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Research Article

Relative Effects of Mobile Technology Use, Attitudes, and Information Provision on Postgraduate Students' Research Activities in Universities in North-Central Nigeria

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Abstract

This study examined the relative effects of mobile technology use, postgraduate students' attitudes towards research activities, and information provision on postgraduate students' research activities in universities in North-Central Nigeria. The increasing demand for quality postgraduate research output in Nigerian universities has intensified interest in identifying factors that enhance or constrain research engagement. The objective of this study is to establish the significant relative effect of mobile technology devices, postgraduate students' attitudes, and information Provision on research activities of postgraduate students in universities in North-Central, Nigeria. A quantitative correlational research design was adopted, and multiple regression analysis was used to determine the relative contribution of the independent variables to postgraduate research activities. The results from the findings revealed that information provision had the most substantial positive and significant effect on postgraduate students' research activities ($\beta = 0.742$, $t = 14.961$, $p < 0.001$), followed by postgraduate students' attitudes towards research ($\beta = 0.260$, $t = 5.977$, $p < 0.001$). In contrast, the extent of mobile technology use had a negative and non-significant effect ($\beta = -0.037$, $t = -0.751$, $p = 0.453$). The model indicates that while all variables collectively contribute to explaining variations in research activities, information provision is the strongest predictor. The study concludes that access to relevant, timely, and adequate research information remains the most critical determinant of postgraduate research productivity in North-Central Nigerian universities. It is recommended that university management strengthen library and digital information systems, while also fostering positive research attitudes among postgraduate students through mentorship and structured research support programmes.

Keywords

Information Provision, Mobile Technology Use, Multiple Regression, North-Central Nigeria, Postgraduate Students Research Activities, Students' Attitude, University Education

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1. Introduction

Postgraduate education plays a critical role in advancing knowledge creation, innovation, and national development, particularly through research output in universities. In Nigeria, postgraduate programmes are designed to produce scholars capable of contributing meaningfully to academic discourse and addressing societal challenges through rigorous research. However, despite the increasing enrolment in postgraduate programmes across universities in North-Central Nigeria, concerns persist regarding the quality, timeliness, and productivity of students' research activities. These challenges have been linked to several influencing factors, including access to information resources, attitudes towards research, and the integration of mobile technology into academic activities (Adedoyin & Soykan, [1])

Research activities at the postgraduate level require sustained engagement with scholarly literature, data analysis, academic writing, and effective communication with supervisors. In contemporary academic environments, these activities are increasingly supported by digital technologies, particularly mobile devices such as smartphones, tablets, and laptops. Mobile technology has transformed access to academic resources by enabling students to retrieve journal articles, engage in academic communication, and manage research tasks remotely (Yusuf et al., [27]). However, studies have shown that the academic benefits of mobile technology depend largely on the purpose of use, digital literacy, and institutional support systems (Agbo & Ubwa, [2]). When mobile devices are primarily used for social interaction rather than academic engagement, their impact on research productivity becomes limited.

Attitude is another crucial determinant of postgraduate research engagement. Attitude towards research reflects students' interest, motivation, perceived competence, and willingness to engage in scholarly inquiry. Students with positive attitudes toward research are more likely to participate actively in literature review, data collection, and academic writing processes (Ajzen, [3]). Conversely, negative attitudes, often influenced by research anxiety, inadequate supervision, and lack of confidence, can significantly hinder research productivity. Empirical studies have confirmed that students' attitudes toward research methodology and academic writing strongly predict their research output and completion rates. (Agbo & Ubwa, [2]).

Information provision remains a foundational pillar of academic research, particularly in higher education institutions. It refers to the availability, accessibility, and usability of scholarly information resources through libraries, digital repositories, and academic databases. Adequate information provision enhances students' ability to access current and relevant literature, thereby improving the quality of their research output (IFLA, [15]). However, universities in developing countries, including Nigeria, often face challenges such as inadequate funding, limited subscriptions to academic databases, and weak digital infrastructure.

These limitations hinder postgraduate students' ability to access up-to-date research materials necessary for high-quality academic work. In North-Central Nigeria, universities operate within a challenging academic environment characterised by increasing postgraduate enrolment, limited research funding, and infrastructural constraints. These conditions make it imperative to examine the relative influence of mobile technology use, students' attitudes, and information provision on postgraduate research activities. Understanding these relationships is essential for policy formulation and institutional improvement aimed at enhancing research productivity (Okiki & Asiru, [21]).

Empirical literature indicates that digital technologies and information systems play a significant role in academic productivity. For instance, studies have shown that institutional digital resources and access to online databases significantly improve students' research engagement and academic performance (Al-Rahmi et al. al [7]). Similarly, socio-technical perspectives emphasise the interaction between human behaviour, technology, and information systems in shaping academic outcomes (Baker et al., [11]). This suggests that research productivity is not solely dependent on technological availability but also on users' attitudes and institutional support structures.

Despite the widespread adoption of mobile technology among students, its impact on research productivity remains mixed in developing contexts. While mobile devices enhance flexibility and access to information, their effectiveness is influenced by academic orientation and the quality of available digital content (Chen et al., [12]). Likewise, positive attitudes toward research may not automatically translate into productivity without adequate access to information resources and institutional support systems.

Therefore, this study investigates the relative effects of mobile technology use, postgraduate students' attitudes, and information provision on research activities among postgraduate students in universities in North-Central Nigeria. This is necessary to determine which of these variables most strongly influences research activities and to provide evidence-based recommendations for improving postgraduate research outcomes.

2. Statement of the Research Problem

Postgraduate research activities in Nigerian universities, particularly in North-Central Nigeria, have continued to face significant challenges despite increasing enrolment in postgraduate programmes. Many postgraduate students experience delays in completing research projects, produce low-

quality dissertations, or struggle to meet academic expectations. These issues raise concerns about the effectiveness of existing academic support systems and the factors influencing students' research activities.

Although mobile technology has become widely available among students, its impact on research productivity remains unclear. In many cases, mobile devices are used more for social communication than for academic research purposes, limiting their potential contribution to scholarly work. This raises the question of whether mobile technology use significantly enhances postgraduate research activities or whether its influence is negligible when compared to other factors.

Similarly, postgraduate students' attitudes towards research have been identified as a potential determinant of research activities. However, there is evidence that many students exhibit anxiety, lack of motivation, and low confidence in conducting research, which may negatively affect their productivity. Despite this, it is not fully established how strong the effect of attitude is when compared with other variables such as information provision and mobile technology use.

Furthermore, information provision remains a critical challenge in many Nigerian universities due to inadequate library resources, limited access to current journals, and insufficient digital infrastructure. Without adequate access to relevant information, postgraduate students may struggle to develop strong research outputs. However, the relative importance of information provision compared to attitude and mobile technology use has not been sufficiently examined in empirical studies within the North-Central region.

Existing studies, such as Awujoola and Abioye [10], have demonstrated that institutional and digital factors contribute to organisational and academic outcomes, yet few studies have simultaneously examined the combined and relative effects of mobile technology use, attitude, and information provision on postgraduate research activities. This creates a gap in knowledge regarding which of these factors most strongly influences postgraduate research productivity.

Therefore, the problem this study addresses is the lack of empirical clarity on the relative effects of mobile technology use, postgraduate students' attitudes, and information provision on research activities among postgraduate students in universities in North-Central Nigeria. Understanding these relationships is essential for developing targeted interventions that can enhance postgraduate research performance and improve overall academic outcomes.

Objectives of the Study

The objective of this study is to

Establish the significant relative effect of mobile technology devices, postgraduate students' attitudes, and information Provision on research activities of postgraduate students in universities in North-Central, Nigeria.

3. Literature Review

3.1. Theoretical Framework

This study is anchored in the Technology Acceptance Model (TAM) and the Information Seeking Behaviour Theory, which together explain how postgraduate students' research activities are influenced by mobile technology use and information provision.

The Technology Acceptance Model (TAM) developed by Davis [13] explains the role of mobile technology devices in postgraduate research activities. In the context of this study, TAM suggests that postgraduate students will adopt and consistently use mobile devices such as smartphones, laptops, and tablets for research only when they perceive them as useful and easy to use. Perceived usefulness refers to the extent to which students believe that mobile technologies improve their research performance, while perceived ease of use refers to how effortless the technologies are to operate (Davis, [13]). Therefore, when postgraduate students in North-Central Nigeria perceive mobile devices as effective tools for accessing academic journals, conducting literature searches, communicating with supervisors, and organising research materials, they are more likely to use them extensively in their research activities. This theoretical explanation aligns with the strong positive relationship found between mobile technology use and research activities in this study.

The Information Seeking Behaviour Theory explains how postgraduate students interact with available information resources during their research process. Wilson [25], explains that information seeking is a purposeful activity influenced by personal needs and the availability of information systems, while Kuhlthau's Information Search Process model further emphasises that access to relevant information reduces uncertainty and improves research performance (Kuhlthau, 18] In this study, information provision refers to the availability and accessibility of academic resources such as library services, electronic databases, journals, and institutional repositories. According to Wilson [25], when information systems are well-structured and accessible, users are more likely to engage effectively in information-seeking activities. This explains why postgraduate students with better access to information resources are more active in research activities. The theory, therefore, supports the strong positive relationship found between information provision and research activities in this study.

In summary, the Technology Acceptance Model (Davis [13]) explains the technological dimension of mobile device usage, while the Information Seeking Behaviour Theory (Wilson [25], Kuhlthau [18]) explains the information access dimension of research activities. Together, they provide a comprehensive understanding of how mobile technology use and information provision jointly enhance research activities among postgraduate students in universities in North-Central Nigeria.

3.2. Postgraduate Students' Attitude

Yusufu et al [27] carried out a study review of attitudes toward mobile technology devices and their influence on information service provision for postgraduate research activities in Nigerian universities. Guided by 11 objectives, 7 research questions, and 4 hypotheses, the study employed a descriptive survey design and a multistage sampling technique to select 1,024 postgraduate students from 10 universities in North Central Nigeria. Data collection involved structured questionnaires and observation checklists, yielding 796 valid responses. Findings revealed a high usage of mobile technology among postgraduate students, with a weighted mean score of 2.84. Postgraduate students demonstrated positive attitudes toward mobile technology, enhancing the availability of information services, as reflected by a weighted mean of 2.87. Hypothesis testing showed significant relationships between mobile technology devices and research activities ($R = 86.9\%$, $p < 0.05$) and between information service provision and research activities ($R = 94.0\%$). Key challenges included funding, device limitations, privacy concerns, bandwidth issues, and lack of training. Recommendations included providing mobile-friendly research tools, increasing funding for mobile technology resources, and fostering student collaboration. Addressing these challenges would optimise mobile technology use in postgraduate research. This study is similar to the present study concerning key variables such as postgraduate students' Attitudes, mobile technology devices, as well as research instruments used, and the method of data analysis.

Akpena [4] carried out a study on the Influence of Postgraduate Students' Attitudes on the Marketing of Information Resources and Services in University Libraries in the North Central Zone, Nigeria. A structured questionnaire was employed to collect data from the respondents. The study targeted postgraduate students from thirteen (13) university libraries in the North-Central Zone of Nigeria. Data were analysed descriptively using the mean and standard deviation. Findings from the study revealed that postgraduate students' perceptions of marketing significantly influenced their attitudes toward marketing information resources and services. Also, a major factor inhibiting effective marketing was identified as poor marketing skills among postgraduate students. The study recommended that University libraries should prioritise the training and retraining of postgraduate students in marketing management. It further recommended that postgraduate students should adopt a user-oriented service philosophy to enhance the marketing of information resources and services. This study is similar to the present study in terms of variables such as postgraduate students' Attitudes as well as the location of the study in the North-Central Zone. Other areas of similarity are the research instruments as well as the data analysis methods. However, it differs from the present study in terms of research design.

A study was conducted by Okezie and Idris [19] on the attitude of faculty members towards participation in open-access institutional repositories in public universities in the North-East, Nigeria. The study adopted the descriptive survey design with a population of 3,612 faculty members drawn from six (6) public universities in the North-East geopolitical zone of Nigeria. The sample of 316 respondents representing 10% of the entire population was utilised. A multi-stage purposive simple random sampling technique was adopted. Data for the study were collected using a 30-item structured questionnaire on a four-point scale. The descriptive and inferential statistics of mean scores and standard deviation were utilised for data analysis, and t-test statistics were used to test the null hypotheses at a 0,05 level of significance. The findings of the study showed that the faculty members perceive OAIRs to be useful in several ways. Similarly, the perception of faculty members in the state universities on the usefulness of OAIRs is higher than that of their counterparts in the Federal universities. The findings of the study also indicated different attitudes of faculty members towards participation in AOIRs in public universities. The test of the hypothesis revealed that attitude and participation vary among faculty members in federal universities in North-East, Nigeria, having a more positive attitude towards participation in OAIRs than their colleagues in state-owned universities. It is against this backdrop that the study recommended that the authority and management of public universities in Nigeria should intensify efforts like organising seminars, workshops and symposiums on the issues of OAIRs to encourage faculty members to develop a more positive attitude towards participation in OAIRs. This study is related to the present study conducted on the variables of the Attitude of postgraduate students. Although the studies have differed in the number of respondents, the former study was conducted on faculty members, but the latter study focused only on postgraduate students in universities in North-Central, Nigeria.

Akporhonor [6] investigated the attitude and perception of postgraduate students towards the marketing of library services in Colleges of Education libraries in South-South, Nigeria. The descriptive survey research design was employed in the study. The population of the study was 106 postgraduate students in the libraries of the 12 colleges of education in South-South, Nigeria. The entire population was used for the study, as the population is not large. The research instrument used for data collection was the questionnaire. Data were analysed using frequency count, percentages, and statistical mean. Hypotheses were tested using the Pearson product-moment correlation coefficient (PPMC) and multiple regression at a 0.05 level of significance. The study found that the postgraduate students have negative attitudes and positive perceptions towards the marketing of library services. The major services marketed in colleges of education libraries include user education consultancy services and lending services. The extent of marketing of library services in colleges of education libraries in South-South Nigeria is low.

The study further revealed that there was a significant relationship between the attitude of postgraduate students and the marketing of libraries, and there was a significant relationship between the perception of postgraduate students in South-South, Nigeria. The study therefore recommended that Postgraduate students in Colleges of Education should improve their attitude to optimise the marketing of library services, and postgraduate students should be trained by service marketing professionals on basic marketing strategies and effective ways of using marketing tools to maintain a good relationship with users and increase patronage. This study is related to the current study being conducted on the variables of the attitude of postgraduate students. Although the two studies differed in respondents and locations, the former was conducted on postgraduate students in colleges of education in the south-west geopolitical zone, while the latter was conducted on postgraduate students in universities in North-Central, Nigeria.

Idiedo [14] carried out a study on the attitude of postgraduate students towards social media use for information dissemination in South-South Universities in Nigeria. The study adopted the correlational research design. The population of the study comprised all 176 postgraduate students working in all 12 federal and state university libraries in South-South, Nigeria. The entire population was used for the study because of its relatively small size. The Pearson Product-Moment Correlation Coefficient (PPMCC) was utilised to answer all the research questions, and the t-test of significance was used to test the hypotheses at the 0.05 alpha level. The result indicated that postgraduate students possess a positive attitude towards social media use for information dissemination in university libraries in South-South, Nigeria. It also showed that there was a significant relationship between postgraduate students' knowledge of social media use and their attitude toward social media use. This research shared some similarities with the current study in terms of variables on the attitude of postgraduate students. The study also shared the same method of data analysis using both statistical and inferential statistics. This research also shares similarities in terms of research design. Although the two studies differ in terms of location and audience, the former was conducted on postgraduate students in South-South, Nigeria, while the latter was conducted on postgraduate students in universities in North-central, Nigeria.

3.3. Mobile Technology Devices

Alexander et al. [8] carried out a study on the application of mobile technology in library services in India. The population of the study comprises 200 Postgraduate students, and the study adopted a survey design. The instrument for data collection was the questionnaire. The findings from the study revealed that mobile technology is presenting fast platforms to render education-related services to learners in a new fashion that they can hardly resist. Alexander et al. [8] stated further that mobile technologies will find a way to penetrate the hearts of those who may be averse to visiting libraries and eventually compel them to access and use library features. Akpoo [5] further revealed that there was a 61% mobile phone penetration rate globally, with 4 billion users. The report adds that while many voice calls were made, users of mobile phones exchanged about 2.3 million text messages among themselves. Nigeria is one of the countries with a speedy increase in mobile phone penetration figures. Examples of library services that can be offered to the user through mobile technologies include notification services with the use of SMS, distance learning, otherwise called e-learning, data browsing, the use of mobile interfaces for e-resources, and the supply of mobile documents, among others.

This study is related to the present study because it has to do with mobile technology applications in libraries. It is also important to state here that Postgraduate students were the respondents in the study. The difference is that the present study's population is focused on postgraduate students.

Oviedo-Trespalacios *et al* [20, 22] carried out a comparative study to investigate the usage of mobile technology among undergraduate students for their academic research in Australia and New Zealand. The study population consisted of 47 university libraries in Australia and New Zealand. The instrument for data collection was the questionnaire. The findings from the study revealed that there was general interest in web tools, but the general level of implementation was low. Rich Site Summary was the most used, and IM was the least used service. Again, the study is related to this present study in terms of the fact that it is based on the use of mobile technology, while this study is a comparative study, the present study is survey-based. Another difference is that while the study is on undergraduate students, the present study focuses on Postgraduate students.

Ozonuwe *et al.* [23] carried out a study on the use of social media and mobile apps for academic activities and resource sharing among postgraduate students of Covenant University, Ota, Nigeria. The descriptive Research design method was used. A structured questionnaire was used for data collection. The population of the study consisted of 365 postgraduate students, who were the respondents for the study. The data obtained were analysed using the Statistical Package for the Social Sciences (SPSS). The data obtained were presented using frequency distribution and percentages. The result of the study revealed that the majority of the students were using platforms like Email, YouTube, Facebook, Bluetooth, Xender, Instagram, LinkedIn, and Twitter to their advantage. Other platforms like Mendeley, G-Suite, webinar, Google apps, academia.edu, and researchgate.net should be explored to facilitate collaboration with other scholars and researchers in their fields of interest. The study also recommends that the use of social media and mobile apps should be adopted in teaching and learning. Postgraduate students and information scientists should appropriately form social media platforms and mobile apps to provide services to users; lecturers should make video clips of their lectures, conferences, and workshops available on YouTube and other social media platforms.

The study also recommended that Students should be encouraged to engage in academic group discussion and collaboration on social media with their colleagues, lecturers, and parents. Academic experts should change their notion about the use of social media and mobile apps and begin to encourage mobile learning with the use of social media platforms and mobile apps.

The study carried out by Ozonuwe *et al*. [23] is similar to the present study in the area of its respondents, who are postgraduate students; both studies adopted the use of a questionnaire for data collection, and there are similarities in terms of variables such as academic research, which is related to the present research activities. The research tools, such as using social media components on a mobile technology device for information sharing, were also in line with the present research objectives.

3.4. Postgraduate Students' Research Activities

Kelechi and Joy [17] carried out a study on lecturers' research attitudes on students' research Motivation: implications for research-based learning. The study population was 96 students pooled from public tertiary institutions in Enugu State, Nigeria, using a self-report measure method in collecting data. The primary purpose of the study was to explore the research attitude of lecturers in academia as a factor that could account for variance in students' research motivation. The study revealed that it operationalised research motivation as the willingness and drive to engage in research activities. The findings of the study using linear regression revealed that there is a statistically significant relationship between research attitude and research motivation. The study further revealed that the research attitude of the lecturers accounted for a 27.2% variation in students' research motivation. The study concluded that the lecturer's research attitude was essential in improving students' research motivation. This study is similar to the present study in terms of variables such as the Research attitude of Lecturers. The only difference is that while the present study was investigating the Attitude toward mobile technology and the Information provision for the research activities of postgraduate students, the former was looking at the lecturer's research attitude toward students' research motivation, while the study used linear regression for its statistical analysis, the present study is using the Pearson Product Moment Correlation Coefficient (PPMC) to analyse its inferential statistics, while the study was carried out in South-East Nigeria, the present study was carried out in North-Central, Nigeria.

Yahaya [26] investigated "motivation, challenges and strategies in the use of electronic information resources by postgraduate library users in Southeast Nigerian Federal Universities". This study explored several factors that motivated postgraduate researchers to use the e-resources available in their university libraries. The study revealed some challenges that constitute inhibiting factors to EIR's use, and strategies that will encourage maximum utilisation are recommended. The research design adopted in this study was a descriptive survey. The sample size for the study was one hundred and twenty (120) respondents. The simple random sampling method was used to select ten (10%) of the total population for the study. Two complementary instruments were used for collecting primary data: a questionnaire and an unstructured interview with Heads of the ICT Unit of the university libraries. At varying percentages, the study reveals that PG students are motivated to use the EIRs in their university libraries because they found e-resources to be more informative, easy to access and use, save time, and more useful or less expensive. The study also revealed that the challenges to the use of mobile technology devices in research activities could also be traced to insufficient mobile phones with internet connectivity, incessant power outages, slow internet connectivity, lack of ICT skills, difficulty in finding relevant information, and inadequate IT infrastructure. Strategies to improve motivation to use Electronic Information Resources (EIRS), among others, include: Increasing ICT infrastructure/facilities and having stable electrical backup, and information literacy training for users. The methodology used for this EIR study is related to the present study. The method of data analysis is different from the present study; to determine the reliability of the instrument, the present study was also different from it, but both studies are related in content, and they are significantly different in scope.

The researcher used the population of postgraduate students, while the present study used Postgraduate students. The researchers focused on one Federal university in the southeast, but the present study focused on federal, state, and private universities in North-central Nigeria. Both studies also used questionnaires as an instrument for data collection.

Awujoola and Abioye [10] examined the influence of institutional, legal and ethical factors as precursors of Consortium Building Readiness among university libraries in South-west Nigeria. Exchange and Resources Dependence, Social Exchange, and Socio-Technical in southwestern Nigeria were enumerated. The instruments used were Institutional Factors ($\alpha = 0.75$), Legal Factors ($\alpha = 0.79$), Ethical Factors ($\alpha = 0.89$), and Consortium Building Readiness ($\alpha = 0.81$) scales. The business ethics ($\beta = 0.34$), OC ($\beta = 0.33$), GL ($\beta = 0.24$), LO ($\beta = 0.24$), finance ($\beta = 0.17$), PS ($\beta = 0.10$), and digitisation ($\beta = 0.07$) relatively contributed to the Consortium Building Readiness.

3.5. Information Provision

Anyim [9] investigated E-library resources and services: improvement and innovation of access and retrieval for effective research activities in universities in Kogi State, Nigeria. The findings from the study revealed that online databases, search engines, World Wide Web (www), e-journals, e-books, and Online Public Access Catalogue (OPAC) were utilised. Also, the electronic information resources available in the library were used to a great extent for the research activities of

the students.

Umar [24] carried out a study to investigate library and information services for the attainment of the United Nations' Sustainable Development Goals (SDGs) with the aid of four (4) research objectives. A survey-type descriptive research design was adopted for the study with a population of 27 heads of libraries registered with the Nigerian Library Association (NLA), Osun State Chapter. Similarly, a total enumeration was used as the sampling technique, and an open-ended questionnaire was used to elicit responses from the respondents. Out of the 27 copies of a questionnaire distributed, 27 were retrieved and found usable for analysis, giving a 100% response rate. The questionnaire was thereafter analysed using thematic analysis based on grounded theory.

The results found that there was a low level of familiarity with SDGs among head Postgraduate students in Osun State. Services like selective dissemination of information and information provision contribute more to the SDGs. New library roles like advocacy programs and community engagement will help libraries contribute more to the agenda. Moreover, it was discovered that poor funding and inadequacy of library facilities, among other things, challenge the library's contribution to the actualisation of SDGs. The researchers concluded by asserting that libraries and Postgraduate students must strengthen conventional practices that will contribute to the global agenda and adopt new services to make more impact on humanity. This study is similar to the present study because one of its variables, which is the independent variable, focuses on the Library Information Service to support the research activities of postgraduate students. It is also similar in terms of the research instruments used for data collection. It differs in terms of geographical locations; it also differs in terms of technology applications.

Isah *et al*. [16] carried out a study on the use of Electronic Information Resources by Postgraduate Students of Universities in North Central Nigeria. A structured questionnaire was utilised to gather data from postgraduate students; the study focused on postgraduate students from five government-owned universities in North-Central Nigeria. A sample size of 357 postgraduate students was determined using Krejcie and Morgan's estimation table. Data were analysed using frequency counts, simple percentages, and mean scores. However, findings from the study revealed that Postgraduate students accessed electronic information resources daily, and the use of these resources was predominantly twice a week.

The findings further revealed that the utilisation of electronic information resources improved research productivity among postgraduate students. Based on the findings, the study recommended that the universities in North-Central Nigeria under study should enhance awareness and training programs to increase the effective use of electronic information resources. Also, the universities should improve their infrastructure to support better access to electronic resources by postgraduate students. This study is similar to the present study in terms of the target population of the study, which is the postgraduate students. Other areas of similarity include: the research instruments questionnaire, the location of the study, which is North-central Nigeria, as well as the use of Krejcie and Morgan's table to determine sample size for the study, and the use of descriptive statistics for data analysis.

4. Research Methodology

The study adopted a correlational research design to examine the relationship between information provision, mobile technology use, and research activities of postgraduate students in universities in North-Central Nigeria. The design was appropriate because it enabled the determination of the strength and direction of relationships among variables without manipulation.

The study was conducted in North-Central Nigeria, comprising seven states and the Federal Capital Territory (Abuja), with several federal, state, and private universities offering postgraduate programmes. The population of the study consisted of 15,041 postgraduate students in these universities (2025 records).

A sample size of 1,024 postgraduate students was determined using Krejcie and Morgan's sampling table. A proportional sampling technique was employed to ensure fair representation of each university and programme type (PGD = 336, Master's= 380, and PhD = 308). Data for the study were collected using a structured questionnaire and an observation checklist. The questionnaire was designed on a four-point Likert rating scale and divided into sections addressing demographic information, research activities, mobile technology usage, information provision, attitudes, and challenges faced by respondents. The observation checklist was used to verify the availability of mobile technology facilities in selected institutions.

The instruments were validated through face and content validation by experts in Library and Information Science and Measurement and Evaluation. A pilot test was conducted, and reliability was established using the split-half method, yielding an overall reliability coefficient of 0.90, indicating high internal consistency. The questionnaire was administered with the help of trained research assistants and retrieved after completion.

Out of the 1,024 copies of the questionnaire administered, 796 were correctly completed and retrieved, representing a response rate of 78%. The data collected were analysed using descriptive and inferential statistics. Descriptive statistics such as frequency counts, mean, and standard deviation were used to answer research questions, while inferential statistics, including Pearson Product-Moment Correlation Coefficient and multiple regression analysis, were used to test the hypotheses at an appropriate level of 0.05 significance.

5. Results and Discussion

5.1. Response Rate

Out of 1,024 copies of the questionnaire distributed, 796 copies were completed, retrieved and found usable, representing a 78% response rate. The response rate from the 10 universities in North Central Nigeria.

Table 1 shows the copies of questionnaires distributed, returned and analysed. The following is the response: Federal University of Technology Minna (distributed = 155; returned = 121), the University of Abuja (distributed = 111; returned = 86), the University of Jos (distributed = 168; returned = 130), University of Ilorin (distributed = 123; returned = 96), Nile University of Nigeria Abuja (distributed = 7; returned = 5), Benue State University, Makurdi (distributed = 45; returned = 35), Kwara State University (shared = 25; returned = 19), Nasarawa State University (distributed = 333; returned = 260), Ibrahim Badamasi Babangida University Lapai (distributed = 12; returned = 9), Prince Abubakar Audu University, Anyigba (distributed = 45, returned = 34). The total number of copies of the questionnaire distributed was 1024, and a total of 796(78%) were the response rate.

Table 1. *Response Rate.*

	Universities	Copies distributed	Copies retrieved%
1.	Federal University of Technology, Minna, Niger State.	155	121 78
2.	University of Abuja, Abuja	111	86 74
3.	University of Jos, Jos.	168	130 77
4.	University of Ilorin, Ilorin.	123	96 78
5.	Nile University of Nigeria (NUN), Abuja.	7	5 71
6.	Prince Abubakar Audu University, Anyigba	45	35 77
7.	Benue State University, Makurdi	45	35 77
8.	Kwara State University, Malete	25	19 76
9.	Ibrahim Badamasi University, Lapai	12	9 75
10.	Nassarawa State University, Keffi	333	260 78
Total		1024	796 78

Source: Author's Field Work (2022)

Table 2. *Relative effect of mobile technology devices, postgraduate students' attitudes, and Information provision on postgraduate students' research activities in universities in Nigeria.*

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta	Rank		
1	(Constant)	0.238	0.065			3.636	0.000
	The extent of use of mobile technology devices	-0.038	0.050	-0.037	3rd	-0.751	0.453
	Postgraduate students' attitude towards research activities	0.278	0.047	0.260	2nd	5.977	0.000
	Information provision for research activities	0.735	0.049	0.742	1st	14.961	0.000

a. Dependent Variable: research activities

b. Predictors: (Constant), information provision for research activities, postgraduate students' attitude towards research activities, and the extent of use of mobile technology devices

To test the hypothesis and analyse the data, multiple regression was used. A relative effect of mobile technology devices, postgraduate students' attitudes and Information provision on research activities of postgraduate students in universities in Nigeria. The result of the analysis is presented in Table 2.

Table 2 shows the relative effect relationship between the use of mobile technology devices, postgraduate students' attitudes, and the Information provision on the dependent variable (research activities of postgraduate students) using the standardised regression coefficient. From the Table, Beta = 0.037, t = 0.751, and p = 0.453 have the least potent contribution to the dependent variable (research activities). The result further showed that postgraduate students' attitude has a Beta = 0.260, t = 5.977, p = 0.000, a potent contribution to research activities. Finally, the table showed that the Information provision has the highest potent contribution, Beta = 0.742, t = 14.961, p = 0.000, to research activities. This result shows that the Information provision has the highest effect, followed by postgraduate students' attitudes and the use of mobile technology devices on the research activities of postgraduate students. This implies that the independent variables have a relative contribution to the research activities of postgraduate students in universities in North-Central Nigeria.

5.2. Summary of Findings

There is a relative effect of postgraduate students' Attitudes, and the Information provision on postgraduate research activities in North-Central Nigeria. However, there is a non-significant relative effect of the use of mobile technology on postgraduate research activities in universities in North-central Nigeria.

5.3. Discussion of Findings

Research Question 1: There is no significant Relative effect of mobile technology devices, postgraduate students' Attitudes, and Information provision on research activities of postgraduate students in universities in North-Central, Nigeria.

The result shows that the independent variables (mobile technology devices, postgraduate students' attitudes and provision of information services) have individually made a relative effect on the dependent variable (postgraduate students' research activities). However, it showed the relative effect relationship between the use of mobile technology devices, postgraduate students' attitudes, and the Information provision on the dependent variable (research activities of postgraduate students) using the standardised regression coefficient. The extent of use of mobile technology devices, Beta = 0.037, t = 0.751, and p < 0.453, has the least potent contribution to the dependent variable (research activities). The result further showed that postgraduate students' attitude has Beta = 0.260, t = 5.977, p < 0.000, a potent contribution to research activities. Finally, the results showed that the Information provision has the strongest contribution, Beta = 0.742, t = 14.961, p = 0.000, to research activities. In summary, this result shows that the Information provision has the highest effect, followed by postgraduate students' attitudes and the use of mobile technology devices on the research activities of postgraduate students. This implies that the independent variables have a relative contribution to the research activities of postgraduate students in universities in North-Central Nigeria. This finding agrees with the findings of Awujoola and Abioye ([10]) who examined the influence of institutional, legal and ethical factors as precursors of Consortium Building Readiness among university libraries in South-west Nigeria. Exchange and Resources Dependence, Social Exchange, and Socio-Technical in south-western Nigeria were enumerated. The instruments used were Institutional Factors (α = 0.75), Legal Factors (α = 0.79), Ethical Factors (α = 0.89), and Consortium Building Readiness (α = 0.81) scales. The business ethics (β = 0.34), OC (β = 0.33), GL (β = 0.24), LO (β = 0.24), finance (β = 0.17), PS (β = 0.10), and digitisation (β = 0.07) relatively contributed to the Consortium Building Readiness.

6. Conclusion

In line with the findings of this study, it can be concluded that postgraduate students' research activities in universities in North-Central Nigeria are significantly influenced by information provision and students' attitudes towards research. The results of the multiple regression analysis revealed that information provision is the strongest predictor of research activities, making the highest and most significant contribution to postgraduate students' research engagement and productivity (β = 0.742, p < 0.05). This indicates that access to adequate, relevant, and timely information resources is fundamental to successful research activities among postgraduate students.

The findings further showed that postgraduate students' attitudes towards research have a significant positive effect on research activities (β = 0.260, p < 0.05). This suggests that students who possess positive dispositions, interest, and commitment towards research are more likely to engage actively in research-related tasks and produce better research outcomes.

Similarly, the extent of mobile technology use was found to have a non-significant effect on postgraduate students' research activities (β = -0.037, p > 0.05). This implies that the mere use of mobile technology devices does not necessarily translate into improved research performance. The effectiveness of mobile technology may depend on how it is utilised for academic and research purposes rather than on its availability or frequency of use.

The study concludes that while information provision, postgraduate students' attitudes, and mobile technology use collectively contribute to research activities, information provision and positive research attitudes are the most critical determinants of postgraduate students' research productivity in universities in North-Central Nigeria.

7. Recommendations

Based on the findings of the study, the following recommendations are made for universities in North-Central Nigeria:

University management and library administrators should prioritise the provision of adequate, current, and accessible information resources, including electronic databases, digital libraries, institutional repositories, and research support services, as information provision was found to be the strongest predictor of postgraduate students' research activities. Strengthening information access systems will enhance students' ability to obtain relevant scholarly materials and consequently improve the quality and productivity of their research outputs.

Abbreviations

AOIRs	Access/Open Access Institutional Repositories
EIR(s)	Electronic Information Resources
ICT	Information and Communication Technology
IFLA	International Federation of Library Associations and Institutions
IM	Instant Messaging
IT	Information Technology
MIS	Management Information Systems
NLA	Nigerian Library Association
NUN	Nile University of Nigeria
OAIRs	Open Access Institutional Repositories
OPAC	Online Public Access Catalogue
PGD	Postgraduate Diploma
PhD	Doctor of Philosophy
PPMCC	Pearson Product-Moment Correlation Coefficient
SDGs	Sustainable Development Goals
SMS	Short Message Service
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
WWW	World Wide Web

Author Contributions

Shehu Amanyi Yusufu: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing

Samuel Yisadoko: Methodology, Supervision, Validation

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Conflicts of Interest

The authors declare no conflicts of interest.

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