Student Attitudes toward Cloud Computing Use in Higher Education: A Case of LIS Students in Bangladesh

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Abstract

This study assesses students' perceptions of using cloud computing technologies for higher education. A quantitative study was conducted to learn more about how Bangladeshi Library and Information Science (LIS) students use cloud services. In this study, the instruments used to collect data were a printed questionnaire and Google Forms Link. The questionnaire used a five-point Likert scale to gather responses from the students. The printed questionnaire and Google Forms link (https://forms.gle/Sec9UFc8MdbWJWtw5) was sent to the University of Dhaka (DU), University of Rajshahi (RU), and Noakhali Science and Technology University (NSTU). With the teacher's assistance and the help of questionnaires they were distributed through Facebook Messenger and WhatsApp groups. The questionnaire comprised open and closed-ended questions. This survey was completed by 326 students, yielding a 90.5% response rate. The collected data were examined using the Statistical Package for the Social Sciences (SPSS). The study found that most students know cloud computing and often utilize cloud services. Similarly, the majority expressed satisfaction with their ease of access, backup capabilities, and storage capacity. The present research also revealed that students experience several obstacles while adopting cloud computing, including slow network speed, a lack of expertise, insufficient training, and worries about privacy and security. The results of the Mann-Whitney test found no significant difference between the level of education in terms of their perceptions of using the cloud services and the solutions provided by cloud services. The research results have profound implications for colleges and universities, particularly those looking to upgrade their technological setup and student support services. Subsequent research endeavors that tackle these concerns may augment the understanding of cloud computing in higher learning. In addition, it facilitates the development of more productive and comprehensible cloud-derived instructional resources.

Keywords: Cloud computing, LIS students, Higher education, Bangladesh

1. Introduction

A new paradigm for hosting and delivering services via the Internet, called cloud computing, has emerged. Although it is still in its infancy and has numerous challenges that need to be resolved, it provides business owners significant benefits [1]. Cloud-based learning

is the newest buzzword in the education sector. The flexibility it offers to create, share, and interact from any place at any time makes it unique. A few institutions have used cloud computing to develop adaptable learning environments [2]. Students at both undergraduate and graduate schools frequently use cloud computing. Cloud services efficiently handle and save educational materials for colleges and other learning establishments, increasing customer value [3]. Three service models - Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS) - are provided by the Cloud as a platform. These models present numerous options to enhance teaching and learning within academic settings [4]. To improve the learning experience for students, faculty members need to receive adequate training on how to use the newest cloud technologies [2].

The Internet and cloud computing technologies facilitate the development of a learning framework that utilizes cloud technologies to report issues with traditional education systems and to facilitate the accessibility of learning resources [2]. A small number of African universities have embraced cloud computing, which has helped them by lowering IT expenses and improving the effectiveness of teaching and learning [5]. Widely used computer tools and robust platforms, students in underdeveloped nations could use the Cloud for various educational purposes. According to Atikuzzaman and Islam [3] research, DU students depend on various cloud functionalities for everyday academic tasks. They also point out that a large number of educators and learners make use of numerous Google features in their instruction. There is little research on the present situation, applications, and difficulties of cloud computing technology in Bangladesh [3].

Students can benefit from cloud computing in an educational context. I can use the Cloud for work, group projects, online classes, assignments, and creating and editing papers and presentations. However, cloud computing attitudes in Bangladeshi academic environments are yet underdeveloped [6], and there is a void in the educational curriculum. Also, students are unaware of cloud computing and its benefits in education. This paper is empirical research designed to address this gap. The main aim is to improve LIS students' understanding of cloud computing in Bangladesh. The research's value stems from its ability to understand Bangladeshi university students' attitudes toward cloud computing thoroughly. Lastly, policymakers may utilize this study's results to tackle the particular issues related to cloud computing in higher education. We also discuss potential obstacles that LIS students may encounter and the likely future advantages of cloud computing in Bangladesh and other developing countries' perspectives.

2. Literature review

Cloud computing is a rapidly developing technology in the field of education. People and institutions in higher education are increasingly prepared to adopt new technologies. In higher education, cloud computing technology has changed how educators and teachers operate [2]. Cloud storage is a helpful tool for many purposes, including personal and enterprise use. Velte et al., [7] talked about the different service tiers that Cloud computing offers. Compared to traditional offline storage, cloud storage has the following advantages: files can be mobile and accessible for use in multiple electronic devices and locations; it can have a greater storage capacity; and backups are readily available with the provider [8].

According to Tubay [8], universities should continue subscribing to a cloud storage system and encourage students to make the most of it. The availability of digital library resources has enabled scholars, researchers, and students to have continuous and comprehensive access to scientific data and literature at their fingertips via a unified interface [9]. Many members of

the academic community plan to use the system because they believe it will increase their productivity with schoolwork and benefit the community. Similarly, Islam et al., [1] revealed that the Cloud has changed our lives. In general, cloud computing will stay a big part of IT in the future, helping businesses become more inventive, efficient, and adaptable in the face of quickening technological development.

Libraries may improve user experience and expand their services constantly compared to previous services [10]. This will likely spur more innovation in Artificial Intelligence (AI) and machine learning in the upcoming years. According to Taylor and Hunsinger [11], Google Docs is well-liked and accepted by university students. Students choose this cloud function because of its helpful features, accessibility, and convenience. When deciding whether to engage in cloud services, organizations should also consider the advantages of such services, such as cost savings, scalability, and flexibility [12].

If cloud computing develops at its current rate or even more quickly, hardware will not be needed as much. Most operations and business activities use virtualization, cloud computing, and Virtual Machines (VMs). As a result of this advancement, the expenses of setting up the physical infrastructure and software installations will be significantly reduced, resulting in lower hardware utility [13]. The use of cloud computing has grown dramatically in the last several years. Openness is one of the most critical limitations that every cloud infrastructure needs. Scalability, security, and intelligent monitoring are further significant limitations [1]. In certain situations, cloud computing is not the ideal answer for your computing requirements. Some of the constraints should be known to organizations. Using a cloud vendor carries several security risks [7]. (14) Investigated the key elements influencing Kosovo students' decisions to embrace cloud computing. Very few studies have been carried out in Bangladesh based on cloud technology. Therefore, this objective is to improve the value of the students' existing cloud computing knowledge developments. So, this paper investigates LIS students' perceptions of using cloud computing technologies for higher education in Bangladesh.

3. Research objectives and questions

The key objective of this study is to assess students' perceptions of using cloud computing technologies for higher education. Based on the key objective, the following research questions were formulated.

RQ1: What factors influence students' perceptions of using cloud computing in higher education?

RQ2: What are the benefits of cloud computing services to LIS students in Bangladesh?

RQ3: What are the challenges in using cloud computing services in Bangladesh?

RQ4: What exciting solutions are provided by cloud applications to LIS students?

RQ5: Are there any significant differences between the level of education and gender of using cloud services in university?

4. Methodology

A quantitative survey was conducted to acquire data to examine the utilization of cloud services among Library and Information Science (LIS) students in Bangladesh. The present study adopted a quantitative method to get feedback from the maximum number of LIS students within a limited period. The data collection instruments employed in this research included a physical questionnaire and a Google Forms Link. The initial segment of the questionnaire focused on obtaining demographic details of the students, encompassing

gender, age, computer proficiency, internet skills, and more. The study targeted 360 students from three Public Universities in Bangladesh. The survey was initiated in late October 2023 and persisted until January 2024. The universities under study were the University of Dhaka (DU), the University of Rajshahi (RU), and Noakhali Science and Technology University (NSTU). A five-point Likert scale was utilized in the questionnaire to obtain student responses. The survey questionnaire was created by incorporating elements from prior studies and developing new items. The survey began in early October 2023 and ended in November 2023. Printed questionnaires were circulated only to DU among the LIS students during class time with the help of a class representative. Google Forms link (https://forms.gle/Sec9UFc8MdbWJWtw5) was sent to RU and NSTU through the Facebook messenger and WhatsApp groups with the teacher's assistance at that respective university. The questionnaire included both closed and open-ended questions. The questionnaire had both closed- and open-ended questions. The survey received responses from 326 students, yielding a 90.5% response rate (Table 1). SPSS software was used to evaluate the gathered data. We have employed a non-parametric "Mann-Whitney" test to examine the significant differences between variables to answer RQ5.

Table 1. The response rate of the questionnaire

Name of the University	Response Received	Percentage (%)
DU	156	47.9
RU	97	29.8
STU	73	22.4
Total	326	100

Source: Computed by authors

5. Analysis and interpretation

5.1. Demographic profile and other information of the respondents

As shown in Table 2, 326 usable questionnaires are analyzed here. Most participants were from the DU (156, 47.9%), the second largest came from the RU (97, 29.8%), and the remaining 73(22.4%) were from the NSTU. As shown in Table 2, 171 (52.5%) participants were male, and 155 (47.5%) were female. The table's data reveals that most students, i.e., 288 (88.3%) of the respondents, belonged to the 21–24 age range. Among the respondents, 26 (8%) were 25-28. The remaining 12 (3.7%) were 17-20 years old. The respondents' study level indicates that among the 326 participants, 259 (79.4%) were undergraduates and the remaining 67 (20.6%) were graduate students. Table 2 also shows that half of the student's computer proficiency level is intermediary 163 (50%), followed by beginner 82 (25.2%), moderate 73 (22.4%), and expert 8 (2.5%). Among the participants, the majority of their internet proficiency level is intermediary 152(48.2%), followed by moderate 111 (34%), beginner 30 (9.2%), and expert 28 (8.6%).

Table 2. Demographic profile and other information of the respondents

Demographic	Frequency (N=326)	Percentage (%)
Gender		
Male	171	52.5
Female	155	47.5
Age group		
17-20 years	12	3.7
21-24 years	288	88.3
25-28 years	26	8.0
Current study level		
Undergraduate	259	79.4
Graduate	67	20.6
Computer proficiency level		
Beginner	82	25.2
Intermediate	163	50.0
Moderate	73	22.4
Expert	8	2.5
Internet proficiency level		
Beginner	30	9.2
Intermediate	157	48.2
Moderate	111	34.0
Expert	28	8.6
Total	326	100

5.2. Familiar with the term "cloud computing"

The table's data reveals that more than half of the LIS students are familiar with the term, i.e., 181 (55.5%). The table also shows that 64 (19.6%) LIS students have heard of the Cloud but are unsure of the concept, followed by 53(16.3%) who have heard of it, but it has been challenging to understand. Among the respondents, 24 (7.4%) have good knowledge about clouds, while only 4 (1.2%) have never heard of clouds until now (Table 3).

Table 3. Familiar with the term "cloud computing"

Statement	Frequency (N=326)	Percentage (%)
I have never heard of clouds until now	4	1.2
I have heard of Cloud but am not exactly sure of the concept	64	19.6
I have heard of the Cloud, but it has been a challenge for me to understand	53	16.3
I am familiar with Cloud	181	55.5
I have good knowledge of Cloud	24	7.4
Total	326	100

5.3. Cloud services do students usually use

The users were asked, "What cloud services do students usually use?" Table 4 establishes that the maximum number of students who used Gmail was 325 (21.3%), followed by Google drive 273 (17.9%), Google class room 227 (14.9%), Google form 163 (10.7%), Google slide 135 (8.8%) Google slide share 105 (6.9%). The table also showed that 33 (10.1%) use the Cloud frequently. The table also shows that only 65(4.3%) and 32 (2.1%) used Google Chat and Dropbox, respectively.

Table 4. Cloud services do students usually use

Statement	Frequency	Percentage (%)
Gmail	325	21.3%
Google Classroom	227	14.9%
Dropbox	32	2.1%
Google Drive	273	17.9%
Google doc	201	13.2%
Google chat	65	4.3%
Google form	163	10.7%
Google slide share	105	6.9%
Google slide	135	8.8%
Total	1526	100

Notes: Multiple responses were permitted

5.4. Where do you often student access the Cloud?

The users were asked, "Where do you often access the cloud?" Table 5 found that the maximum number of students who used the Cloud accessed by their mobile phone, i.e., 299 (40.8%), followed by laptop 223 (30.5%). The table also found that only 93 (12.7%) and 82 (11.2%) accessed the Cloud by Computer lab from their department and Desktop. The table also showed that very few, i.e., 35(4.8%), used the cyber center to access the Cloud.

Table 5. Where do you often access the Cloud

Statement	Frequency	Percentage (%)
Desktop	82	11.2%
Laptop	223	30.5%
Cyber center	35	4.8%
Computer lab at the department	93	12.7%
Mobile phone	299	40.8%
Total	732	100

Notes: Multiple responses were permitted

5.5. Frequency of using Cloud

The users were asked, "How often do you use the cloud?" Table 6 found that the maximum number of students who used Cloud frequently was 134 (41.1%), followed by sometimes 123 (37.7%), and rarely 36 (11%). The table also showed that 33 (10.1%) use the Cloud frequently.

Table 6. Frequency of using Cloud

Statement	Frequency (N=326)	Percentage (%)
Rarely	36	11
Sometimes	123	37.7
Freq" entry	134	41.1
Very frequently	33	10.1
Total	326	100

5.6. Satisfied with Cloud services

The users were asked about their satisfaction with cloud services. Among the respondents, the majority of them, 190 (54.3%), replied that they are satisfied with the cloud services, followed by neutral 104 (31.9%) and highly satisfied 19 (5.8%). The table also shows that

only 7 (2.1%) and 6 (1.8%) were highly dissatisfied and dissatisfied, respectively, regarding satisfaction with cloud services (Table 7).

Table 7. Satisfied with cloud services

Statement	Frequency (N=326)	Percentage (%)
Highly dissatisfied	7	2.1
Dissatisfied	6	1.8
Neutral	104	31.9
Satisfied	190	58.3
Highly satisfied	19	5.8
Total	326	100

5.7. Learn to use the Cloud services

The users were asked how they learned to use cloud services. Among the respondents, 210 (27.3%) replied that they understood the cloud services learning by themselves, followed by web browsing 148 (19.2%), class teachers 144 (18.7%), and YouTube tutorials 143 (18.6%). Table 8 also shows that only 124(16.1%) learned to use cloud services from their friends.

Table 8. Learn to use the cloud services

Statement	Frequency	Percentage (%)
Class teacher	144	18.7%
Learning myself	210	27.3%
Web browsing	148	19.2%
From friends	124	16.1%
YouTube tutorials	143	18.6%
Total	769	100

Notes: Multiple responses were permitted

5.8. Practical experience using Cloud

The users were asked about practical cloud experiences by giving various purpose options. Most users, i.e., 249 (39.8%), replied that they have practical experiences with the Cloud for class assignment purposes. Table 9 also shows that users have practical experiences with the Cloud through a research proposal 73 (11.7%), followed by project work 70 (11.2%), internship reports 69 (11.0%), research monograph 52 (8.3%), report preparation 49 (7.8%), thesis 44 (7.0%), and laboratory report purposes 19 (3.0%).

Table 9. Practical experience using Cloud

Statement	Frequency	Percentage (%)
Research proposal	73	11.7%
Internship report	69	11.0%
Thesis	44	7.0%
Class assignment	249	39.8%
Research monograph	52	8.3%
Report preparation	49	7.8%
Laboratory report	19	3.0%
Project work	70	11.2%
Total	625	100

Notes: Multiple responses were permitted

5.9. Opinions about using cloud services

Students were questioned regarding cloud services. According to Table 10, the majority of students indicated that they utilize cloud services because it makes it "easier to go to my educational resources," "increases the reliability of my reading materials," and "offers a substantial storage capacity for keeping valuable papers safe." For these statements mean are 3.95(SD=.881), 3.92(SD=.909), and 3.91(SD=.907). Participants favored using the Cloud as their mean score fell from 3.50 to 3.85.

Table 10. Opinions about using cloud services

Statement	Mean	SD
Sharing my class notes with friends is easier now	3.82	.911
Increases the reliability of my reading materials	3.92	.909
Easier to go to my educational resources	3.95	.881
Easier to engage in class conversations with fellow students	3.74	.886
Offers a substantial storage capacity for keeping valuable papers safe	3.91	.907
It is simple to communicate with academic members and research supervisors	3.63	.827
Convenient for use at any time from any place	3.85	1.027
Total	326	100

5.10. Barriers to using cloud services

Students were requested to tick a few difficulties they typically encounter when utilizing cloud services. According to Table 11, most students (243: 19.1%) acknowledged that a slow internet speed was the primary obstacle to using cloud-related services. Table 11 also shows that a lack of knowledge (219; 17.2%), a lack of cloud training programs (195; 15.3%), privacy security (137%; 10.8%), and unavailability of computer labs (130; 10.2%) are other barriers of cloud services mentioned by the students.

Table 11. Barriers to using cloud services

Statement	Frequency	Percentage (%)
Lack of knowledge	219	17.2%
Unavailability of computer lab	130	10.2%
Insufficient electricity	127	10.0%
Slow internet speed	243	19.1%
Lack of cloud training program	195	15.3%
Privacy of security	137	10.8%
Not interested	73	5.7%
Total	1272	100

Notes: Multiple responses were permitted

5.11. Opinions about the solutions provided by cloud services

Students were asked to give opinions about the solutions offered by cloud services. It was found that most of the students replied to the statement "gives my files 24/7 global accessibility" as the major solutions provided by cloud services (Mean=3.92; SD=.994). "Will increase my productivity when using a computer" is the second most common solution offered by cloud services (Mean=3.86; SD=.888), followed by "will enhance my readiness for scholarly work" (Mean=3.78; SD=.856), "will increase my competitiveness in the employment market in the future" (Mean=3.76; SD=.920) and "will make others more aware of my work" (Mean=3.69; SD=.870) (Table 12).

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Table 12. Opinions about the solutions provided by cloud services (n=326)

Statement	Mean	SD
Will enhance my readiness for scholarly work	3.78	.856
Will increase my competitiveness in the employment market in the future	3.76	.920
Will increase my productivity when using a computer	3.86	.888
I will make others more aware of my work	3.69	.870
Gives my files 24/7 global accessibility	3.92	.994

5.12. Differences between the level of education of using cloud services in university

The results of the Mann-Whitney test in Table 13 show that there was no significant difference between the level of education in terms of their perceptions of using the cloud services and the solutions provided by cloud services, except "simple to communicate with academic members and research supervisors" (Mann-Whitney $U=$ 7147.000; Wilcoxon W =40817.000; Z= -2.392; Asymp. Sig.= .017) and "will enhance my readiness for scholarly work" (Mann-Whitney U =7387.500; Wilcoxon $W=$ 9665.500; Z =-2.096; Asymp. Sig.= .036).

Table 13. Difference between the level of education in their perceptions and satisfaction with using cloud services and solutions provided by cloud services

Opinions about using cloud services	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Sharing my class notes with friends is easier now	7855.000	10133.000	-1.284	.199
Increases the reliability of my reading materials	7946.500	10224.500	-1.158	.247
It is easier to go to my educational resources	8330.000	42000.000	-.548	.583
Easier to engage in class conversations with fellow students	8501.500	10779.500	-.276	.782
Offers a substantial storage capacity for keeping valuable papers safe	8288.500	10566.500	-.606	.545
It is simple to communicate with academic members and research supervisors	7147.000	40817.000	-2.392	.017 *
Convenient for use at any time from any place	8665.000	10943.000	-.018	.986
Opinions about the solutions provided by cloud services				
Will enhance my readiness for scholarly work	7387.500	9665.500	-2.096	.036 *
Will increase my competitiveness in the employment market in the future	8401.000	42071.000	-.433	.665
Will increase my productivity when using a computer	8470.500	10748.500	-.327	.744
I will make others more aware of my work	8187.500	41857.500	-.767	.443
Gives my files 24/7 global accessibility	8501.000	42171.000	-.270	.787

*Notes: *significant at p<0.05*

5.13. Differences between genders in using cloud services at university

The results of the Mann-Whitney test in Table 14 show that there was no significant difference between male and female students in terms of their perceptions of using the cloud services and the solutions provided by cloud services, except "sharing my class notes with friends is easier now" (Mann-Whitney $U=$ 11678.000; Wilcoxon W =23768.000; Z= -1.992; Asymp. Sig. = .046) and "convenient for use at any time from any place" (Mann-Whitney $U=$ 11699.000; Wilcoxon $W=$ 23789.000; Z =-1.933; Asymp. Sig.= .053).

Table 14. difference between genders in their perceptions and satisfaction with using cloud services and solutions provided by cloud services

Opinions about using cloud services	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Sharing my class notes with friends is easier now	11678.000	23768.000	-1.992	.046*
Increases the reliability of my reading materials	12171.500	24261.500	-1.387	.165
Easier to go to my educational resources	12929.000	25019.000	-.414	.679
Easier to engage in class conversations with fellow students	13207.500	27913.500	-.058	.954
Offers a substantial storage capacity for keeping valuable papers safe	13143.000	27849.000	-.138	.890
It is simple to communicate with academic members and research supervisors	12566.000	24656.000	-.869	.385
Convenient for use at any time from any place	11699.000	23789.000	-1.933	.053*
Opinions about the solutions provided by cloud services				
Will enhance my readiness for scholarly work	12907.500	24997.500	-.454	.650
Will increase my competitiveness in the employment market in the future	12930.000	25020.000	-.410	.682
Will increase my productivity when using a computer	12146.000	24236.000	-1.421	.155
Will make others more aware of my work	13001.000	25091.000	-.319	.749
Gives my files 24/7 global accessibility	11929.000	24019.000	-1.646	.100

*Notes: *significant at p<0.05*

6. Findings and discussions

This study's key objective is to assess students' perceptions of using cloud computing technologies for higher education. The results of the study revealed some significant findings. Four research questions were formulated to guide the study in addressing this objective.

The RQ1 examined the factors influencing student's perceptions of using cloud computing in higher education. The research data revealed that more than half of the LIS students are familiar with the term, i.e., 181 (55.5%). The study also showed that 64 (19.6%) LIS students have heard of the Cloud but are unsure of the concept, followed by 53 (16.3%) who have heard of it but it has been challenging to understand. Among the respondents, 24 (7.4%) have good knowledge about clouds, while only 4 (1.2%) have never heard of clouds until now. The users were asked, "How often do you use the cloud?" The current study found that the maximum number of students who used Cloud frequently was 134 (41.1%), followed by sometimes 123 (37.7%), and rarely 36 (11%). The research also indicated that 33 (10.1%) use the Cloud frequently. This finding is quite similar to the study's findings [15], where the authors found that most academic library users at the Federal University of Petroleum Resources used the library mainly for the availability of the Internet in the library.

The RQ2 measured the benefits of cloud computing services to LIS students in Bangladesh. The users were asked about their satisfaction with cloud services. Among the respondents, the majority of them, 190 (54.3%), replied that they are satisfied with the cloud services, followed by neutral 104 (31.9%) and highly satisfied 19 (5.8%). The study also found that only 7 (2.1%) and 6 (1.8%) were highly dissatisfied, respectively, regarding satisfaction with cloud services. The users were asked how they learned to use cloud services. Of the respondents, 210 (27.3%) replied that they learned the cloud services learning by themselves, followed by web browsing 148 (19.2%), class teachers 144 (18.7%), and

YouTube tutorials 143 (18.6%). The research also indicated that only 124 (16.1%) learned to use cloud services from their friends. The users were asked about practical cloud experiences by giving various options. Most users, i.e., 249 (39.8%), replied that they have practical experiences with the Cloud for class assignment purposes. The study showed that users have practical experiences with the Cloud through a research proposal 73 (11.7%), followed by project work 70 (11.2%), internship reports 69 (11%), research monographs 52 (8.3%), report preparation 49 (7.8%), thesis 44 (7%), and laboratory report purposes 19 (3%). Students were asked their opinions about cloud services. The present research revealed that most students responded that they use cloud services because it is "easier to go to my educational resources," "increases the reliability of my reading materials," and "offers a substantial storage capacity for keeping valuable papers safe." For these statements mean are 3.95(SD=.881), 3.92(SD=.909), and 3.91(SD=.907). Participants favor using the Cloud as their mean score fell above 3.50 to 3.85.

The RQ3 measured the challenges in using cloud computing services in Bangladesh. Respondents were asked to list any obstacles they frequently encountered when utilizing cloud services. According to the current study, most students (243; 19.1%) said a slow network was the main obstacle to using cloud-based services. Next in order of importance were ignorance (219; 17.2%), absence of a cloud training program (195; 15.3%), privacy security (137%; 10.8%), and departmental computer lab unavailability (130; 10.2%).

The RQ4 explored the exciting solutions provided by cloud applications to LIS students. Students were asked to give Opinions about the solutions offered by cloud services. The present study found that most students replied to the statement "gives my files 24/7 global accessibility" as the major solutions provided by cloud services (Mean=3.92; SD=.994). "Will increase my productivity when using a computer" is the second most common solution offered by cloud services (Mean=3.86; SD=.888), followed by "will enhance my readiness for scholarly work" (Mean=3.78; SD=.856),), "will increase my competitiveness in the employment market in the future" (Mean=3.76; SD=.920) and "Will make others more aware of my work" (Mean=3.69; SD=.870).

The RQ5 discovered the differences between the educational level and gender of the students in university cloud services. The results of the Mann-Whitney test found that there was no significant difference between the level of education in terms of their perceptions of using the cloud services and the solutions provided by cloud services, except for "simple to communicate with academic members and research supervisors" and "will enhance my readiness for scholarly work." The results of the Mann-Whitney test showed that there was no significant difference between male and female students in terms of their perceptions of using the cloud services and the solutions provided by cloud services, except "sharing my class notes with friends is easier now" and "convenient for use at any time from any place."

The study's findings have important implications for higher education institutions, especially those seeking to improve their technical infrastructure and student assistance. According to the research, while most Library and Information Science (LIS) students are aware of cloud computing, a significant number either do not completely understand the idea or struggle to comprehend it. So, this emphasizes the necessity for educational programs and seminars to increase students' cloud literacy. Furthermore, the high levels of student satisfaction with cloud services and their widespread use highlight the need to incorporate cloud-based solutions into academic settings. Institutions should investigate broadening access to cloud services while ensuring these tools are dependable and user-friendly. The findings also emphasize the advantages of cloud computing in assisting academic work, such

as easy access to learning resources and the ability to back up papers, implying that cloud services are becoming increasingly important to students' academic achievement.

However, the highlighted difficulties, such as sluggish network connections and a lack of training, highlight areas that need institutional attention. Addressing these limitations through infrastructure enhancements and focused training programs can boost cloud technology efficacy and acceptance. Moreover, the survey found that students believe cloud services boost their efficiency, academic readiness, and job market competitiveness. This impression may encourage higher education institutions to increase their investment in cloud technology to better prepare students for future professions.

Therefore, it is recommended that educational institutions continue using the cloud storage service, for which it now has a license. The institution must create metrics based on this to assess the effectiveness of cloud-based educational activities. They can improve educational achievements, student happiness, and competitiveness in academic and career markets. Collaborating with different learning groups of people, exchanging academic papers, and giving lessons would help educators and users become more productive using the Cloud. Furthermore, the institution can create a model strategy for using cloud technology, include all relevant parties, and implement an action plan. Higher educational institutions may maximize the fixed cost of subscribing to such cloud storage solutions and increase productivity by encouraging everyone to utilize the system. Finally, our findings suggest that higher education institutions should continue to support and incorporate cloud computing technologies and address the hurdles to practical implementation.

7. Conclusions

The study analyzed students' attitudes toward employing cloud computing technologies in higher education, focusing on LIS students in Bangladesh. According to the research, many students know cloud computing, although many do not fully comprehend the idea. According to the statistics, students often utilize cloud services, with the majority expressing satisfaction with their ease of access, backup capabilities, and storage capacity. Despite the positive opinions, students experience several obstacles while adopting cloud computing, including sluggish network connections, a lack of expertise, insufficient training, and worries about privacy and security. These constraints underscore the need for upgraded infrastructure and extensive training programs to boost cloud technology effectiveness. The study also highlighted other advantages of cloud computing, such as increased efficiency in academic assignments and improved preparation for future employment, implying that cloud services are essential in helping students' educational and professional growth. The present research is significant because it provides a comprehensive understanding of the views of Bangladeshi LIS students regarding cloud computing. Additionally, the findings of this study could be used by policymakers to address the specific problems associated with cloud computing in higher education in Bangladesh and other developing countries. Future studies addressing the following issues can contribute to a more thorough knowledge of cloud computing in higher education and create more effective and accessible cloud-based educational materials.

7. 1. In-depth analysis of cloud literacy

Future studies should identify the precise gaps in cloud literacy among students and develop tailored educational interventions to overcome these gaps.

7.2. Longitudinal studies

Tracking changes in students' views and use of cloud computing over time may give significant insights into the long-term impact of cloud integration in higher education.

7.3. Comparative studies

By comparing cloud computing views and usage across fields and institutions, best practices and methods for effective deployment may be identified.

7.4. Impact of training programs

Investigating the effectiveness of various cloud computing training programs and workshops could help institutions design more effective educational resources.

7.5. Technological advancements

Investigating the influence of developing technologies and advancements in cloud computing infrastructure on student usage and perceptions may reveal future trends and requirements.

7.6. Privacy and security concerns

Further research could focus on developing and evaluating strategies to address students' privacy and security concerns related to cloud computing.

7.7. Cloud computing in remote learning

With the move to remote learning, future research might examine how cloud computing can be optimized to support online education while improving student engagement and outcomes.

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