Research Article

Predicting users' behavior: Gender and age as interactive antecedents of students' Facebook use for research data collection

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ARTICLE INFO	ABSTRACT
	Previous studies have extensively examined how teachers and students utilize Facebook for instructional engagement, writing, research dissemination, and e-learning. However, there is a lack of research focusing on Facebook as a tool for collecting research data. This study aims to fill this gap by analyzing how final-year students utilize Facebook for research data collection (RDC). The study also assesses demographic differences in students' use of Facebook for RDC. An online survey was conducted on a sample of 11,562 final-year students from tertiary

institutions in Nigeria. The researchers followed global best practices in designing and validating the online survey. The survey items demonstrated clarity and relevance, with item content validity indices ranging from .71 to .99. Dimensionality and goodness of fit were assessed through exploratory and confirmatory factor analyses. Convergent validity was evaluated using average variance extracted, while discriminant validity was assessed using the Fornel-Larcker criterion and Heterotrait-Monotrait ratio. The composite reliability indices (.97, .94, and .90) confirmed the usability of the instrument's three sub-scales. The study's main findings revealed a significantly low usage of Facebook for RDC among students. Age was a significant predictor, indicating that older students used Facebook more for RDC. While males reported higher usage, the gender difference was negligible. The interaction of age and gender was significant in predicting students' use of Facebook for RDC. These results have implications for future research, which are further discussed.

INTRODUCTION

According to Kemp (2022), Facebook is the most popular social media platform globally, with 2.912 billion users in January 2022. The same source reports that 1.929 billion people (66.0%) use Facebook daily. Bashir et al. (2021) and Lattie et al. (2022) note that students at various education levels spend approximately 30 minutes daily on Facebook. This significant and growing number of Facebook users presents an appealing opportunity for research data collection (RDC). Engaging with these influential users could yield substantial benefits for research projects. Furthermore, students could leverage their brief visits to the platform to share insightful and original posts concerning their research activities.

The use of Facebook in educational contexts have attracted considerable interest from researchers worldwide. Over the past decade, numerous studies have examined the use of Facebook by teachers and students for various purposes. For example, Alwreikat et al. (2021), Moorthy et al. (2019), and Shodiyev et al. (2022) have shown that Facebook can serve as a learning environment, fostering students engagement, support, and knowledge creation. In higher education, studies have explored the relationship between students' Facebook use and variables such as sexual behavior (Carmack & Rodriguez, 2020; Olamijuwon et al., 2021), attitudes towards learning (Arop et al., 2019; Díez-Palomar et al., 2020), and academic achievement (Razavi, 2021; Tafesse, 2020). Some research has also focused on how Facebook and other social media platforms are used to disseminate scholarly publications, primarily among academic staff in tertiary institutions (Aldahdouh et al., 2020; Chugh et al., 2021; Heck et al., 2020). However, there is still a gap in understanding the extent higher education students utilize Facebook for academic research.

A significant portion of the literature has examined students' use of Facebook in the context of writing, such as those that explored the effectiveness of Facebook groups in facilitating writing activities (Andini, 2019) and peer revision (Razak & Saeed, 2015). Scholars have also investigated how students use Facebook to practice writing skills (Putri & Aminatun, 2021) and enhance motivation (Khusnita, 2017). In English as a foreign language (EFL) settings, there is extensive research on the use of Facebook to promote writing proficiency among EFL learners, including studies by Al-Tamimi et al. (2018), Barrot (2021), and Yen et al. (2015). Some research has compared EFL learners' use of Facebook with traditional writing methods (Dizon, 2016) to enhance writing skills (Alkhoudary, 2018). However, the application of Facebook for RDC to support academic writing remains understudied.

To address this gap, researchers have explored the integration of Facebook into lessons to improve students' literature review skills (Arifani & Khaja, 2021). Nwangwa et al. (2014) conducted a relevant study on using social media for research among undergraduate students, focusing on sourcing research materials, generating ideas, and developing creative writing skills. However, they did not specifically approach it from the data collection perspective for research purposes. It is important to distinguish between using social media to find literature materials and using it for RDC, as research data encompasses various forms and serves as evidence for conclusions.

In studies on information and communication technology (ICT) and social media, researchers have often examined demographic characteristics such as age and gender to compare students' usage across different traits (Al-Qaysi et al., 2020; Hassan & Masoud, 2021). However, limited research has focused specifically on

Facebook use for RDC, and existing studies have yielded inconsistent findings. These gaps highlight the need for the present study.

In this study, the primary objective was to determine the extent of students' Facebook use for RDC among those in final-year. Additionally, the research aimed to investigate whether there were differences in students' utilization of Facebook for RDC based on two demographic characteristics, namely gender and age. The selection of final-year students was deliberate, as they are the ones writing their final research project reports. Utilizing Facebook can allow them to interact with experts who could offer valuable guidance and context. Also, students could gather essential data or information from respondents by leveraging Facebook groups, chats, posts and comments, live sessions, or voice notes, which proved useful for their research projects.

Conceptual Framework

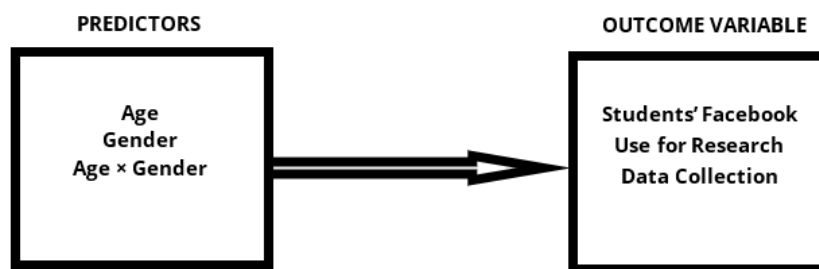The conceptual framework of this study is presented in **Figure 1**.

Figure 1. Conceptual model of the study (Source: Authors)

Literature Review & Hypothesis Development

Existing empirical literature related to this study is reviewed according to the following sub-headings.

Facebook use among higher education students

The extent to which students utilize Facebook for educational and non-educational purposes has been documented extensively in the literature. For example, studies have shown that students use Facebook for chatting, communication and other non-educational purposes to a large extent (Arop et al., 2019; Owan & Robert, 2019). Similarly, there is ample evidence that higher education teachers and students are not inclined to use Facebook for academic purposes for various reasons, including cultural resistance, pedagogical concerns, and institutional limitations (Manca & Ranieri, 2016). According to documented evidence, the primary reason students use Facebook is resource sharing, followed by perceived usefulness, enjoyment, collaboration, and social influence (Sharma et al., 2016).

In the academic context, some scholars have highlighted that the adoption of digital devices necessitates a profound change in the pedagogical approach, which could have revolutionary implications for academic institutions (e.g., Caena & Redecker, 2019; Oke & Fernandes, 2020; Owan et al., 2023a). Alternatively, other researchers have noted that increased social media usage in higher education can help academic institutions disseminate their research to the younger generation of students (e.g., Mason, 2020). However, a significant portion of the literature primarily focuses on the potential benefits of social media for learning (Greenhow & Lewin, 2016; Manca & Ranieri, 2013; Smutny & Schreiberova, 2020) or provides empirical evidence of its utilization by students in higher education (Cooke, 2015; Owan & Robert, 2019). There is a scarcity of extensive survey studies that specifically investigate students' use of Facebook for research purposes such as data collection, results dissemination and impact assessment. Even among the general studies focusing on students' Facebook use, there is a disagreement in the findings reported across different studies. For example, some studies show that students used Facebook to a low extent (Gordon et al., 2023; Palazon et al., 2015; Taipe et al., 2023). In contrast, others have shown that students' use of Facebook was high (Ilakkuvan et al., 2019), especially for viewing sexual content (Langlais et al., 2020; Stănculescu & Griffiths, 2021; Owan et al., 2020), narcissism, self-identity and empowerment (Gulatee et al., 2021), and other non-educational purposes (Zagidullin et al., 2021). Since the results of previous studies tend to show high use of Facebook for non-educational purposes, the first hypothesis of this study was developed.

Researchers have explored diverse methods for conducting qualitative health studies by utilizing data from Facebook users (Franz et al., 2019). In the realm of education, Facebook has served as an enclosed space for instructors and students to facilitate communication and resource-sharing (Greenhow et al., 2020). Nevertheless, it is imperative to address the ethical considerations associated with employing Facebook for research, particularly concerning issues of privacy and confidentiality (Green et al., 2022; Kamp et al., 2019; Zimmer, 2020). Additionally, Facebook has been instrumental in investigating study abroad experiences (Dressler & Dressler, 2019).

One notable domain, where Facebook has been extensively harnessed for research pertains to the recruitment of research participants. Integrative reviews have scrutinized the effectiveness of recruiting study participants through Facebook (Reagan et al., 2019). Researchers have also delved into the potential of using Facebook advertisements for survey sampling in diverse global contexts (Rosenzweig et al., 2020). Nonetheless, it remains crucial to ensure that the use of Facebook for participant recruitment aligns with ethical guidelines and safeguards the privacy and autonomy of research subjects (Kamp et al., 2019). Researchers have leveraged Facebook to connect with participants and as a setting for their research endeavors (Dressler & Dressler, 2019; Mancosu & Vegetti, 2020). However, there is limited discussion about the extent to which students involved in their final research projects utilize Facebook for data collection purposes due to low awareness and willingness (Owan et al., 2023b).

Studying the extent to which students incorporate Facebook into their final research projects for data collection is essential for several compelling reasons. It reflects the current landscape of research practices in our increasingly digital world, ensuring that researchers stay abreast of evolving methodologies and technology usage. Facebook's cost-efficiency and accessibility makes it an attractive option, particularly for students with limited research budgets. Furthermore, Facebook's vast user base allows students to engage with a diverse range of participants, enhancing the external validity of their research. Moreover, acquiring expertise in Facebook research equips students with valuable real-world skills applicable in various career paths. Investigating this area also encourages innovative research methodology, fosters interdisciplinary collaborations, and enhances students' research and critical thinking skills. Based on the review the first hypothesis was developed.

Hypothesis 1: There is a significantly low extent of students' Facebook use for RDC.

Gender & Facebook use

Research on gender differences in internet usage, ICT skills, and social media engagement has produced diverse outcomes. Some studies suggest that males exhibit higher proficiency in using the internet, ICT, or social media platforms than females (McGregor et al., 2017; Odigwe & Owan, 2020). Conversely, other studies argue that females demonstrate greater competence in utilizing social media platforms than males (Gil-Clavel & Zagheni, 2019; Oberst et al., 2016). Moreover, some studies found no significant difference in students' use of ICT, social media, or Facebook with regards to gender, attributing any observed disparities to chance (Guillén-Gámez et al., 2019; Mesagan et al., 2022). The lack of consensus among these studies underscores the need for further research to understand gender-related dynamics in this subject better.

Gender differences in social media usage have been extensively studied. Several studies have found that females use Facebook more frequently than males (Gil-Clavel & Zagheni, 2019; James & Jonah, 2022). Additionally, research has shown that female gender is a significant factor in the development of Facebook addiction (Cudo et al., 2019). Gender stereotypes are also reflected in social media content, with men being depicted as "active," "dominant," and "independent," while women are depicted as "attractive" and "dependent" (Siddiqui, 2023). Furthermore, gender identification and gender ideologies influence the purposes of social media use in adolescence. These purposes include emotion and activity bonding with friends, social compensation, appearance validation, and bullying (Manago et al., 2023). Gender differences in social media usage have also been observed in different regions and age groups. For example, female users who are living away from their hometown are more likely to engage in Facebook use than their male counterparts (Gil-Clavel & Zagheni, 2019).

Excessive Facebook use has been linked to negative mental health outcomes. Studies have found associations between Facebook usage and depressive symptoms, decreased subjective well-being, and

mental health issues (Boer et al., 2021; Stieger, 2019; Gugushvili et al., 2022). However, more research is needed to fully understand the relationship between Facebook use intensity, problematic Facebook use, and mental health outcomes. Gender differences in social media usage extend beyond Facebook. Women tend to have larger networks of close friends than men across different countries (Gil-Clavel & Zagheni, 2019). Gendered norms in society are also reflected in social media behaviors, such as posting patterns and communication styles (Gan et al., 2022; Razib & Pinky, 2023). Additionally, parents tend to mention sons more often than daughters on social media (Sivak & Smirnov, 2019).

Sex differences in Facebook use for RDC have been a topic of interest in recent studies. Several studies have explored the relationship between gender and Facebook use, shedding light on the different patterns and behaviors exhibited by male and female users. One study by Coskun et al. (2020) found that female users are more likely to use social networking sites like Facebook for research purposes compared to male users. Another study by Alnjadat et al. (2019) found that the number of Facebook friends was positively related to academic performance for male students, while it was negatively related for female students. This suggests that male and female users may have different motivations and behaviors when it comes to using Facebook for research purposes. Furthermore, a study by Nasser et al. (2019) investigated problematic Facebook use among undergraduate students and found that male gender was a significant predictor of problematic Facebook use. This suggests that there may be gender differences in the way individuals interact with and use Facebook, which could impact data collection efforts.

On the other hand, a study by Cudo et al. (2019) found that there is no clear evidence for female gender being a predictor of Facebook addiction. This highlights the complexity of the relationship between gender and Facebook use, and the need for further research to fully understand the dynamics at play. In addition to gender differences, it is important to consider the broader context of Facebook as a platform for RDC. Franz et al. (2019) emphasized the importance of understanding the peculiarities of Facebook before establishing partnerships for data collection.

Moreover, the use of Facebook for RDC has been explored in various fields. For example, Russomanno et al. (2019) investigated the utility of targeted Facebook advertisements for recruiting transgender and gender nonconforming individuals into a research study. Furthermore, a recent study found that male students demonstrated a stronger inclination and practical use of Facebook for RDC compared to their female peers, with their willingness to engage in RDC directly influenced by their awareness level, further serving as a mediating factor between awareness and actual Facebook usage for RDC (Owan et al., 2023b). For this reason, the second hypothesis was developed.

Hypothesis 2: Gender significantly influences students' Facebook use for RDC.

Age & Facebook use

Age has also been a subject of investigation, and the findings have been diverse. Some scholars argue that younger students use Facebook and social media more than their older counterparts (Ozimek & Bierhoff, 2016). In the opposite, other researchers favor older students, suggesting they are more adept at utilizing digital resources, including Facebook, for various purposes (McAndrew & Jeong, 2012; Owan et al., 2021). This indicates that age plays a significant role in students' ICT usage (Guillén-Gámez et al., 2019). Interestingly, some scholars have found no significant difference in ICT or social media use based on respondents' age (Dúo-Terrón et al., 2022; Juhaňák et al., 2019; Owan & Asuquo, 2021).

However, it is worth noting that these studies, despite their inconclusive arguments, have seldom focused specifically on Facebook as a social media platform. Furthermore, the cited studies primarily examined ICT or social media usage in writing and learning, with less emphasis on RDC. Consequently, it remains unclear to what extent Facebook can serve educational purposes beyond the commonly reported areas of teaching, student engagement, and improvement of academic writing skills found in previous studies. In line with this argument, numerous research studies have examined the complex interplay between age and Facebook use, shedding light on various facets of this relationship (Hsu et al., 2021; Maheshwari & Mukherjee, 2020; Majeed et al., 2022; Shehzad et al., 2021; Temmesen et al., 2021).

In one notable study, Hsu et al. (2021) found that Line and Facebook use can mitigate the link between subjective social capital and loneliness in older individuals, implying that Facebook usage can positively

influence social capital and reduce feelings of loneliness among this age group. Conversely, Maheshwari and Mukherjee (2020) revealed a positive association between Facebook usage and academic achievement, indicating that Facebook can serve as a tool to enhance academic performance among college students. On the other hand, Majeed et al. (2022) identified a negative association between social media usage, including Facebook, and mental well-being, suggesting that excessive use of Facebook may have detrimental effects on the mental well-being of young adults. Furthermore, Shehzad et al. (2021) discovered that a significant proportion of Facebook users aged 18-29 actively engage in political activities on the platform, indicating Facebook's potential as a platform for political involvement among young adults. In addition to individual effects, a study by Temmesen et al. (2021) highlighted Facebook's potential as a valuable platform for conducting online focus groups in health research, underscoring its utility in data collection and research in the field of health.

The influence of age on Facebook usage has been a subject of interest in various research studies, exploring different aspects of this relationship, including perceived enjoyment, problematic use, and social media platform preferences. For example, Zhang and Jung (2022) categorized participants into three age groups–younger users (18-34 years old), middle-aged users (35-59 years old), and older users (60 years old and above)–to investigate the association between Facebook use and perceived enjoyment. Their findings indicated that age significantly affects the perceived enjoyment of various Facebook activities, suggesting that the level of enjoyment derived from using Facebook varies across age groups. Nasser et al. (2019) revealed that younger individuals, along with males and those experiencing depression, were more likely to exhibit problematic patterns of Facebook use, implying a greater vulnerability to such behaviors among younger age groups. Throuvala et al. (2019) conducted a qualitative study, which discovered that Facebook was no longer the preferred platform for adolescents, with platforms like Instagram, Snapchat, and YouTube gaining more popularity. This suggests that younger age groups, particularly adolescents, exhibit different usage patterns and preferences when it comes to social media platforms. Another study found that younger students, particularly those aged 19 to 28, demonstrated higher awareness, willingness, and actual usage of Facebook for RDC, with age directly impacting awareness and acting as both a positive influencer and a negative mediator between awareness and usage for certain age groups (Owan et al., 2023b). Following the literature reviewed, the third hypothesis of the study was developed.

Hypothesis 3: There is a significant influence of age on students' Facebook use for RDC.

Interactive effect of age & gender on students' Facebook use

The intricate interplay between age and gender in students' Facebook use is influenced by diverse factors, as revealed in several studies. Tamime and Weber (2022) identified that gender gaps in Facebook use vary across regions and are linked to gender inequality, suggesting that societal factors influence gender differences. Boer et al. (2021) shed light on the potential impact of social media use, albeit indirectly, on mental health among adolescents, offering insights relevant to age and gender-based Facebook use patterns. Kashyap et al. (2020) found regional variations in gender gaps in Facebook use, with greater disparities in regions marked by gender inequality and lower development levels. Rostami et al. (2021) explored how age, gender, and education levels shape faculty members' Facebook use and perceptions, demonstrating that these factors influence attitudes and behaviors regarding Facebook. Moreover, studies have delved into gender and Facebook addiction, with Cudo et al. (2019) and Sotero et al. (2019) identifying predictors of addictive behaviors, highlighting the interaction between age and gender. Manago et al. (2023) investigated gender-related factors impacting the purposes of social media use among adolescents, offering insights into how gender affects motivations for Facebook use.

Gugushvili et al. (2022) examined Facebook use and mental health, considering demographic characteristics like age, revealing the potential role of demographics in shaping the relationship between Facebook use and mental health outcomes. Lastly, Torun (2020) explored the influence of gender and social networking sites, including Facebook, on educational social media usage among higher education students, providing insights into the role of gender and social media in educational contexts. However, none of the previous studies focused on the interactive effect of age and gender on students' Facebook use for RDC. This study is the first to specifically examine the use of Facebook for RDC by exploring the interactive effect of age and gender. While a few studies in the field of ICT have examined the interaction effect of multiple

demographic variables to obtain more insightful results (e.g., Aduma et al., 2022; Owan & Asuquo, 2021; Toroujeni, 2021; Xie & Karan, 2019), such investigations are still limited. It is crucial to determine the interaction between age and gender to understand better gender variations in ICT use among users across different age categories. This research builds upon the limitations and recommendations identified by Nwangwa et al. (2014) by shifting the focus to the practical application of social media, specifically Facebook, in collecting data for research projects. Furthermore, Kosinski et al. (2015) developed a framework that enables researchers to recruit study participants on Facebook, provide incentives, and engage them during the research process. Surprisingly, this study is the first to apply the framework developed by Kosinski et al. (2015), even though it has been available for seven years.

Hypothesis 4: There is a significant interactive influence of age and gender on students' Facebook use for RDC.

METHODS

Research Design & Participants

This study utilized a cross-sectional survey design and involved a total of 11,562 participants who were final-year students. To be eligible for participation, individuals had to be final-year college, polytechnic, or university students engaged in a research project that involved collecting data in the field. These criteria ensured that a diverse group of higher education students was included. Focusing on final-year students also allowed for examining a more current cohort who had experienced the advancement and changing uses of social media in education.

In this research report, the justification for employing an extensive sampling methodology is rooted in the pursuit of robust and reliable findings. A priori power analysis, perform using G*power, revealed that a sample of 11,149 respondents is the minimum requirement to detect a very small effect size (d=.05) using two-way ANOVA and achieve a 95% power in correctly rejecting the null hypothesis if it is false and vice versa (**Figure 2**). Thus, with a larger sample size, statistical power is significantly improved, reducing the likelihood of Type II errors and enhancing the study's ability to detect meaningful effects (Cohen, 1988; Erdfelder et al., 2009; Uakarn, 2021). Furthermore, extensive sampling enhances the representativeness of the sample, thereby bolstering the external validity of the study's conclusions. Moreover, precision in parameter estimation is heightened, contributing to more accurate and trustworthy results.
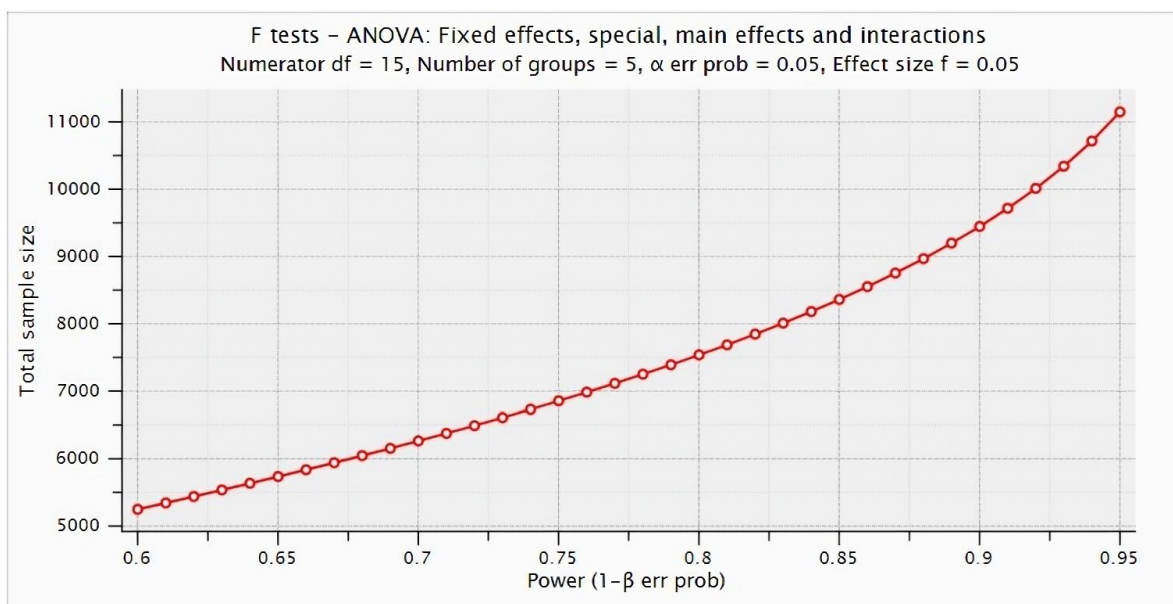

Figure 2. Power analysis results for sample size determination (Source: Authors, using G*Power software)

Extensive sampling accommodates subgroup analyses, a crucial element for exploring variations within the population (Cochran, 1977; Kish, 1965). Complex research questions and analyses are better supported

by larger samples, as are investigations into small effects (Lakens, 2013). Additionally, it served as a buffer against nonresponse or attrition, increasing the reliability of longitudinal or survey research.

The sampling method used in this study is a combination of stratified convenience sampling techniques. The researchers first categorized the population into distinct strata based on the type of institution (universities, colleges, and polytechnics) and geographic location (excluding the North-East zone for safety concerns). This stratification ensured that the sample would be representative of the diverse higher education student population in different types of institutions and geographic regions. Within each stratum, a convenience sampling method was employed. Research assistants were recruited and assigned to specific geographic zones in Nigeria to physically contact tertiary institutions. This approach made use of available and accessible participants within each stratum. The class representatives in these institutions were then approached to distribute the questionnaire to eligible final-year students. This convenience sampling method was chosen for practical reasons, as it allowed for cost-effective data collection and leveraging existing networks within the institutions.

Regarding the participants' demographic characteristics, the study comprised 45.9% females (n=5,309) and 54.1% males (n=6,253). Concerning age, 60.4% of the participants (n=6,982) were between 19 and 28 years old, 34.7% (n=4,013) fell in the 29-38 years range, and 4.9% (n=567) were aged 39 to 48. Concerning the type of institution, 91.2% of the participants (n=10,539) were final-year students at universities, 8.2% (n=947) were from colleges, and 0.7% (n=76) were from polytechnics.

Instrument & Measures

An online survey called the "Facebook and data collection for research report writing questionnaire" was employed to collect data. The questionnaire was developed by Owan et al. (2023b) through Google Forms, chosen for its free, user-friendly, and adaptable nature, which suited the straightforward nature of the study. The survey can be accessed at https://docs.google.com/forms/d/e/1FAIpQLSfXxAscRKl6CZQnM5qT_BQj_oZzAtLheT7PPXYPeqku0bZC2w/viewform. It was divided into four sections. The first section comprised a cover letter outlining the study's objectives and addressing ethical considerations, such as confidentiality, anonymity, and the importance of honest responses. Respondents were required to give written informed consent by checking a box. They were also asked to provide their email addresses to trace multiple submissions. The second section focused on gathering demographic information, including age, gender, and the type of institution the respondents belonged to.

The third section evaluated respondents' awareness of and willingness to use Facebook for RDC. This section was divided into two parts: one addressing awareness and the other focusing on willingness. Each part contained multiple items that respondents rated on a four-point scale, ranging from "strongly agree" to "strongly disagree." The fourth and final section presented a list of ten Facebook features that could be utilized for collecting various data types. Respondents were asked to indicate their current utilization level for RDC on a linear scale, ranging from zero (no utilization) to four (high utilization). Although the instrument covered awareness, willingness and utilization of Facebook, only the utilization of Facebook for RDC is considered in this work.

Content Validity

A panel of seven experts, including psychometrists and educational technologists, was consulted to assess the items. They focused on ensuring sufficient coverage of each domain and determining appropriate scaling choices. The process followed the procedures outlined in existing instrument validation studies (e.g., Bassey et al., 2020; Boateng et al., 2018; Watkins, 2018). Based on the recommendations of the experts, five items for awareness and five for willingness were eliminated, resulting in a revised pool of 36 items. Content validity was evaluated using the quantitative approach. The analysis showed acceptable values for several items, but five items with I-CVIs below .80 were revised for clarity and relevance. The scale content validity indices for clarity and relevance ranged from .92 to .95 and .90 to .97, respectively. After revising the weak items, the second draft of the instrument consisted of 36 items (10 each for awareness and willingness and 16 for utilization).

Pre-Testing of Items

A group of 15 graduates who completed their degree programs in 2020 and 2021 participated in an evaluation of the second draft. Their feedback regarding item clarity, reaction time, scale choices, and ambiguity was sought. The respondents were satisfied with the items, response speed, clarity, and scale choices. However, three items related to Facebook utilization were identified as uncommon or unpopular features and were subsequently removed, resulting in a final draft of the instrument with 33 items.

Pilot Testing

The third draft of the instrument was converted into an electronic form using Google Forms and sent via email to 360 bachelor's degree holders who graduated between 2020 and 2021. The sample size of 360 respondents was chosen to ensure a ratio of 10:1 between respondents and items in the survey, following recommended practices (Boateng et al., 2018; Mundfrom et al., 2005; von Rezori et al., 2022). The pilot sample had similar demographic characteristics regarding gender, age, and institution type. The participants received a link to the electronic questionnaire and were sent reminders over three months. The collected data were cleaned and converted into a numeric format for analysis.

Internal Structure, Construct Validity, & Reliability

The data collected from the pilot study were analyzed to assess the internal structure of the instrument. Exploratory factor analysis (EFA) was employed for this purpose. Convergent validity was evaluated using average variance extracted (AVE) method, while discriminant validity was assessed using the Fornell-Larcker criterion and Heterotrait-Monotrait (HTMT) ratio. AVE values of .50 or higher indicate convergent validity, and factors demonstrate discriminant validity if the square root of their AVE values exceeds their correlation with other factors (Bassey et al., 2019; Owan et al., 2022b). Internal consistency was examined using the composite reliability measure. Confirmatory factor analysis (CFA) was used to evaluate the model's goodness of fit. The findings related to the internal structure, construct validity, and reliability can be found in the results section.

Main Study

The main study's data collection involved administering the questionnaire electronically to the targeted respondents. A team of 50 research assistants was recruited and incentivized to ensure unbiased responses and reach eligible participants. The research assistants were divided into five groups, each assigned to cover specific geopolitical zones in Nigeria, excluding the North-East zone due to safety concerns. The research teams physically contacted tertiary institutions in their assigned zones to locate final-year students from various departments. Contact information of class representatives was obtained, and a Telegram group was created for them. The questionnaire link was shared in the Telegram group, and class representatives were instructed to share it in appropriate online forums, excluding certain groups that may include ineligible students. The data collection period spanned from January 18, 2021, to January 20, 2022. A total of 11,562 responses were received and downloaded for analysis.

Ethical Considerations

Participation in the study was voluntary, and measures were taken to ensure its validity and regulate data collection process. The respondents were assured that their responses would be aggregated anonymously to maintain integrity and confidentiality. Email addresses were collected to prevent multiple submissions. Data access was restricted to the principal investigator's computer, protected by a strong password, antivirus software, and a firewall. The respondents were informed that the collected data would be analyzed and published as a journal article, and afterwards, the data would be deleted, and the hard drive destroyed.

RESULTS

Exploratory Data Analysis

In the preliminary data analysis, no missing data were found among respondents, and there were no outliers detected in the dataset. Skewness and kurtosis values were within acceptable ranges for structural

equation modeling (SEM). Skewness values ranged from -0.52 to -0.32 for awareness, -0.89 to -0.70 for willingness, and 0.95 to 1.82 for Facebook utilization in RDC. Kurtosis values ranged from -0.06 to 0.38 for awareness, 2.08 to 3.83 for willingness, and -0.33 to 1.82 for utilization, all falling within minor violations of normality criteria for SEM (Brown, 2015).

Internal Structure

EFA was conducted using an orthogonal varimax rotation with maximum likelihood extraction. The analysis initially yielded a seven-factor solution, but after removing dysfunctional items and repeating the analysis, a three-factor solution was obtained, explaining 74.0% of the variance in squared loadings. The first factor represented utilization (40.1%), the second factor represented willingness to use (21.5%), and the third factor represented awareness (12.4%). Bartlett's test of sphericity indicated significant relationships among the variables, and the Kaiser-Meyer-Olkin (KMO) test suggested that the sample size of 360 graduates used in the pilot study was sufficient for factor analysis (KMO=0.9, exceeding the 0.60 threshold). A KMO cut-off value of 0.60 or higher is adequate (Owan et al., 2022a). Factor loadings for the three factors ranged from 0.72 to 0.92 for utilization, 0.81 to 0.90 for willingness, and 0.81 to 0.87 for awareness (**Table 1**).

Table 1. Dimensionality evidence of internal structure of instrument using EFA

Items	Mean	SD	Skewness	Kurtosis	λ	λ^2	ε	z
UT8	0.93	1.25	1.15	0.20	.92	.84	.16	5.84
UT5	0.94	1.27	1.07	-0.08	.91	.83	.17	5.36
UT7	0.98	1.34	1.10	-0.10	.91	.82	.18	5.06
UT2	0.97	1.33	1.15	0.04	.89	.80	.20	4.37
UT4	1.01	1.27	1.03	-0.06	.89	.78	.22	4.12
UT6	0.92	1.19	0.95	-0.33	.88	.77	.23	3.80
UT14	0.72	1.02	1.38	1.34	.87	.75	.25	3.49
UT10	0.82	1.16	1.43	1.17	.86	.74	.26	3.35
UT13	0.77	1.12	1.30	0.74	.79	.62	.38	2.09
UT1	0.64	1.14	1.71	1.82	.72	.51	.49	1.46
∑	8.70	12.09	12.26	4.74	8.62	7.47	2.53	38.93
WI7	3.10	0.57	-0.89	3.83	.90	.81	.19	4.69
WI5	3.14	0.59	-0.70	2.58	.88	.77	.23	3.90
WI3	3.08	0.63	-0.74	2.08	.83	.68	.32	2.62
WI4	3.12	0.65	-0.85	2.09	.82	.67	.33	2.50
WI2	3.12	0.60	-0.75	2.59	.81	.66	.34	2.41
WI1	3.14	0.58	-0.87	3.55	.81	.65	.35	2.29
∑	18.70	3.63	-4.80	16.73	5.05	4.25	1.75	18.41
AW6	2.76	0.71	-0.52	0.38	.87	.76	.24	3.55
AW2	2.70	0.73	-0.32	-0.03	.83	.69	.31	2.67
AW8	2.67	0.77	-0.45	-0.06	.82	.67	.33	2.52
AW4	2.68	0.74	-0.45	0.04	.81	.65	.35	2.29
∑	10.81	2.96	-1.74	0.32	3.33	2.77	1.23	11.02

Note. Extraction method: Maximum likelihood; Rotation method: Varimax with Kaiser normalization; & a rotation converged in four iterations

Convergent & Discriminant Validity

Upon inspection of **Table 2**, it is evident that AVE values for each factor exceed the threshold of 0.50, indicating the attainment of convergent validity for the three latent factors. This indicates a theoretical relationship between all the items measuring each construct (Owan et al., 2022a). Regarding discriminant validity, the Fornell-Larcker coefficients for each factor surpass their correlation with other factors, confirming the achievement of discriminant validity according to the Fornell-Larcker criterion (Fornell & Larcker, 1981). Moreover, all HTMT values are below the threshold of 0.90, providing additional evidence of discriminant validity (Henseler et al., 2015). The attainment of discriminant validity through both methods indicates that the questionnaire items are conceptually distinct from other constructs not related to them, effectively discriminating against unrelated latent variables (Fresco et al., 2007; Patterson et al., 2005). Lastly, examining **Table 2** reveals that all the composite reliability coefficients surpass the threshold of 0.70, demonstrating good internal consistency for all the factors.

Table 2. Construct validity & reliability

Factors	CR	AVE	1	2	3
Utilization (1)	0.97	0.75	**0.86**	0.15	0.24
Willingness (2)	0.94	0.71	0.16	**0.84**	-0.10
Awareness (3)	0.90	0.69	0.23	-0.10	**0.83**

Note. CR values of .70 or higher provide evidence of internal consistency; AVE values of .50 or higher are acceptable indices for convergent validity; **bolded** values along diagonal are Fornell-Larcker coefficients of discriminant validity & must be less than factor correlations below diagonal; above diagonal are HTMT ratios of discriminant validity; & HTMT values must be less than .90 for discriminant validity

Test of Dimensionality

CFA was conducted to evaluate the measurement accuracy of the hypothesized models and determine their acceptability based on theoretical assumptions. The maximum likelihood estimation method was employed due to evidence of normality. **Figure 3** presents the standardized CFA model, illustrating the indicators and their respective latent factors. To assess the acceptability of CFA model in **Figure 3**, nine fit indices were utilized. A minimum of four fit indices, namely χ^2, RMSEA, CFI, and SRMR, is recommended to evaluate whether a CFA model should be considered acceptable (Kline, 2016; Schreiber et al., 2006).
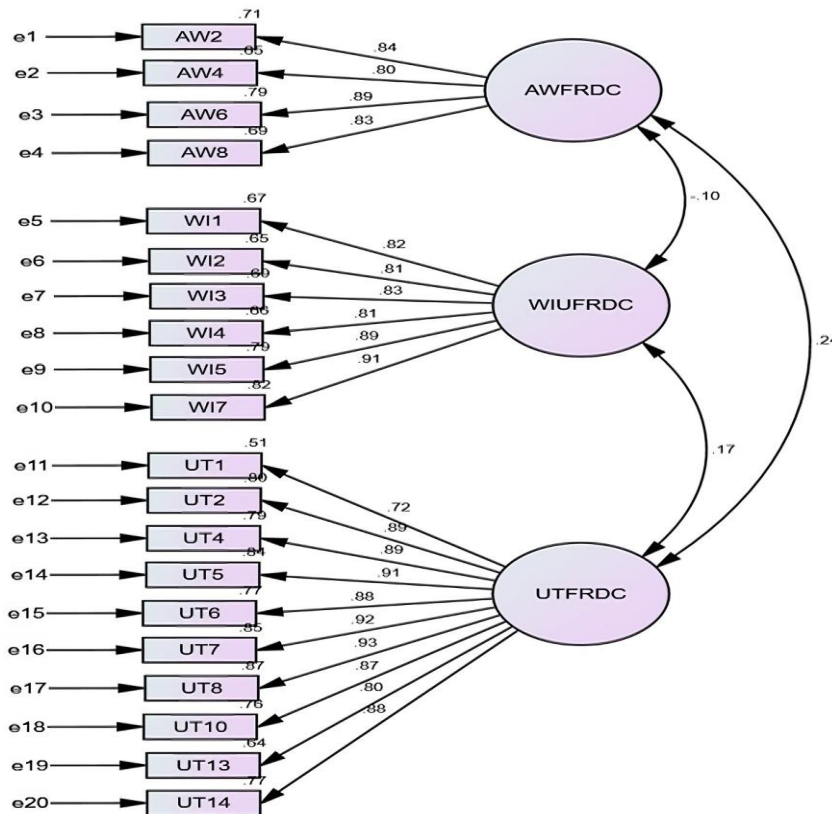

Figure 3. Three-factor latent-trait CFA model of the study (Source: Authors, using AMOS software)

As shown in **Table 3**, CFA model achieved acceptability from eight of the nine indices used. The threshold for deciding the acceptability or otherwise of a CFA model remains debatable. The Chi-square test results may be taken lightly due to the large sample of respondents in the pilot study. SEM studies have often reported that the Chi-Square test commits a type 1 error in large sample sizes (Myers et al., 2010). This may be a reason for the chi-square criterion rejecting the model. Nevertheless, our model performed well across other fit indices. Some researchers offer a baseline of .90 for the CFI (e.g., Schumacker & Lomax, 2004), while others suggest a harsher benchmark of .95 (e.g., Hu & Bentler, 1999). Thus, the CFI value of .97 indicates a good fit. IFI is one index, revealing that our model has an acceptable fit, although the value is slightly less than the .95 threshold. IFI values greater than .90 are acceptable (Bollen, 1989). Nevertheless, relying on the evidence of other fit statistics, CFA model of this study has a good fit warranting its acceptability.

Table 3. Goodness of fit assessment of CFA model

SN	Fit indices	Threshold	Values	Decision
1	χ^2	p>.05	637.19, df=167, p<.001	Reject
2	CMIN	2.00 to 5.00	3.82	Accept
3	PNFI	>.60	.80	Accept
4	RFI	≥.95	.96	Accept
5	IFI	>.95	.94	Accept
6	TLI	≥.95	.93	Accept
7	CFI	≥.95	.97	Accept
8	RMSEA	≤.08	.07	Accept
9	SRMR	≤.08	.06	Accept

Common Method Bias

Common method bias (CMB) was first assessed using Harman's single factor test using SPSS, where only one fixed factor was extracted for all the items. The single factor explained 38.3% of the total variance. Since the variance explained is less than 50.0%, it suggests no CMB (Fuller et al., 2016; Kock et al., 2021). However, Harman's single-factor approach to CMB has been heavily criticized (e.g., Malhotra et al., 2006; Podsakoff et al., 2003; Schwarz et al., 2017). It has also been argued that the test is not sensitive enough to detect common method effects since it is unlikely that a single general factor would emerge when measuring multiple constructs with multiple indicators unless the influence of common method effects is extremely significant (Aguirre-Urreta & Hu, 2019). Thus, we also used the common latent factor (CLF) approach to assess CMB. In this approach, we compared the standardized regression weights of CFA model in **Figure 4** with the standardized regression weights of the same CFA model after imposing CLF on the various items. **Table 4** shows the presence of CMB across all paths from Facebook utilization to all its measures. However, CMB was not detected across two other factors–willingness and awareness. We attribute response bias in utilization responses to social desirability. Therefore, to minimize or correct bias, CLF was imposed on all CFA testing for predictions (Jordan & Troth, 2020; Rodríguez-Ardura & Meseguer-Artola, 2020; Tehseen et al., 2017).
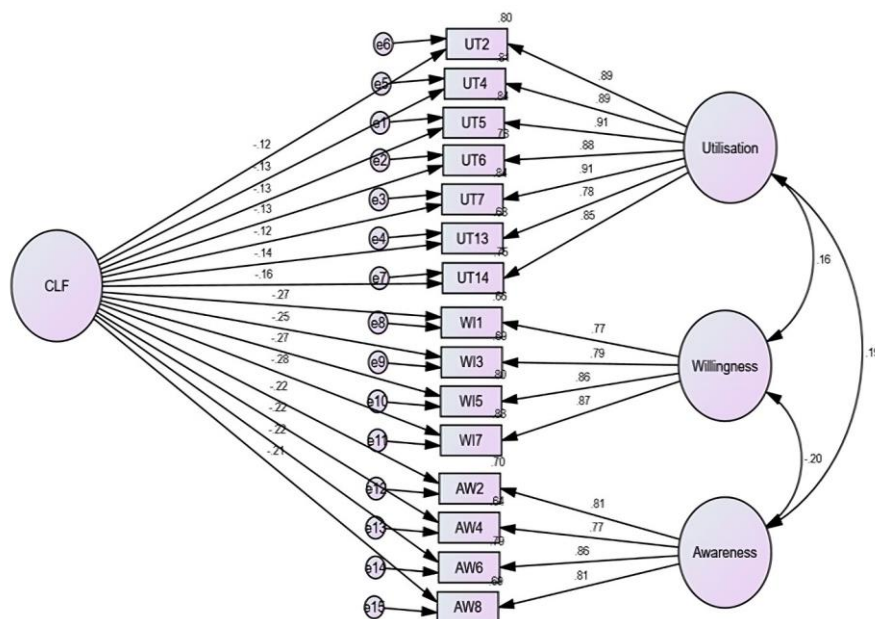

Figure 4. Common latent factor model (Source: Authors, using AMOS software)

Table 4. Common latent factor bias

Paths	β with CLF	β without CLF	δ	CMB
Utilization→UT2	.31	.89	.58	Yes
Utilization→UT4	.35	.90	.56	Yes
Utilization→UT5	.36	.92	.55	Yes
Utilization→UT6	.33	.89	.56	Yes

Table 4 (Continued). Common latent factor bias

Paths	β with CLF	β without CLF	δ	CMB
Utilization→UT7	.34	.92	.57	Yes
Utilization→UT13	.19	.80	.60	Yes
Utilization→UT14	-.90	.86	1.76	Yes
Willingness→WI1	.79	.81	.02	No
Willingness→WI3	.82	.83	.01	No
Willingness→WI5	.89	.90	.01	No
Willingness→WI7	.90	.91	.02	No
Awareness→AW2	.82	.84	.03	No
Awareness→AW4	.79	.80	.02	No
Awareness→AW6	.87	.89	.02	No
Awareness→AW8	.82	.83	.02	No

Note: δ values greater than 0.20 indicates presence of CMB

Students' Utilization of Facebook for RDC

We used one-sample t-test to estimate how much students use Facebook for RDC based on a population mean value of 20.0. We estimated the population mean by summing each item's average expected mean score across the ten items, yielding a value of 20.0. Our analysis revealed that the observed mean score (mean [M]=9.9, standard deviation [SD]=10.9) of students' utilization of Facebook for RDC was lower than population mean (μ=20.0), with a significant mean difference of 10.13, 95% CI [9.94 to 10.33], t(11,561)=99.82, p<.001.

Demographic Variables (Age & Gender) & Students' Facebook Use for RDC

A 2×3 factorial ANOVA tested the main and interactive effect of gender and age on students' Facebook use for RDC. Gender had two levels (males and females), while age had three levels (19-28 years, 29-38 years, and 39-48 years). The descriptive statistics results indicated that males (n=6,253) had a higher mean utilization (M=10.4, SD=10.4) of Facebook for RDC than their female counterparts (n=5,309, M=9.3, SD=11.4). It was also revealed that students aged 39-48 years (n=567) reported the highest mean utilization of Facebook (M=14.2, SD=4.4) than those aged 29-38 years (n=4,013, M=11.7, SD=11.4). In contrast, students aged 19-28 (n=6,982) reported the lowest mean utilization of Facebook for RDC (M=8.5, SD=10.8).

The intersection of age and gender also showed that females aged 19-28 years (n=3,870) had a higher mean utilization of Facebook for RDC (M=8.5, SD=11.7) than their male counterparts of the same age range (n=3,112, M=8.4, SD=9.6). Also, females aged 39-48 years (n=113) reported higher mean use of Facebook for RDC (M=16.0, SD=0.0) than males within the same age bracket (n=454, M=13.8, SD=4.8). However, males aged 29-38 years (n=2687) had a higher mean utilization of Facebook for RDC (M=12.0, SD=11.6) than their female counterparts of the same age category (n=1,326, M=11.0, SD=10.8). Within the male and female categories, students aged 39-48 years, followed by those aged 29-38, reported the highest mean utilization of Facebook for RDC, whereas those aged 19-28 had the lowest mean in Facebook use for RDC.

The test of the between-subject effect in **Table 5** reveals no significant main effect of gender on students' use of Facebook for RDC. This means that males did not differ significantly from their female counterparts in Facebook use for RDC.

Table 5. Age & gender effects on students' Facebook use for RDC

Source	Type III SS	df	MS	F	p	Partial η²
Corrected model	39,254.08[a]	5	7,850.80	67.77	.000	.03
Intercept	381,140.10	1	381,140.10	3290.41	.000	.22
Gender	126.68	1	126.68	1.09	.296	.00
Age	32,144.87	2	16,072.43	138.75	.000***	.02
Gender*age	1,225.67	2	612.84	5.29	.005**	.00
Error	1,338,574.00	11,556	115.83			
Total	2,503,236.00	11,562				
Corrected total	1,377,828.00	11,561				

Note. [a]R-squared=.028 (adjusted R-squared=.028); ***p<.001; & **p<.01

Table 5, however, reveals a significant main effect of age on students' Facebook use for RDC. This means a substantial difference in students' use of Facebook among the age categories. The partial Eta squared value indicates that age accounted for 2.0% of the overall variance in students' Facebook use for RDC. The

interaction of gender and age significantly predicts students' Facebook use for RDC. Thus, there is a significant difference in Facebook use between male and female students of different age categories.

A Tukey HSD post hoc test was performed for pairwise differences among the three age categories. The result indicated that students aged 39-48 years differed significantly from those aged 19-28years and those aged 29-38 years in their Facebook use for RDC, by a mean difference of 5.75, 95% CI [4.69 to 6.81], p<.001 and 2.52, 95% CI [1.43 to 3.61], p<.001, respectively. Further comparison showed that students aged 29-38 also differed significantly from those aged 19-28 regarding their Facebook use for RDC, with a mean difference of 3.23, 95% CI [2.75 to 3.71], p<.001.

DISCUSSION

This study discovered that final-year students in tertiary institutions in Nigeria had a significantly low utilization status of Facebook for RDC, below the anticipated population average. Several personal and environmental factors might be responsible for the low utilization of Facebook for RDC, regardless of their awareness and willingness. It could mean students are not using Facebook for RDC because it is not common in Nigeria, even among professional researchers. Thus, students may not have adequate knowledge of using the platform for RDC. Knowing something differs from using it for a specific purpose. Another reason for the low utilization of Facebook for RDC despite the high awareness and willingness may be due to challenges such as the high cost of internet subscriptions, inconsistent electricity supply, poor access to personal computers, and their social behavior and attitudes towards academic activities. Some studies have found that students lack interest and portray poor attitudes toward educational activities due to social media exposure (Carmack & Rodriguez, 2020; Díez-Palomar et al., 2020; Olamijuwon et al., 2021). This means that students easily get carried away by other content or uses of social media than for academic purposes. Furthermore, studies in Nigeria have continually reported challenges to ICT usage, including illiteracy, high data cost, poor power supply, and inadequate ICT infrastructure (Aworanti, 2016; Fahm et al., 2021).

This study also discovered no significant main effect of gender on students' use of Facebook for RDC, although males demonstrated higher use of the platform than females. This result could mean that both male and female students had similar knowledge of using Facebook for RDC. The result is also attributable to both sexes' willingness to use Facebook for RDC. The result corroborates the finding of Odigwe and Owan (2020) that males utilized ICT tools more than females for teaching, research, and records management because African women are most often concerned about housekeeping, cooking and caring for the family. This might explain why females underutilized Facebook for RDC compared with their male counterparts, even though the difference is negligible. This result corroborates a study documenting no significant difference in cyberspace access between male and female higher education students (Mesagan et al., 2022). This near-equal access could be a reason for both sexes demonstrating similar levels of Facebook use for RDC.

The study revealed a significant main effect of age on students' utilization of Facebook for RDC. The use of Facebook for RDC was discovered to be an increasing function of age, with older final-year students reporting more use than their younger counterparts. This result is not surprising because older students are more mature and experienced. Younger students are more likely to be carried away by the fun features of the platform and may likely appreciate Facebook use for educational purposes later in life. The result strengthens the finding of McAndrew and Jeong (2012) that older individuals utilize Facebook for more responsible purposes, such as caring for the family, than younger individuals. The result is consistent with other studies (e.g., Gil-Clavel & Zagheni, 2019; Ozimek & Bierhoff, 2016), revealing a significant age difference in using the Internet or ICT tools for research and pedagogical purposes. Thus, any notable age differences in using Facebook for RDC are not attributable to chance. The result, however, disagrees with the result of other studies (Dúo-Terrón et al., 2022; Juhaňák et al., 2019; Owan & Asuquo, 2021) reporting no significant age differences in students' satisfaction and use of ICT. The difference between the result of the current and cited studies is glaring. While the present research focuses on Facebook use specifically for RDC, the three contrasting studies focused on ICT motivation, usage, and satisfaction. These studies were all broadly focused on ICT, whereas the current study is more specific on just an aspect of ICT.

Although the main effect of gender on Facebook use for RDC is non-significant, the current study provided evidence of a significant interactive effect of age and gender on students' Facebook use. This implies that male

or female students of specific age categories significantly differ from their gender counterparts within the same age categories. For instance, we documented that at age 19-28 years, female students reported higher use of Facebook for RDC. At age 29-38, male students reported higher use of Facebook for RDC. However, at age 39-48 years, female students utilize Facebook more for RDC than males. This study supports previous research (e.g., Aduma et al., 2022; Owan & Asuquo, 2021), revealing a significant interactive effect of age and gender on ICT satisfaction, job performance and Internet use for research dissemination. The result, however, disagrees with Toroujeni's (2021) finding that there is no significant age and gender interaction effect on computer attitudes and ICT literacy. The point of difference between the cited and the current study could be the study area difference, respondents' nature, and slight differences in focus and methods.

Limitations & Future Research Directions

This study has a few limitations that provide directions for future research. Firstly, although efforts were made to minimize it, there was no guarantee that all respondents who completed the survey were eligible. To address this limitation, future studies could explore offline data collection methods that allow for greater control over the data collection process. Secondly, while this study identified gender differences in Facebook use for RDC, it did not quantify these differences regarding awareness and willingness. Future research should investigate gender differences in awareness and willingness to use Facebook for RDC. Additionally, incorporating respondents' perspectives through interviews would have provided richer insights. Therefore, future studies could consider employing qualitative or mixed methods designs to complement the findings of this study. These limitations highlight potential avenues for further exploration, ensuring a more comprehensive understanding of the topic.

CONCLUSIONS

This study assessed final-year students' utilization level of Facebook for RDC. The study proved that students had a significantly low utilization level of Facebook for RDC. Being a male or female is not highly predictive of Facebook use for RDC. Age strongly predicts students' Facebook use, with older individuals more likely to use it for RDC. This study contributes to the existing literature on social media use, specifically Facebook, in the educational sector. Through this study, there might be increments in using Facebook by students and other individuals for academic purposes. Therefore, tertiary institutions must provide opportunities for students to access institutional ICT resources and services. There should be open access to institutional wireless networks to promote students' use of Facebook or other internet-based platforms for research engagements. Sensitization campaigns on designing and managing electronic data collection tools should be organized in workshops, seminars or conferences for all undergraduates and postgraduate students in tertiary institutions.

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