A Survey on Students' Perception of Grid and Cloud Computing Applications

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ABSTRACT

This study investigates the perception, awareness, and practical engagement with grid and cloud computing technologies among computer science students in Nigerian tertiary institutions. Utilizing a structured online survey, data were collected from 585 respondents across a university and a polytechnic. Results indicate that while a majority of students are theoretically knowledgeable and highly aware, primarily through classroom instruction, there remains a significant gap between this knowledge and practical application. Key findings show that female university students aged 15–20 represent the most active users of cloud services. Despite general satisfaction and trust in cloud technologies, students report limited opportunities for real-world practice, citing infrastructural deficits and minimal hands-on exposure. The study underscores the need for curriculum enhancements, institutional support, and experiential learning strategies to bridge the theory-practice divide, thereby equipping students for future cloud-enabled careers in the digital economy.

Keywords: Tertiary Education, Practical Application, Cloud Computing, Theoretical knowledge, Digital Awareness.

1.0 INTRODUCTION

1.1 Background of the study

In the digital age, the growth of data, devices, and distributed systems has increased the need for efficient computing paradigms. Grid and cloud computing are foundational, offering transformative potential across sectors. Grid harnesses dispersed resources for complex problems, while cloud provides scalable, on-demand infrastructure, supporting flexibility, cost efficiency, and innovation. These technologies are linked, with grid serving as a precursor to cloud. Cloud evolved through virtualization, becoming user-friendly and viable for various applications, from data backups to AI. Grid remains crucial for scientific simulations and federated data processing.

1.2 Problem Statement

Despite their importance worldwide and their frequent use in developed countries, grid and cloud computing are still not yet commonly adopted or effectively used in some developing nations, especially in schools and universities. Many students learn about these ideas in textbooks but do not get enough chance to use real-world tools or platforms. This gap between what students learn and their hands-on experience makes it harder for graduates to be fully ready for digital transformation jobs.

1.3 Objectives and Scope of the Study

This study aims to address this gap, concentrating on tertiary students in Nigeria. It investigates students' awareness, theoretical understanding, and practical engagement with grid and cloud computing technologies. The research specifically examines how age, computer literacy, and institutional exposure influence their perception and use of these technologies.

1.4 Significance of the study

This study employs a structured survey to gather data-driven insights into how well students can apply their knowledge outside classroom settings. It also aims to identify systemic barriers such as inadequate infrastructure, poor curriculum integration, and limited institutional support that hinder full utilization of these technologies. By analyzing these factors, the research intends to offer practical recommendations for educators, policymakers, and technology stakeholders to close the gap between theory and practice, ultimately enhancing ICT education and preparing students for careers in cloud computing. As digital fluency increasingly correlates with job readiness and innovation, understanding and improving the transition from learning to application in grid and cloud computing is both critical and urgent.

2.0 LITERATURE REVIEW

2.1 Related Works

The rise of grid and cloud computing has transformed how computational resources are delivered and consumed. Grid computing allows geographically distributed resources to operate as a unified system. [1] described it as a framework for coordinated resource sharing and problem-solving in dynamic, multi-institutional virtual organizations. Its influence spans research areas such as weather modeling, molecular simulations, and data-intensive scientific experiments.

Cloud computing evolved from grid computing and virtualization, offering better accessibility, elasticity, and resource provisioning. [2] define it as a model for on-demand access to shared configurable resources. Its service models, IaaS, PaaS, SaaS, are widely adopted in business and consumer markets. Recent studies show cloud computing boosts organizational agility, reduces costs, and fosters innovation. A Survey on Cloud Computing. [3] conducted research on a survey on cloud computing security: issues, threats, and solutions. In the research, the survey presented a comprehensive overview of the security issues for different factors affecting cloud computing. The researchers emphasised a detailed discussion on several key topics regarding embedded systems, applications, storage systems, clustering-related issues and many more. The paper worked on public cloud and private cloud authorities as well as related security concerns. Additionally, it encompassed the requirements for better security management and suggested a 3-tier security architecture.

[4], in a review on cloud computing, described the basic concepts of cloud computing in a nutshell so that the readers can get an essence of this newly emerging technology.

In education, cloud computing has transformed digital learning with e-learning, resource sharing, collaboration, and virtual labs. While developed nations successfully adopt cloud services, developing countries like Nigeria face a gap between theory and practice. A Survey of Cloud Computing Awareness, Security Implication and Adoption in Nigeria IT-Based Enterprises by [5] found that the trend of awareness and adoption was very minimal, with many being sceptical, although few businesses were aware of the cloud technology. [6] investigated the impact of cloud computing technology on record management of secondary schools in Agbani Education Zone of Enugu State. The findings of the study showed that Software-as-a-Service and Platform-as-a-Service have significant impact on record management in secondary schools in Agbani Education zone of Enugu State. Based on the study's findings, it was recommended that secondary schools in the Agbani Education zone of Enugu State consider adopting Software-as-a-Service (SaaS) and Platform-as-a-Service (PaaS) solutions for their record management systems. [7] note that Nigerian institutions see benefits but are hindered by infrastructure and exposure challenges. Research shows that students often feel disconnected from real-world applications of classroom knowledge. Many learn about grid and cloud tech theoretically but lack hands-on experience with platforms like AWS, Azure, or Google Cloud. Many educational institutions also join the effort to incorporate cloud technologies into their operations. The use and adoption of cloud-delivered services are spreading everywhere, and the education sector is no exception. However, rates and magnitudes vary by region and regional currency positions [8]. Cloud computing is becoming an increasingly essential part of the education industry, and this is due to increasing competition in the higher education market and pressure on performance, student success, and revenue [9]. This gap challenges the development of a digitally proficient workforce. Literature suggests integrating grids' decentralized capabilities with cloud elasticity and AI orchestration for dynamic workload management, hinting at a future where these technologies coexist and improve smart infrastructures, IoT, and edge computing. This review emphasizes the urgent need for empirical studies on how students in developing countries perceive and use these technologies. It sets the stage for a study with data from a case in Nigerian tertiary institutions.

2.2 Research Questions

1. Which demographics show the highest level of cloud service usage?
2. What is the relationship between students' theoretical knowledge and their real-life experience with grid and cloud computing?
3. What are the barriers preventing students from transitioning theory into practice?
4. What is the level of satisfaction and trust in cloud computing among young users?

3.0 METHODOLOGY

3.1 Research Design

This study adopted a quantitative survey approach to assess students’ awareness, theoretical understanding, and practical application of grid and cloud computing technologies. A descriptive research design was used to collect data that reflects participants' knowledge levels, experiences, and perceptions.

3.2 Population and Sampling

The target population comprises students from tertiary institutions in Nigeria, specifically universities and polytechnics. The selection aimed to ensure diversity in academic exposure and technological literacy. A non-probability sampling method (convenience sampling) was used, relying on voluntary student participation through online survey links.

3.3 Data Collection

Data was collected using a structured questionnaire administered via Google Forms. The questionnaire consisted of both closed-ended questions (Likert scale, multiple choice) and multiple-choice items across several sections

In this study, the survey was conducted to analyze the perception and experience towards the use of grid and cloud computing applications among computer science students only. Data was collected using a structured questionnaire administered via Google Forms (a cloud computing application provided by Google).

The survey consists of two parts: the first part includes an introduction and personal information, which contains 5 questions: institution type, age classification, gender, computer literacy, and how they heard about grid and cloud computing?. Figure 1 shows the first section of the survey. All questions in the first and second were set to compulsory (i.e. must be answered before moving to the next section or submitting).

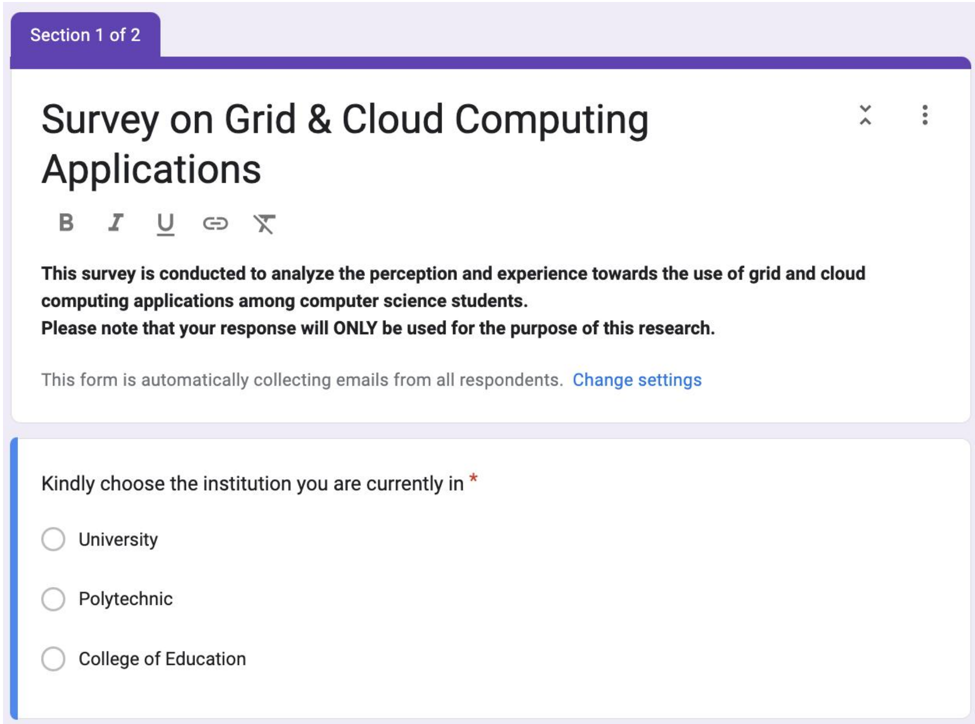


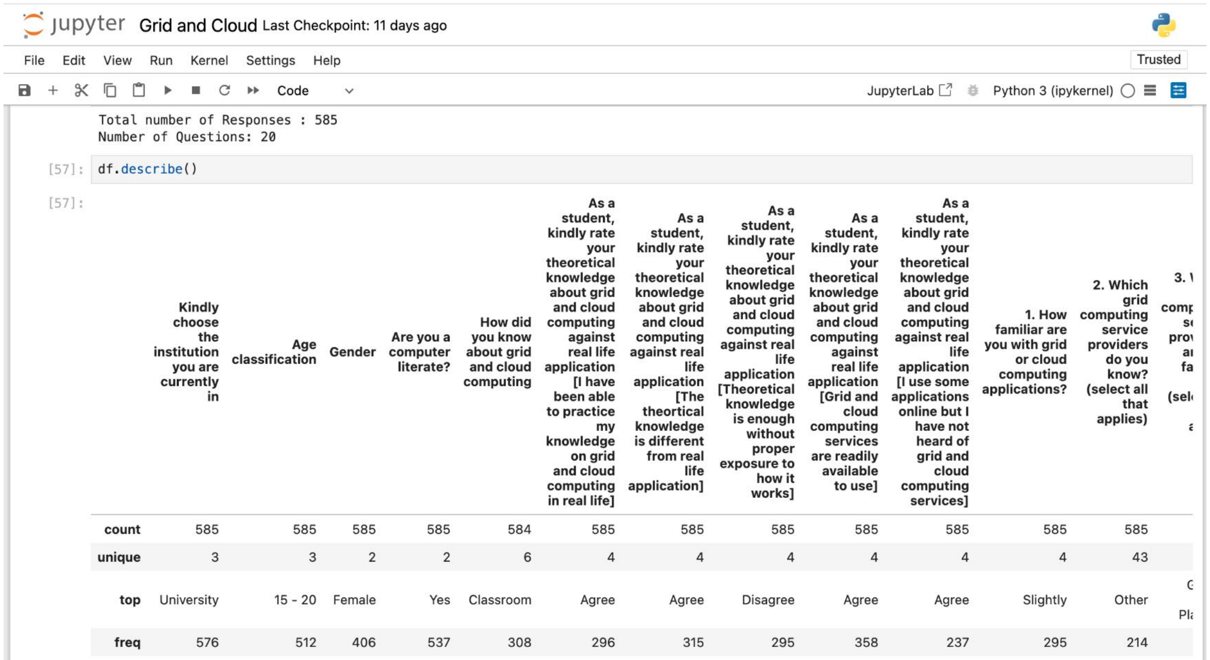
Figure 1: The first section of the survey contains the title and demographics.

The second section contains the questionnaire regarding individuals' experience with grid and cloud computing. Fifteen (15) questions were asked in the second section, making it 20 questions in total for the survey, and they were pivotal to individuals' perceptions of the use of grid and cloud computing applications. To view the survey, view_analytics shows how respondents answered each question.

4.0 RESULTS AND ANALYSIS

4.1 Data Analysis

585 responses were recorded from two institutions, the University and the Polytechnic students. The collected data was cleaned and analyzed using Microsoft Excel and Python for descriptive statistics. The Microsoft Excel format was exported as a Comma-Separated Value (.csv) file format and imported into Python (Jupyter).

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Total number of Responses : 585
Number of Questions: 20
[57]: df.describe()
[57]:
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	Kindly choose the institution you are currently in	Age classification	Gender	Are you a computer literate?	How did you know about grid and cloud computing	As a student, kindly rate your theoretical knowledge about grid and cloud computing against real life application [I have been able to practice my knowledge on grid and cloud computing in real life]	As a student, kindly rate your theoretical knowledge about grid and cloud computing against real life application [The theortical knowledge is different from real life application]	As a student, kindly rate your theoretical knowledge about grid and cloud computing against real life application [Theoretical knowledge is enough without proper exposure to how it works]	As a student, kindly rate your theoretical knowledge about grid and cloud computing against real life application [Grid and cloud computing services are readily available to use]	As a student, kindly rate your theoretical knowledge about grid and cloud computing against real life application [I use some applications online but I have not heard of grid and cloud computing services]	1. How familiar are you with grid or cloud computing applications?	2. Which grid computing service providers do you know? (select all that applies)	3. \ comp se prov ai fa (sel a
count	585	585	585	585	584	585	585	585	585	585	585	585	
unique	3	3	2	2	6	4	4	4	4	4	4	43	
top	University	15 - 20	Female	Yes	Classroom	Agree	Agree	Disagree	Agree	Agree	Slightly	Other	G Pl
freq	576	512	406	537	308	296	315	295	358	237	295	214	

Figure 2: Image showing the description of the data, total responses, and number of questions administered using Python language (Jupyter)

4.1.1 Demographics and Background Data (Categorical variables)

Each respondent was asked, “Are you computer-literate?”. Background information about respondents' technological skills or familiarity. This helps to know whether respondents are capable of using computers or digital tools. 537 (91.6%) students answered “Yes” and 48 (8.4%) students answered “No” to being Computer literate.

4.1.1.1 Demographics by Institution

Of the 585 respondents, 576 (98.5%) are University students, 8 (1.4%) are Polytechnic students, and 1 (0.1%) is from the College of Education. This suggests that a significant number of respondents who completed the survey are university students.

4.1.1.2 Demographics by Age Classification

There exist 4 classifications in the Age variations: below 15 with no students, 15 - 20 with 512 students, 21 - 25 with 54 students, and above 25 with 19 students. Figure 3 shows the percentage and the age classification of the total respondents.

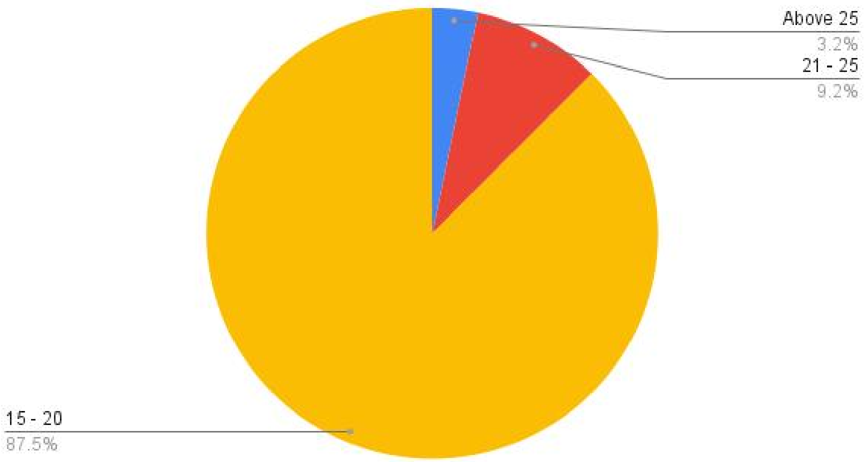

Figure 3: Age demographics of the sample population

4.1.1.3 Demographics by Gender

This study adopts binary gender classification, with 179 (30.6%) male students and 406 (69.4%) female students, for the total respondents.

4.1.2 Theoretical Knowledge (Categorical variables)

4.1.2.1 Awareness on grid & cloud computing

The question was asked in order to gather insight into information sources and awareness pathways. It also helps to assess how widespread knowledge of the topic is. Figure 4 is a chart showing the frequency of different sources through which people became aware of the topic "How did you know about grid and cloud computing?".

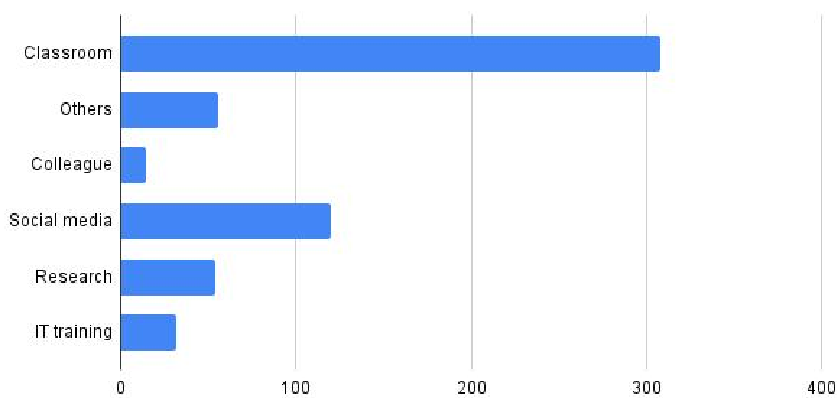

Figure 4: Sources of awareness about grid and cloud computing among students

This implies that a good number of students are aware of grid and cloud computing applications through the following media: 52.7% from the classroom, 20.5% from social media, 9.2% from research, 5.5% from IT training, 2.4% from colleagues, and 9.6% from other media.

4.1.2.2 Knowledge about grid computing service providers

Respondents were asked which grid computing service providers they are familiar with and were told to select all that apply. Figure 5 gives the total number of times various students selected the particular grid computing service provider and does not account for the total respondents, being a multiple-response question.

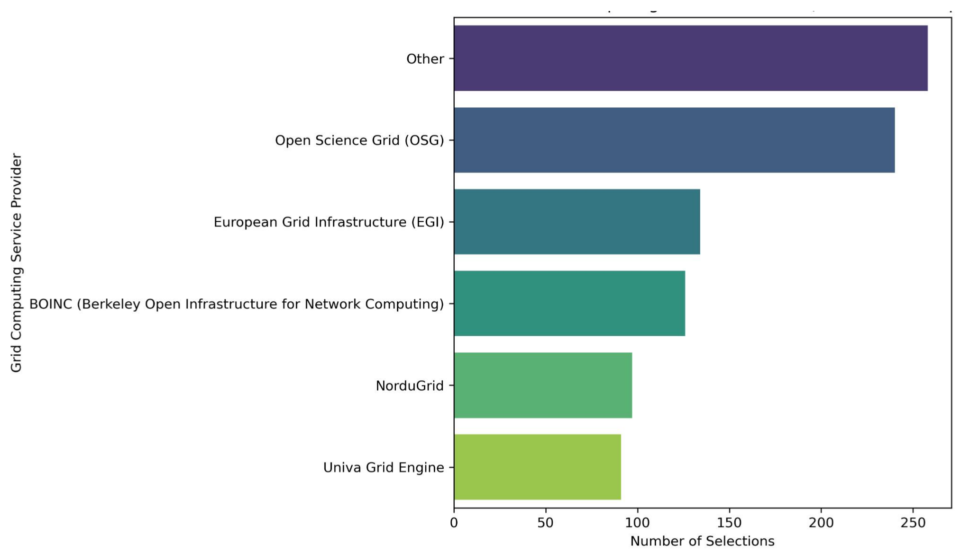

Figure 5: Selection of grid computing service providers among students

This may imply that most students are not familiar with the listed grid computing service providers or do not know them. Figure 7 illustrates students' selection of grid computing service providers.

4.1.2.3 Perception about cloud computing service providers

Respondents were asked which cloud computing service providers they are familiar with and were told to select all that apply. Figure 6 illustrates that most students are conversant with the listed cloud computing service providers.

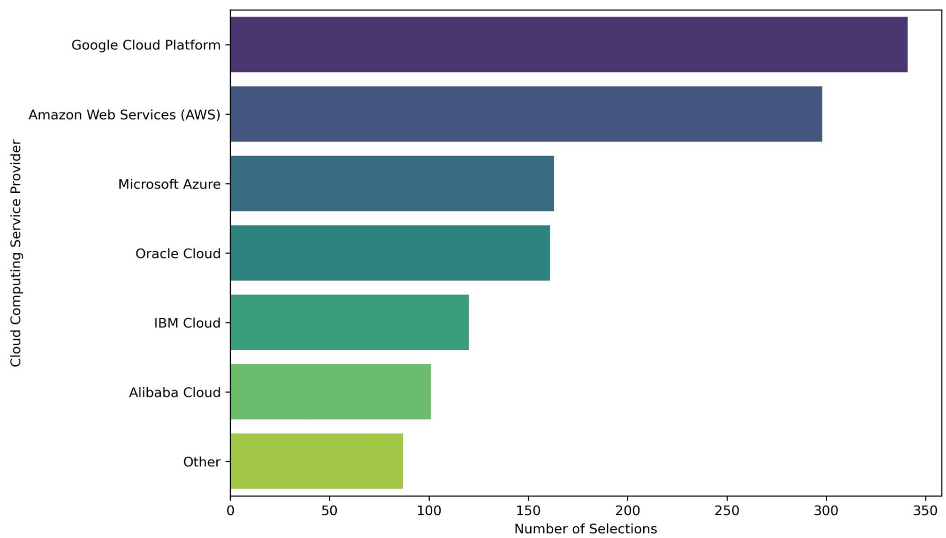

Figure 6: Cloud computing service provider selection among students

421 (72%) students answered "Yes", and 164 (28%) students answered "No" to having used a cloud storage service. Among the 421 students, Figure 7 illustrates the top 6 demographics of cloud storage adoption among students.

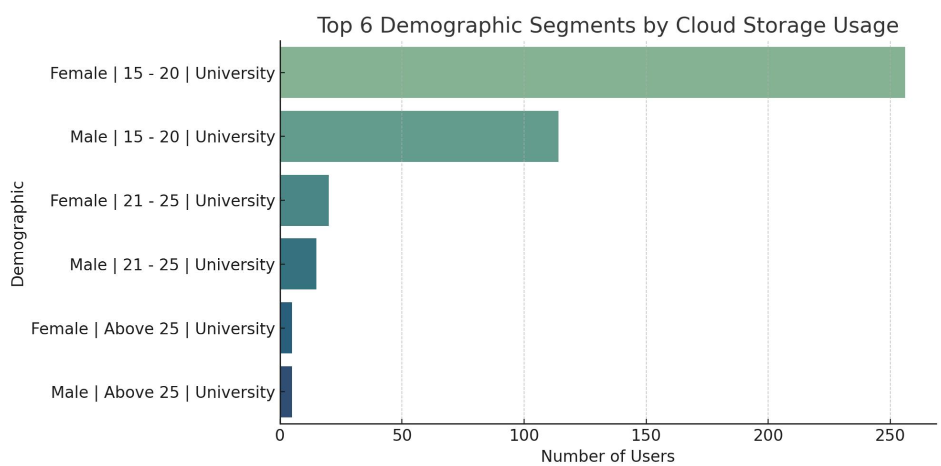

Figure 7: Students' demographics by cloud storage service utilization

This answers the first research question, "Which demographics show the highest level of cloud service usage?". Young female university students are the leading demographic using cloud services, indicating strong early adoption among this group.

4.1.3 Perception Rating (Ordinal variables)

4.1.3.1 Theoretical knowledge vs Real-life experience

The variable ranges from Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). As shown in Figure 8, 296 students (Agree) and 90 students (Strongly Agree) believe they have been able to practice their theoretical knowledge in real life.

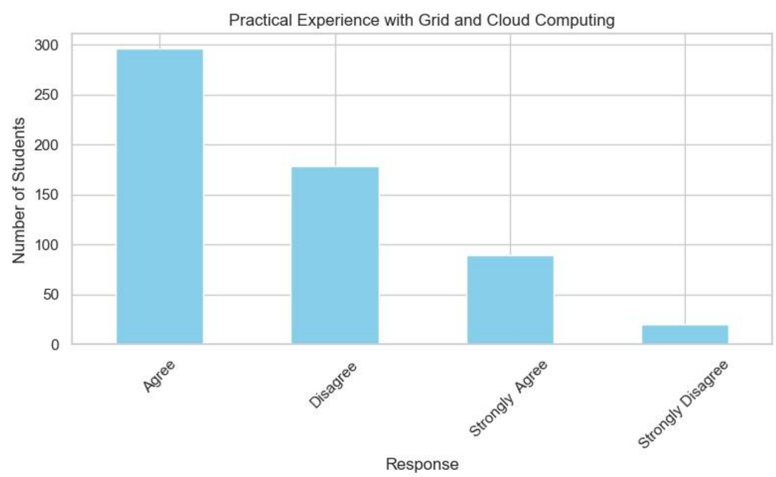

Figure 8: Practical experience of students on grid and cloud computing

The mean score: $\underline{x} = \frac{\Sigma \quad x}{n}$ = 2.7795

Standard Deviation $SD = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \underline{x})^2}{n-1}}$ = 0.7409

However, in Figure 9, 315 students also agree that theoretical knowledge is different from real-life application, indicating a significant gap between understanding and application.

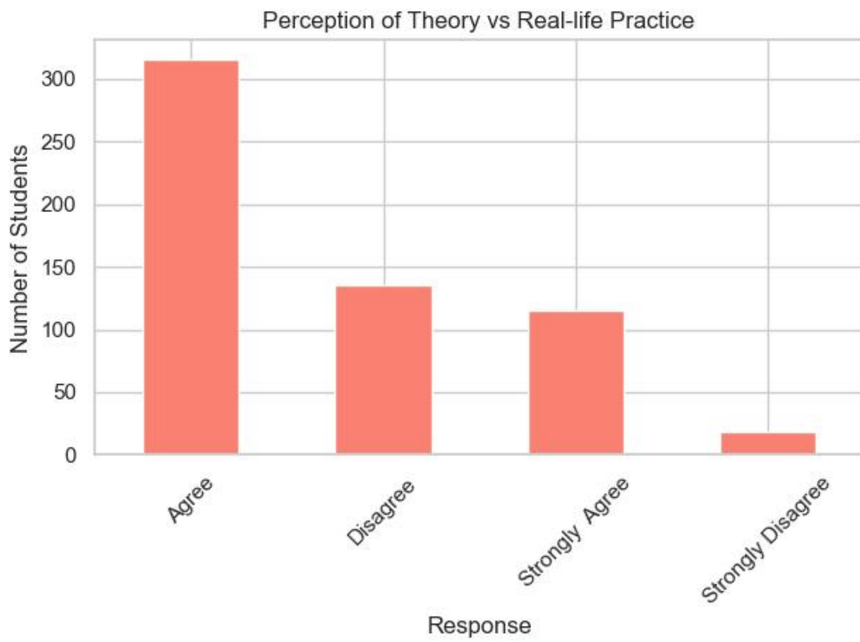

Figure 9: Theory vs reality of students' perception of grid and cloud computing.

$\underline{x} = 2.8992$

SD = 0.7414

This answers the second and third research questions, "What is the relationship between students' theoretical knowledge and their real-life experience with grid and cloud computing?" and "What are the barriers preventing students from transitioning theory into practice?". This shows that while many students have some exposure, practical implementation is still limited, and theoretical knowledge alone does not translate into sufficient hands-on skills. The barriers are likely to be inadequate laboratory resources and insufficient project-based learning.

4.1.3.2 Satisfaction level of cloud computing

The variable ranges from Very Satisfied (4), Satisfied (3), Somewhat Satisfied (2), and Not Satisfied (1). 354 students (Satisfied) and 55 (Strongly satisfied) are satisfied with cloud computing. Figure 10 illustrates the proportion of satisfaction among the students.

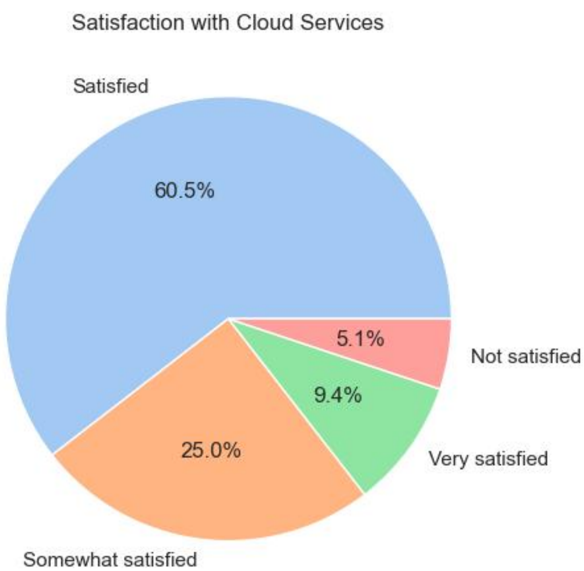

Figure 10: Level of satisfaction in cloud computing among students.

$\underline{x} = 2.7419$

SD = 0.6949

However, 394 respondents rated cloud/grid services as reliable. Only 21 rated them as not reliable, and 62 as highly reliable, as shown in Figure 11. The variable ranges from Very Reliable (4), Reliable (3), Somewhat Reliable (2), and Not Reliable (1).

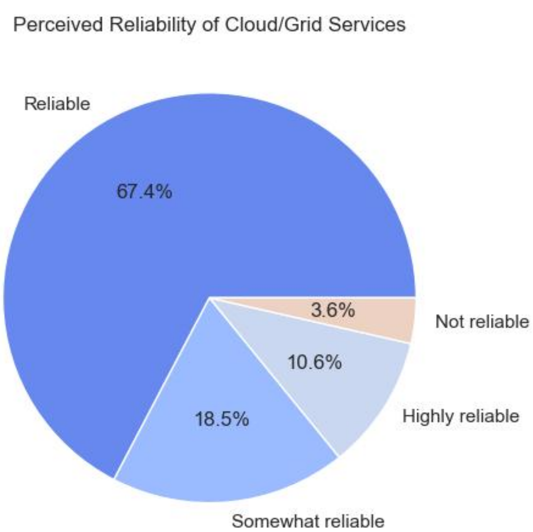

Figure 11: Reliability of grid/cloud services among students.

$\underline{x} = 2.7132$

SD = 0.5342

This answers the fourth research question, “What is the level of satisfaction and trust in cloud computing among young users?”. This shows a generally positive perception, with high satisfaction and trust in grid and cloud computing among student users.

4.2 Descriptive Analysis

The ordinal variables are: the practical experience of students on grid/cloud computing (Practical experience), the difference in theoretical knowledge and reality of grid and clod computing applications (Theory vs Reality), the sufficiency of theoretical knowledge to reality (Theoretical sufficiency), students’ familiarity with grid and cloud computing applications (Familiarity), students’ satisfaction with the performance of cloud computing service (Satisfaction), the reliability of grid and cloud computing services (Reliability), the importance of cloud computing for the future of businesses and organizations (Importance), and the recommendation of cloud computing services (Recommendation). Table 1 summarizes the mean and standard deviation of each variable.

Table 1: Mean and Standard deviation scores of the ordinal variables

Variables	Mean	Standard Deviation
Practical experience	2.78	0.74
Theory vs Reality	2.90	0.74
Theoretical sufficiency	2.37	0.82
Familiarity	2.28	0.76
Satisfaction	2.74	0.69
Reliability	2.85	0.64
Importance	3.41	0.65
Recommendation	3.03	0.76

4.3 Inferential Analysis

The relationship between all the ordinal variables is shown in Table 2, giving the correlation analysis.

Table 2: Correlation analysis of the ordinal variables

	Practical	Theory vs	Theoretical	Familiarity	Satisfaction	Reliablity	Importance	Recommen-

	Experience	Reality	Sufficiency					dation
Practical Experience	1.000000	0.155828	0.180010	0.340876	0.231822	0.066934	0.041581	0.150262
Theory vs Reality	0.155828	1.000000	0.126444	0.025196	0.009209	-0.024729	-0.014656	-0.018181
Theoretical Sufficiency	0.180010	0.126444	1.000000	-0.030313	0.036103	0.005344	-0.100619	0.023583
Familiarity	0.340876	0.025196	-0.030313	1.000000	0.273443	0.238562	0.148097	0.254882
Satisfaction	0.231822	0.009209	0.036103	0.273443	1.000000	0.404046	0.279296	0.353925
Reliablity	0.066934	-0.024729	0.005344	0.238562	0.404046	1.000000	0.389762	0.301807
Importance	0.041581	-0.014656	-0.100619	0.148097	0.279296	0.389762	1.000000	0.336218
Recommend-ation	0.150262	-0.018181	0.023583	0.254882	0.353925	0.301807	0.336218	1.000000

5.0 CONCLUSION

This study provides significant insights into the perception, awareness, and practical experience of grid and cloud computing among computer science students in Nigerian tertiary institutions. The findings reveal that while students demonstrate substantial theoretical knowledge and general awareness primarily acquired through classroom exposure, there is a notable gap between theory and real-life application. Despite high levels of computer literacy and positive attitudes toward cloud technologies, students struggle to transition this knowledge into hands-on skills, primarily due to limited infrastructure, inadequate exposure to platforms, and a lack of project-based learning environments.

Furthermore, the analysis highlights that female university students aged 15 - 20 show the highest adoption of cloud services, signaling a promising demographic for early technology integration. Overall, students expressed satisfaction and trust in cloud services, recognizing their importance for future careers and organizational success.

Bridging the gap between academic instruction and practical implementation is essential. This can be achieved through curriculum reforms, better institutional support, access to industry-standard tools, and fostering experiential learning. Doing so will empower students not only to understand but to apply these transformative technologies effectively, preparing them for digitally driven careers.

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