in high research productivity, with 4 publications per year and a citation impact score of 12.5. Their active involvement in writing research articles, editorials, and research grants reflects their strong academic engagement.	In contrast, RSs use around 10 ERs, resulting in lower productivity with 0.5 publications and 1.1 conference presentations annually, and a citation impact score of 8.0. Despite limited academic engagement, ERs positively influence their research progress.	ERs positively impact research productivity, with FM benefiting more than RS due to experience and access.	Strengthening the access of ERs and training can bridge the productivity gap between FM and RS. Encouraging collaborative research among FM and RS, and offering targeted support, such as citation management tools and research grant assistance, can further enhance their productivity and impact.
SRQ4. What are the perceptions of faculty members and research students about the accessibility, effectiveness, utilization, and cost-effectiveness of ERs?	The FMs generally have a positive perception of ERs, valuing their access, quality, and usefulness, with less emphasis on cost-effectiveness. MANOVA results show that perceived access and usefulness significantly affect their overall perception.	The RSs, while also appreciating access and usefulness, face more challenges in these areas and place a higher emphasis on content quality. Cost-effectiveness is less of a priority for them, similar to FMs.	FMs seems significant ERs for research, teaching, and professional development. RS face more challenges with accessibility but still appreciate ERs for their usefulness. Cost-effectiveness is not a major factor for either group.	Libraries should ensure that ERs are accessible, of high quality, and user-friendly, particularly focusing on improving accessibility for RS. While cost-effectiveness remains secondary, libraries can consider offering free or low-cost resources.
SRQ5. What challenges do faculty members and research students face in accessing and effectively using ERs into their scholarly activities?	The FMs face key challenges such as limited access to full-text resources, lack of infrastructural facilities, and a lack of adequate training.	The FMs face key challenges such as limited access to full-text resources, slow internet connections, and a lack of adequate training.	Common challenges revolve around access, training, and infrastructure. The FMs and RSs seek tailored support.	Common challenges revolve around access, training, and infrastructure. FMs and RSs seek tailored support.

5.18 Chapter summary

The chapter discusses the significant findings from the data analysis and integrates them with insights from other studies. It also provides key answers to the research questions. It concludes by triangulating the findings to ensure a comprehensive knowledge of the outcomes by both groups i.e. FMs and RSs. This study highlights the essential function of ERs in enhancing academic output. The FMs and RSs acknowledge the importance of ERs, while their utilization patterns and issues vary considerably. The FMs frequently utilize e-books and e-journals based on their advanced digital literacy. However, they face challenges like limited access to full-text documents, insufficient infrastructure, and an absence of extensive training. The RSs, particularly in fields such as Agriculture and the Arts are less frequent users of ERs. The challenges in utilizing ERs indicate by RSs inadequate training, inconsistent internet access, and limited resource availability. The research uncovers variations in ER utilization that are affected by gender and academic fields. These problems underscore the necessity for a more inclusive academic environment. Enhancing digital infrastructure, offering specialized training, providing equal resource access, and promoting mentoring programs help address these disparities. Implementing effective solutions such as enhancing digital literacy, enabling smooth access to high-quality resources, and integrating advanced technologies can substantially improve researchers' capacity to connect with and utilize ERs successfully. Moreover, developing an enabling research environment via institutional policies, training initiatives, and accessible digital platforms can enhance the advantages of ERs. Consequently, researchers will be more capable of providing significant insights, interacting more effectively, and enhancing knowledge within the larger academic community, eventually strengthening the global research landscape.

Chapter Six: Recommendations and Conclusion

6.1 Introduction

The chapter represents the research findings for practical insights to inform various stakeholders, including, but not limited to, government policy makers, the University Grants Commission (UGC), university libraries, and academic institutions. It explores the research implications regarding gaps in understanding and utilization of ERs. Then, it describe the ways such resources can be developed for better access, use, and sustainability to facilitate scholarly productivity and academic growth at large. It further recognizes the limitations of the study and points to further research that might be done to refine and extend the understanding of ERs use in higher education and scholarly works. This chapter identifies the research gaps and provides some pragmatic ways in which a gap between theoretical knowledge and practical applications can be bridged for better integrating ERs into academic landscape.

6.2 Research implications

The implications of this research present a framework for transforming findings into practical strategies to address the challenges identified in this study. The implications impact various stakeholders, such as the government, academic institutions, and individual users, to improve the accessibility, utilization, and impact of ERs in the academic setting. Implementing these recommendations will enable stakeholders to foster a more equitable and effective academic environment that promotes scholarly growth and innovation.

6.2.1 Implications for Government in policy making

Government bodies may play an important role in shaping the information landscape. The study gives evidence to:

6.2.1.1 Development of ERs funding at a national policy level: This could support policy frameworks that provide adequate funding for ERs in academia.

6.2.1.2 Open Educational Resources: This may trigger the development and use of Open Educational Resources (OERs) to reduce dependence on highly priced subscriptions.

6.2.1.3 Encourage collaboration: This may encourage the government to include publishers, universities, and other shareholders in collaboration to enable practical distribution .



Figure 6.1 Government policy framework

6.2.2 Implications for University Grants Commission (UGC)

As a regulatory authority, the UGC can influence the research outcomes by:

6.2.2.1 Devise standardized guidelines: To establish benchmarks for ERs acquisition, use and assessment across universities.

6.2.2.2 Monitor Scholarly Output: To develop framework for evaluating the impact of ERs on research output and other academic activities.

6.2.2.3 Facilitate resource sharing: To offer opportunities through consortia or a centralized platform to reduce subscription costs and eliminate duplication across universities.

6.2.2.4 Promote professional development: To facilitate regular training and workshop programs for FMs and RSs on using ERs and increasing scholarly writing skills.



Figure 6.2 Strategic role of UGC in ERs management

6.2.3 Implications for university libraries

In fostering research and academic excellence, university libraries play a dynamic role. The results of this research can help libraries to:

6.2.3.1 Enhancing resource accessibility: Libraries can progress access to ERs by implementing more user-friendly platforms and enhancing subscriptions to align with user preferences.

6.2.3.2 Training and capacity building: The study directs that specific training programs on the effective use of ERs must be undertaken for FMs and RSs.

6.2.3.3 Strategic investments: Libraries can use the results to advance strategies for investments targeting the high demand for ERs, emerging technologies such as AI, and data analytics that meet users' scholarly needs.

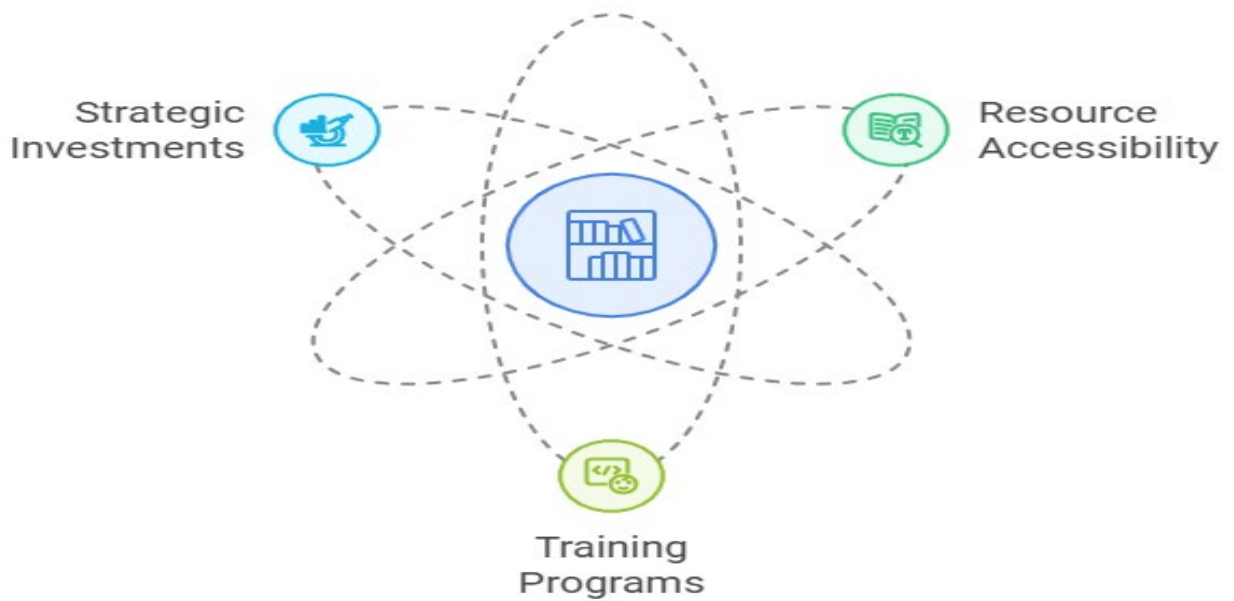


Figure 6.3: Enhancing university library services

6.3 Mitigating research gap

Bridging research gaps has become crucial for developing knowledge and resolving unexplored or insufficiently examined areas within a discipline. By eliminating and reducing these gaps, researchers may offer significant insights that strengthen knowledge limitations, bridge the divide between theory and practice, and help to promote more knowledgeable decision-making and practice. This approach ensures that academic work remains extensive, relevant, and impactful.

Table 6.1 : Mitigating research gap

Research Gap	Identified Issues	How the Study Addresses It
Contextual Gap	Limited research on user behaviour, engagement, satisfaction, and interdisciplinary usage in Bangladesh.	It explores perceptions, challenges, and interdisciplinary use of ERs by FMs and RSs.

Knowledge Gap	Lack of insight into the effect of ERs on the scholarly output and the ways of integration.	It analyzes the effect of ERs on academic achievement and proposes sustainable use strategies.
Population Gap	There is a lack of differentiation between FMs and RSs and little focus on various institutions.	Explores specific needs and challenges of FMs and RSs from public universities.
Geographical Gap	Insufficient number of localized studies on Bangladeshi universities, reliance on global/regional data.	It focuses on usage in Bangladeshi universities, considering some determining factors like the UDL consortium and local contexts.

6.4 Recommendations

In light of the findings on ERs and their application in academic endeavours and research outputs, the recommendations are as follows:

6.4.1 Increasing access to ERs: The university should enhance access to diverse types of ERs, such as online databases, e-books and e-journals, so FMs and RSs have informed academic content.

6.4.2 Training and promotion: Regular workshops and training should be provided to FMs and RSs on the effective use of ERs to advance their information-seeking abilities.

6.4.3 Institutional repositories: The development of Institutional Repositories (IR) in university libraries needs motivating FMs and RSs to upload their theses, dissertations, and published research to increase the visibility and access of research and academic productions.

6.4.4 Strengthening collaboration with providers: Universities should collaborate with digital libraries and other ERs providers to update their content with the latest or relevant information for their research studies.

6.4.5 User interface or accessibility: Improvement in navigational convenience and finding resources that most relate to their study or research is necessary.

6.4.6 Utilize E-conference proceedings: The university should subscribe to e-conference proceedings and facilitate more involvement in international research conferences to increase exposure to world-class academic research.

6.4.7 Assess the utilization of ERs: The FMs and RSs should periodically assess their use of ERs. This will identify gaps in access, training, or relevance of content.

6.4.8 Promote Open Educational Resources (OER) : The university should encourage OER to ease the economic burden and increase access to quality academic material for students, teachers and researchers alike.

6.4.9 Encourage collaborative research: Facilitate collaboration between FMs and RSs from other institutions to share access to ERs and databases, thus encouraging a wider academic network.

6.4.10 Renew resource licenses regularly: Regularize licenses of subscribed ERs to ensure the continuity of access to relevant academic materials.

6.4.11 Research objectives aligned with corresponding recommendations

The following table provides a comprehensive summary of the core research objectives addressed in this study, alongside relevant recommendations and thematic indications derived from the overall research findings. It highlights how each objective is linked to specific insights gained through data analysis, reflecting the perceptions, practices, and challenges associated with the use of electronic resources (ERs) among FMs and RSs in public universities of Bangladesh. This synthesis serves to bridge the study's aims with actionable strategies and thematic evidence to support informed decision-making and policy development.

Objectives	Recommendations	Indications
1. To assess the current scenario of the usage and access to ERs in public universities of Bangladesh for academic and research purposes;	The themes ‘Awareness Campaigns’ and ‘Optimized Authentication and Access Procedures’ reveal significant gaps in user knowledge and access systems. Many faculty	6.4.1, 6.4.5, 6.4.10

	members (FMs) and research students (RSs) were unaware of available ERs or found the login processes cumbersome. These findings indicate that while ERs are technically available, practical access remains limited for many users.	
2. To analyze the variation in the use of ERs across demographic information such as academic discipline and age;	Responses showed variations in ER usage based on discipline, with Engineering and Science FMs and RSs more likely to request personalized resource alerts and training in thesis writing using ERs, while Humanities users reported greater difficulty in navigating digital platforms. This aligns with the theme ‘Field-specific Resource Preferences’ (noted in the broader analysis), confirming demographic-based disparities.	6.4.2, 6.4.6, 6.4.7
3. To evaluate the impact of ERs on research productivity, quality of publications, and overall academic works;	Respondents highlighted that limited access and lack of training negatively affected the integration of ERs into their scholarly output. The themes ‘Tailored Training Programs’,	6.4.3, 6.4.9

	‘Institutional Repositories’, and ‘Collaborative Initiatives’ suggest that improving resource use can enhance research quality and visibility, thereby positively influencing academic productivity.	
4. To investigate the perceptions of the respondents on ER usage in terms of accessibility, effectiveness, utilization, and cost-effectiveness;	Themes such as ‘Improved Discovery and Access Platforms’, ‘Feedback and Continuous Improvement’, and ‘Budget Allocation and Cost Efficiency’ directly address these perceptions. Users stressed that ER systems should be more intuitive, cost-efficient, and regularly updated based on user feedback, indicating a demand for more effective and economical resource management.	6.4.4, 6.4.5, 6.4.7, 6.4.8
5. To recognize challenges faculty members and researchers face in using ERs for integrating ERs into public universities in Bangladesh;	Challenges such as lack of training, inconsistent access, and usability issues emerged across all themes. Notably, the ‘Boosting Awareness and Engagement’ theme illustrates that users receive little follow-up after initial orientation, while the ‘Collaborative Initiatives’	6.4.2, 6.4.4, 6.4.9, 6.4.10

	theme emphasizes time constraints and limited interaction between faculty and students regarding ERs.	
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6.5 Limitations of the study

This study has several limitations which are affecting the generalization of the results. First, this study focuses only on a sample of ten universities in Bangladesh, which raises limited possibilities of generalizing its results to all universities or other regions. The study was based on self-reported data through questionnaires, which might be vulnerable to response bias; participants may overestimate or underestimate the use or perceptions of the ERs. Also, the study has no longitudinal analysis; therefore, changes over time cannot be measured regarding using ERs or its implication for research and academic progress. The study took place with the following limitations:

6.5.1 Qualitative data exclusion: This is essentially a quantitative study; therefore, it may lack of qualitative information that could provide more insight into users' experiences, challenges, and expectations regarding ERs.

6.5.2 Technological and infrastructure variability: Variations in technological infrastructure, such as internet connectivity, device availability, or library facilities, were not considered, which might affect the pattern of ERs usage.

6.5.3 The limited analysis of scholarly outputs: While the study examines perceptions of the impact of ERs on scholarly output and academic progress, it does not measure concrete academic outcomes or academic performance.

6.5.4 Lack of cross-national comparison: This study is exclusively focus on Bangladesh only, which reduces its ability to compare findings with other countries and understand how the context of Bangladesh may align with or differ from global trends in the use of ERs.

6.5.5 Poor control of extraneous variables: Variables ranging from changes in academic workload and institutional policies to changes in the personal circumstances of the

participating groups were controlled insufficiently, therefore, provide a biased estimate of certain effects.

Finally, regarding the broader use of ERs, some background factors related to institutional support, funding, and training may likewise be crucial in effectively utilizing this increasingly important resources.

6.6 Directions for the future research

Therefore, future studies should eliminate the limitations found in this study and supplement self-reported data with objective sources like usage logs and publication records for improved overall accuracy. This could include expanding into the private university and international spheres, which would generate highly valued comparative insights. Poor representation of arts and humanities disciplines may reflect important ER needs and usage variations.

Longitudinal studies are important in capturing the evolution of ER use in response to technological and policy changes. A greater focus on undergraduate and graduate populations would shed light on their challenges and needs.

Research into the effect of institutional infrastructure on ER access and use and the investigation of issues of gender disparities and inclusivity would inform strategies to achieve equitable resource distribution. Finally, the review of the effectiveness of training programs on digital literacy and competency in using ERs would lead to the identification of best practices to support diverse academic communities effectively.

6.7 Conclusion

The study explores the use of ERs for scholarly output and academic progress among FMs and RSs at public universities in Bangladesh. Both FMs and RSs are found to be actively using the ERs. E-journals and e-books are the most accessed ERs by both categories of respondents. The FMs mainly use these resources for writing research articles, project and teaching and class lectures. In contrast, the RSs use these resources for thesis or dissertation, academic purpose and writing of research articles. The study also establish differences in the usage of ER across academic disciplines and FMs of Science and Engineering are the most engaged with

ERs. In contrast, the Arts disciplines are the least engaged. This difference is statistically significant and hence reflects each field's varying demands in terms of ER use. Overall, FMs are more productive than RSs in terms of output produced, they contribute more to journal articles, conference presentations, and writing books or chapters. However, both groups face near to similar challenges in utilizing ERs to the fullest due to limited access to full-text documents, lack of sufficient training, and technical issues. These findings revealed infrastructure development, continuous training, and the need for service customization for different academic disciplines. Improving these issues with better accessibility and usability of ERs will result in long-term research productivity and academic output. This study provides valuable insight and has brought into light several issues requiring further exploration, especially the different challenges and needs of various disciplines, to see that ERs effectively support academic and research activities. The study highlighted that ERs significantly impact the academic environment in public universities in Bangladesh. It also reflected impressive engagement by FMs, indicative of better research output and higher academic productivity. This is far less evident with the same level of use from RSs, indicative that the current state of access and supporting mechanisms need to be radically improved. The findings also highlight inequalities in the use of ERs across academic disciplines and demographic groups. This indicates the need to address such inequities to create a more inclusive academic environment. Academic institutions should focus on a few key initiatives to fully realize the potential of ERs; enhancing technological infrastructure, providing extensive training programs, and developing user-friendly support services. Concentrating on these initiatives will enhance the research abilities of FMs and RSs, strengthen the academic culture, and increase academic productivity and advancement. Finally, overcoming the identified challenges and inequalities in ER use will significantly enhance research productivity and academic activities.

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Appendix A Consent Letter

Targeted Group: Faculty members and Research students.

Framework

The main goal of this study is to explore the perceptions of e-resource usage for scholarly output and academic progress of faculty members and researchers in public universities in Bangladesh. This study is being supervised by Dr. Md. Saiful Islam, Professor of the Department of Information Science and Library Management, University of Dhaka. You are requested to take part in this investigation to provide your insight into using e-resources (ERs) in your libraries.

Overview and instructions

The questionnaire contains four (4) sections. Section A includes 11 questions from 1 to 11 related to access, utilization, research and scholarly activities and research productivity of the respondents about ERs. Section B includes 4 questions from 12 to 15 pointing toward perceptions regarding using ERs. Section C asks 3 questions 16 to 18, focusing on the constraints, recommendations and opinions to overcome the barriers to using ERs in libraries. Section D contains 7 general questions about the background information of the respondents and the university.

Confidentiality

The data and information given by respondents will be used solely for this research purpose. In addition, the results of the research will be combined together to secure the confidentiality of respondents and the organization.

Contributions

It is predicted from the study that the FMs, RSs and LIS professionals as a whole will get benefits through knowing the present scenario and impact of using ERs in university libraries of Bangladesh.

Returned the filled-up questionnaire

Please fill up the questionnaire and return it to me by 25th October, 2023.

Thank you very much for your cooperation.

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Appendix B

Questionnaire- I (Faculty Member)

Use of ERs for Improving Scholarly Output and Academic Progress: Perceptions of Faculty Members and Researchers in Bangladesh

[ERs or ERs are digital materials that can be accessed electronically. These include e-journals, e-books, online databases etc. available in various formats.]

Section A: Access and Utilization of ERs

1. Have you received any training on using the Internet?

- a) Yes b) No

If yes, please specify the type of your training-

- a) Formal b) Informal

2. Do you have experience and knowledge on utilizing ERs efficiently?

- a) Yes b) No

[If yes, please proceed to the next questions, otherwise fill up only Q. No. 9]

3. Would you please mention your Proficiency Level of using ERs?

- a) Beginner b) Intermediate c) Advanced

4. Which ERs do you use for scholarly works?

(Select as much as you think)

- ☐ Online journals
- ☐ Scholarly databases
- ☐ E-books
- ☐ Educational databases
- ☐ Institutional Repository
- ☐ Conference proceedings
- ☐ Other websites

5. How many hours do you use ERs per week?

.....

6. Where do you get information about ERs?

(Select as much as you think)

- ☐ Library website
- ☐ Search engine
- ☐ Colleagues and friends
- ☐ Social Media
- ☐ Publishers Database (Emerald, Sage, Elsevier etc.)
- ☐ Journal Database (JSTOR)
- ☐ All of the above

7. Would you please indicate the purpose of using ERs?

Purpose	Yes	No
Professional work		
Writing research articles		
Teaching and academic activities		
Research/ project work		
Supervising/guiding research fellows		
Update of knowledge on the concerned field		
Curriculum Development		
Searching required inf		
Research networking and collaboration		
All of the above		

8. How satisfied are you with the ERs that the library provides for your research?

- ☐ Very Satisfied
- ☐ Satisfied
- ☐ Neutral
- ☐ Dissatisfied
- ☐ Very Dissatisfied

9. If you are not currently using ERs, please indicate the reasons below for not using these services.

(Select as much as you think) Non users only

- ☐ Lack of knowledge regarding the use of ERs
- ☐ Insufficient ERs in my discipline
- ☐ Do not have any internet facility
- ☐ Do not appear useful
- ☐ Lack of enough technological infrastructure
- ☐ Do not know the university subscribes to ERs
- ☐ All of the above

10. Would you please indicate the research and scholarly activities by using ERs?

(These questions are open-ended, allowing respondents to provide specific details about their scholarly achievements.)

- Please specify the number of your current research article (Yearly).....
- How many editorial books/chapters have you authored at present? (Yearly)
- Please indicate the number of theses/dissertations you have submitted (Yearly)
- How many research grants/projects have you successfully obtained? (Yearly)
- How many paper presentations have you conducted in the course of your career? (Yearly)
- Please state the number of fellowships you have been awarded (Yearly)

11. In what ways have ERs contributed to your research productivity?

(This question is open-ended, encouraging respondents to share specific details about their scholarly achievements.)

- Please indicate the average number of ERs you access monthly.....
- Could you please provide the number of research publications you completed over the past year?
- What is your average citation (GS) impact score?.....
- How would you rate the improvement in your productivity, on a scale from 1 to 10, due to ERs on the following scale?

1	2	3	4	5	6	7	8	9	10
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Section B: Perceptions in Accessibility, Content Quality, Usefulness and Cost effectiveness of ERs.

12. Would you please mention your Perception in the Accessibility of ERs?

(Please rate your agreement with the statements on a 7-point scale ranking the values 1=strongly disagree; 2=disagree; 3=somewhat disagree; 4=neutral; 5=somewhat agree; 6=agree; 7=strongly agree)

Perception in Accessibility	1	2	3	4	5	6	7
ERs are easy to find and access							
Available anytime and anywhere							
Accessible on all devices							

13. Would you please mention your perception of the content quality of ERs?

(1=strongly disagree to 7=strongly agree)

Perception in Content Quality	1	2	3	4	5	6	7
Content is accurate and reliable							
Covers a wide range of topics							
High-quality multimedia resources							

14. Would you please mention your perception in the usefulness of ERs?

(1=strongly disagree to 7=strongly agree)

Perception in Usefulness	1	2	3	4	5	6	7
Keeps me updated with research							
Helps in academic performance							
Assists in organizing and citation management							

15. Please mention your perception of the cost-effectiveness of using ERs.

(1=strongly disagree to 7=strongly agree)

Perception in Cost effectiveness	1	2	3	4	5	6	7
Save money compared to print materials							
Confident in using without support							
Offer more value from traditional resources							

Section C: Constraints and Recommendations regarding Usage of ERs.

16. What are the perceived constraints of using ERs in scholarly activities and academic works?

(1=strongly disagree to 7=strongly agree)

Statements	1	2	3	4	5	6	7
Inadequate infrastructural facilities							
Difficulty in accessing relevant resources							
Lack of training on effective use of ERs							
Limited access to full-text documents							
Lack of skilled personnel in the library							
Limited subject coverage							

17. Please recommend how libraries can overcome the constraints of using ERs.

(1=strongly disagree to 7=strongly agree)

Statements	1	2	3	4	5	6	7
Assume an educational campaign for users							
Notification to user for new ER services							
High infrastructural facilities							
Skilled the staff for helping users							
Subscribe as far as user preference							
Continuous training and workshops for both							

18. How do ERs can help in promoting scholarly research and academic activities? Please specify-

.....

Section D: Personal and Demographic Information

University Name :

Academic discipline : a) Arts b) Science c) Social Science d) Engineering f) Agriculture g) Business & Management h) If others, please specify.....

Designation : a) Lecturer b) Assistant Professor c) Associate Professor d) Professor

Gender : a) Male b) Female

Age group : a) 25-30 b) 31-40 c) 41-50 d) 51-60 f) >60

Job experience : a) < 5 years b) 5-10 years c) 11-15 years d) 16-20 years e) > 20 years
:

Email :

Signature & date

Thank you very much for your cordial participation and kind efforts.

**Sabrina Aktar, PhD Researcher
Department of Information Science and Library Management**

Appendix C
Questionnaire-II (Research Student)

Use of ERs for Improving Scholarly Output and Academic Progress: Perceptions of Faculty Members and Researchers in Bangladesh

[ERs or ERs are digital materials that can be accessed electronically. These include e-journals, e-books, online databases etc. available in various formats.]

Section A: Access and Utilization of ERs

1. Have you received any training on using the Internet?

- a) Yes b) No

If yes, please specify the type of your training-

- a) Formal b) Informal

2. Do you have experience and knowledge on utilizing ERs efficiently?

- a) Yes b) No

[If yes, please proceed to the next questions, otherwise fill up only Q. No. 11]

3. Would you please mention your Proficiency Level of using ERs?

- a) Beginner b) Intermediate c) Advanced

4. Which ERs do you use for scholarly works?

(Select as much as you think)

- ☐ Online journals
- ☐ Scholarly databases
- ☐ E-books
- ☐ Educational databases
- ☐ Institutional Repository
- ☐ Conference proceedings
- ☐ Other websites

5. How many hours do you use ERs per week?

.....

6. Where do you get information about ERs?

(Select as much as you think)

- ☐ Library website
- ☐ Search engine
- ☐ Colleagues and friends
- ☐ Social Media
- ☐ Publishers Database (Emerald, Sage, Elsevier etc.)
- ☐ Journal Database (JSTOR)
- ☐ All of the above

7. Would you please indicate the purpose of using ERs?

(Please rate your agreement with the statements on a 7-point scale ranking the values 1=strongly disagree; 2=disagree; 3=somewhat disagree; 4=neutral; 5=somewhat agree; 6=agree; 7=strongly agree)

Purpose	Yes	No
Searching for required/updated information		
Research networking and collaboration		
Writing research articles		
Thesis/dissertation		
Academic work		
Coursework assignment		
Following research supervisor		
All of the above		

8. How satisfied are you with the ERs that the library provides for your research?

- ☐ Very Satisfied
☐ Satisfied
☐ Neutral
☐ Dissatisfied
☐ Very Dissatisfied

9. Would you please indicate the research and scholarly activity by using ERs?

(These questions are open-ended, allowing respondents to provide specific details about their scholarly achievements.)

- Please specify the number of your current research article (Yearly).....
- How many editorial books/chapters have you authored at present? (Yearly)
- Please indicate the number of theses/dissertations you have submitted (Yearly)
- How many research grants/projects have you successfully obtained? (Yearly)
- How many paper presentations have you conducted in the course of your career? (Yearly)
- Please state the number of fellowships you have been awarded (Yearly)

10. In what ways have ERs contributed to your research productivity?

(This question is open-ended, encouraging respondents to share specific details about their scholarly achievements.)

- Please indicate the average number of ERs you access monthly.....
- Could you please provide the number of research publications you completed over the past year?
- What is your average citation (GS) impact score?.....
- How would you rate the improvement in your productivity, on a scale from 1 to 10, due to ERs on the following scale?

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

11. If you are not currently using ERs, please indicate the reasons below for not using these services.

(Select as much as you think) Non users only

Reasons for Not Using ERs

- ☐ Lack of knowledge regarding the use of ERs
- ☐ Insufficient ERs in my discipline
- ☐ Do not have any internet facility
- ☐ Do not appear useful
- ☐ Lack of enough technological infrastructure
- ☐ Do not know the university subscribes to ERs
- ☐ All of the above

Section B: Perceptions in Accessibility, Content Quality, Usefulness and Cost effectiveness of ERs.

12. Would you please mention your Perception in the Accessibility of ERs?

(Please rate your agreement with the statements on a 7-point scale ranking the values 1=strongly disagree; 2=disagree; 3=somewhat disagree; 4=neutral; 5=somewhat agree; 6=agree; 7=strongly agree)

Perception in Accessibility	1	2	3	4	5	6	7
ERs are easy to find and access							
Available anytime and anywhere							
Accessible on all devices							

13. Would you please mention your perception of the content quality of ERs?

(1=strongly disagree to 7=strongly agree)

Perception in Content Quality	1	2	3	4	5	6	7
Content is accurate and reliable							
Covers a wide range of topics							
High-quality multimedia resources							

14. Would you please mention your perception in the usefulness of ERs?

(1=strongly disagree to 7=strongly agree)

Perception in Usefulness	1	2	3	4	5	6	7
Keeps me updated with research							
Helps in academic performance							
Assists in organizing and citation management							

15. Please mention your perception of the cost-effectiveness of using ERs.

(1=strongly disagree to 7=strongly agree)

Perception in Cost effectiveness	1	2	3	4	5	6	7
Save money compared to print materials							
Confident in using without support							
Offer more value from traditional resources							

Section C: Problems and Recommendations regarding Usage of ERs.

16. What are the perceived constraints of using ERs in scholarly activities and academic works?

(1=strongly disagree to 7=strongly agree)

Statements	1	2	3	4	5	6	7
Slow internet speed							
Inadequacy of subject coverage							
Lack of training on how to use ERs							
Limited access to full-text documents							
Inadequate support from library staff							
Technical issues with accessing ERs							

17. Please recommend how libraries can overcome the constraints of using ERs.

(1=strongly disagree to 7=strongly agree)

Statements	1	2	3	4	5	6	7
Raise awareness about the impact of ERs							
Skilled professionals for helping users							
Ensure uninterrupted power supply							
Display new services							
Continuous training and workshops							
Know the user requirements and feedback							

18. How do ERs can help in promoting scholarly research and academic activities? Please specify-

.....

Section D: Personal and Demographic Information

University Name :

Academic discipline : a) Arts b) Science c) Social Science d) Engineering f) Agriculture g) Business & Management h) If others, please specify.....

Gender : a) Male b) Female

Age group : a) 25-30 b) 31-40 c) 41-50 d) 51-60 f) >60

Higher degree : a) Postdoctoral b) PhD c) MPhil d) Master's e) Second Master's

Degree Taken : a) Home b) Abroad c) Home & Abroad

Email :

Signature & date

Thank you very much for your cordial participation and kind efforts.

Sabrina Aktar, PhD Researcher
Department of Information Science and Library Management

Sabrina Aktar

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