

Study of Cloud Computing Implementation in School Education: The Case of Selected Schools in Madhya Pradesh

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Abstract – This paper focuses on examining the awareness and integration of cloud technology in school education within Madhya Pradesh. It will delve into the advantages of employing cloud computing services within educational settings, as well as the hurdles faced in adopting these services in Madhya Pradesh. Through both qualitative and quantitative research methodologies, the perspectives of students and educators regarding cloud adoption will be explored. The study also investigates the utilization of cloud technology in educational institutions where computer technology is increasingly prevalent, aiming to maximize benefits for students and staff. The research findings indicate a notable level of awareness among academic communities in Madhya Pradesh regarding cloud services, highlighting potential positive outcomes for educational purposes. This study aimed to investigate the determinants of cloud computing adoption among faculty members in the Madhya Pradesh school education system using the Technology Acceptance Model (TAM). Data were gathered from 300 participants through a survey designed to explore the relationship between perceived ease of use, perceived usefulness, perceived security, perceived benefit, perceived accessibility of the information technology system, and cloud computing adoption in school education.

Keywords: - School Education, Cloud Computing, Adoption, Resource Management

INTRODUCTION

Learning technologies have received serious attention for the last two decades. Technology has enabled learning and teaching to be conducted in an active and autonomous situation. On the other hand, teachers play an important part in delivering successful instructional practices. The teacher's role comprises curriculum enactor, learning mediator, examiner, and educator. Research also reported that many teachers contributed to the improvement of student learning outcomes. Similar findings reported teachers' influence in improving students' ability to work together. Although previous studies provided evidence that teachers have an important contribution in learning and instructional practice, they still need technical support and enough online infrastructures in daily instructional activities to support teaching. When working with the learning technologies and learning tools, teachers' technology acceptance has long been identified as a strong determinant of successful online learning practices. In the original concept, studies of technology acceptance measure behavioral intention to use the technology. Teachers' technology acceptance comprises some predictors to measure their intention in utilizing the specific learning technology, for instance, PU and PEU as a significant determinant. The diversity of Indian state schools and limited resources face a lot of problem in adoption of cloud-based education in school education.

The survey of study finds some common problem in cloud computing. To explore the goals for implementing the criteria/standards of various accreditations and rankings for achieving excellence in engineering institutions in India, the primary data was gathered from students, faculty and staff members, senior members, and leaders of engineering colleges. Surveys are used to gather information for quantitative analysis. In order to comprehend the function and effects of accreditation and ranking, interviews with the functional heads of various departments and institutions were also conducted. Observations were also made. Both in-person and online surveys were administered. The questionnaires were typically given out by hand. On the other hand, it is unfortunate that despite the progressive impact of cloud computing (CC) in the educational industry, many schools in developing countries have yet to embrace and fully utilize its potential. Reasons for this underutilization in educational institutions in most developing countries include poor awareness of the technology's advantages, inadequate expert training for both staff and students, financial constraints, and several other limitations. Madhya Pradesh falls into this category, where the impact of CC technology in school education is only mildly felt. Although the region has yet to fully implement CC technology across all sectors, the educational system cannot flourish as expected without fully embracing this trend. While studies on CC exist in the developed world, there are limited studies focusing on the core implementation of cloud computing technology in the Madhya Pradesh region. This research aims to contribute to existing knowledge by exploring how educational institutions in developing countries, particularly in Madhya Pradesh, have adopted and implemented cloud computing in their teaching and learning processes. The study also seeks to identify the factors that have impeded the full adoption of CC technology in the region over the years. Finally, the research will suggest possible ways to implement CC technology in the education sector in Madhya Pradesh and other developing states to match the standards of developed regions. The rest of the article is organized as follows: Section 2 discusses related work on cloud computing adoption, Section 3 explores the methodology of cloud computing, and Section 4 concludes the article.

II RELATED WORK

The extensive global adoption of cloud computing (CC) technology in the educational sector, combined with the competitive nature of school systems, drives institutions to seek improved solutions to educational challenges

through the implementation of CC technology. This adoption is expected to elevate the quality and standards of academic practices and outcomes. Schools in Madhya Pradesh are regarded as a key sector that significantly contributes to economic growth by supplying the labour market with skilled manpower and expertise through their numerous annual graduates. The TAM, as utilized in prior research [1], holds significant importance within contemporary technological acceptance literature. A recent comprehensive review indicates that TAM surpasses alternative theoretical models in effectively gauging the acceptability of technology in educational settings. The research methodology employed in this study, as indicated by the author [2], is grounded theory—a widely recognized approach in various research endeavours. Grounded theory studies can incorporate both qualitative and quantitative data generation techniques. In illustrating the significance of private cloud computing in an educational context, the author [3] presents a case study conducted at University Sains Malaysia, Malaysia. The outcomes of the study reveal that the deployment of cloud resources offered flexibility to both students and staff, facilitating seamless access and fostering more effective and efficient collaboration within and among research groups. Reference [4] delves into an exploration of the features and delivery methods provided by cloud computing, along with an examination of the potential challenges and limitations associated with its integration in business environments. Additionally, the study delves into cybersecurity aspects related to cloud computing, specifically focusing on intrusion detection and prevention, and elucidates their applicability within the cloud infrastructure. The objective of the study by the author [5] is to put forth a streamlined framework designed for extracting pertinent information from an educational environment, specifically tailored for decision-making within a cloud infrastructure. The framework prioritizes the resolution of essential queries for administrative and decision-making objectives. In [6], the study involved participants from both staff and students within higher education institutions throughout Nigeria. As of the time of writing, Nigeria boasted a considerable population of around 1.9 million university staff and students. Given this substantial size, the survey realistically could not target the entire population comprehensively. Reference [7] employed a combination of quantitative and qualitative methods in the research. A survey instrument was utilized to gather data for a quantitative analysis of the STOPE model. The questionnaire items were adapted from previous studies

and adjusted to suit the study's specific context. Additionally, a preliminary study involving 35 respondents was conducted to pilot and enhance the survey instrument. The goal of this research by the author [8] is to comprehend the significance of implementing cloud computing (CC) in higher education institutions. This exploration not only presents opportunities for future research but also holds practical implications that can guide decision-makers in the legal and effective utilization of CC services. The methods employed by the author [9] have gained recent popularity, especially in the realm of quantitative research methodology. For this investigation, the primary data collection method utilized was an online questionnaire survey. The utilization of case studies is prevalent in research focused on information systems and technology deployment, as noted by the author [10]. The argument put forth suggests that case studies are especially fitting when combined with qualitative research methods. This combination permits thorough and intensive research activities, typically adopting an inductive approach to explore the relationship between theory and research. The study conducted by the author [11] focuses on the analysis and assessment of concerns related to the educational reform of a higher education institution. The research object encompasses four key components. To quantify the impact of various cloud computing technologies, the paper introduces three distinct cloud computing technologies, employing them to analyse research data and construct pertinent mathematical models. The primary focus of this study by the author [12] is to uncover the significant facilitators and fundamental advantages of cloud computing (CC) in Higher Education Institutions (HEIs) in West Africa. Additionally, the study aims to identify the key factors that have hindered the widespread adoption of this technology in the specified region. The study by the author [13] introduces an assessment approach for university teaching reform, grounded in thorough research networking. Subsequently, it delves into an in-depth analysis of the principal components of university teaching reform. The study proceeds to establish the evaluation framework for university teaching reform, culminating in the development of a comprehensive model for assessing educational reforms within universities. Reference [14] emphasizes that the establishment of scientific and methodological foundations for this issue is essential. This effort will enable the organization of both theoretical and practical frameworks, fostering the creation of cloud-based educational tools. This approach is rooted in a systematic

enhancement of the system for the professional training of future engineers. Reference [15] seeks to counterbalance the dominance of U.S. tech giants, particularly in the cloud sector, such as Microsoft, Google, and Apple, by leveraging open-source solutions. Despite this aim, the high levels of user satisfaction contradict the argument. Looking ahead, it becomes crucial to uphold and enhance both usefulness and user-friendliness, and when necessary, bridge any gaps through effective communication measures. In [16], cloud computing enables the connection of instructors and students through a unified, versatile platform. Beyond its cost-effectiveness, cloud computing facilitates the implementation of innovative teaching methods and enhances student engagement. The objective of this paper by the author [17] is to explore alternatives to traditional IT usage while guiding universities toward heightened awareness and increased funds. Higher education institutions anticipate a 20% reduction in IT funding by transitioning a significant portion of their applications to cloud-based solutions. Reference [18] examines the advantages of leveraging cloud computing in the educational sector, proposing the adoption of this innovative technology by the Nigerian educational sector. The research employed descriptive research methods for the investigation. Reference [19] utilized an analytical descriptive approach to delineate and analyze the problem, with the study population comprising 1,245 employees within charitable institutions. The findings of the study indicated that the overall assessment of the Senior Management Support axis was 68.13%, while the organizational structure axis achieved a level of 83.9%. Reference [20] employed a highly qualitative multiple-case-study design for the current research. This study delves into the cybersecurity threats and challenges faced by State Universities and Colleges (SUCs), focusing on the increasing risks of malicious online threats targeting essential information data stored in digital systems.

III METHODOLOGY

In exploring the context of school education in Madhya Pradesh, it's important to understand its vast geographical and demographic diversity. As the 3rd largest state in India by area, Madhya Pradesh encompasses a wide range of regions, each with its own distinct characteristics and challenges. Madhya Pradesh's school education system is broadly categorized into two sections: rural and urban area schools. These schools vary significantly in terms of infrastructure, resources, and accessibility. While urban schools may have better

facilities and resources, rural schools often face challenges such as inadequate infrastructure, limited access to technology, and insufficient teaching staff. Within both rural and urban areas, Madhya Pradesh hosts a mix of private, government, and hybrid schools. Private schools typically cater to families seeking better quality education, while government schools serve a larger population, especially in rural areas where access to private education may be limited. Hybrid schools, which combine elements of both private and government schooling, provide an alternative option for families seeking a balance between affordability and quality. Data collection in Madhya Pradesh's school education system typically involves gathering information from schools across various levels, ranging from 9th standard to 12th standard. This data collection process encompasses both teaching and non-teaching aspects, involving faculty members in activities related to curriculum delivery, administration, and student support services. Overall, exploring Madhya Pradesh's school education landscape involves examining the diverse educational settings, infrastructure challenges, and the role of different types of schools in catering to the needs of students across rural and urban areas. Understanding these dynamics is crucial for addressing disparities and implementing targeted interventions to improve the quality of education for all students in the state. This section describes the table of student data collection sheet, the total data collection is 10 and the rating of question is marked as 4-5, 5-8, 8-10, the mark of rating covers the factors such as good, very good and excellent.

Table 1 data representation of questioner of 10

Question	2		3		5	
	Responder	questioner value 4-5	Responder	questioner value 5-8	Responder	questioner value 8-10
1	8	1	5	0	9	1
2	6	1	7	1	7	1
3	8	1	6	1	6	1
4	4	1	4	0	4	1
5	8	1	2	1	8	0
6	2	0	8	1	3	1
7	5	1	2	1	8	1
8	9	1	8	0	6	1
9	5	1	6	1	4	0
10	7	0	3	1	8	1

Q1) How far do you agree with the fact that cloud services such as shared access, data storage are important to students and lecturers in a school?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	50%	300	600
Agree	16%	100	600
Disagree	8%	50	600
Strongly disagree	16%	100	600

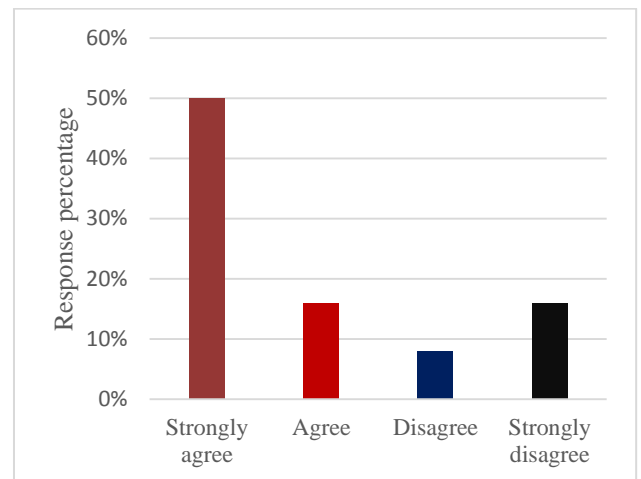


Figure: 1 Comparative analysis of using Strongly agree, Agree, Disagree, strongly disagree, and Response percentage.

Q2) Are you using the cloud services such as online texting, video conferencing, online referencing for academic purposes?

Options	Response percentage	Number of responses	Total number of respondents
Yes	33%	200	600
No	16%	100	600

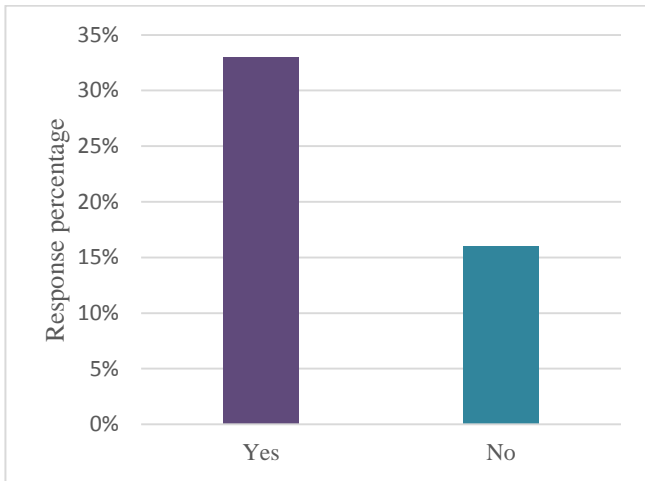


Figure: 2 Comparative analysis of using Yes, No, and Response percentage.

Q3) Cloud services like video conferencing and online reference helps students in training and research related needs for their education. Do you agree?

Options	Response percentage	Number of responses	Total number of respondents
Yes	50%	300	600
No	16%	100	600

Options	Response percentage	Number of responses	Total number of respondents
Reduced cost of organizational expenses	50%	300	600
Powerful functional capabilities	25%	150	600
Low maintenance burden	8%	50	600
Eliminates disaster recovery risk	16%	100	600

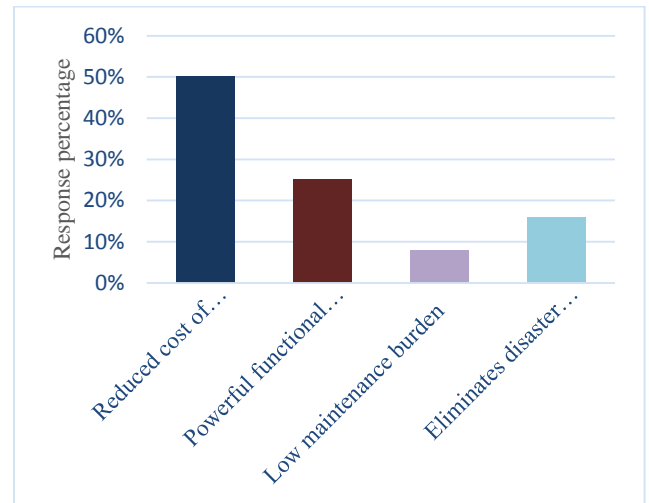


Figure: 4 Comparative analysis of using Reduced cost of organizational expenses, Powerful functional capabilities, Low maintenance burden, Eliminates disaster recovery risk, and Response percentage.

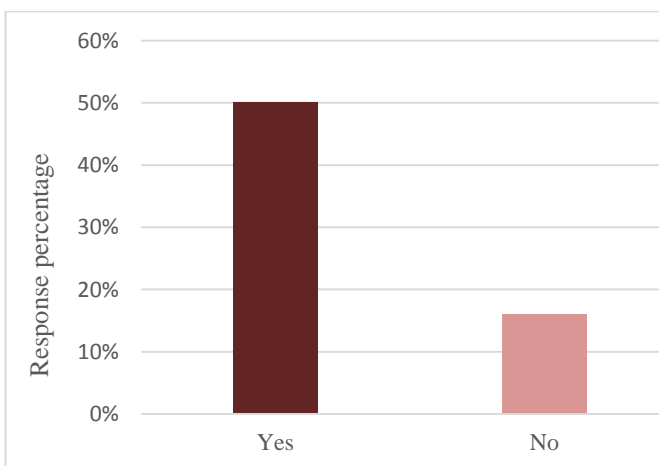


Figure: 3 Comparative analysis of using Yes, No, and Response percentage.

Q4) Apart from online texting and video conferencing, which cloud application, will be more beneficial to educational institutions?

Q5) How far do you agree that school in Madhya Pradesh have gained benefits with the implementation of cloud services?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	50%	300	600
Agree	33%	200	600
Disagree	8%	50	600
Strongly disagree	8%	50	600

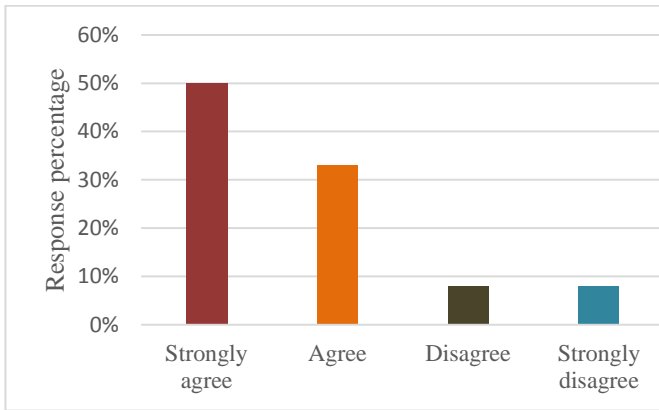


Figure: 5 Comparative analysis of using Strongly agree, Agree, Disagree, strongly disagree, and Response percentage.

Q6) What are the changes that happened in school Madhya Pradesh after the implementation of cloud computing?

Options	Response percentage	Number of responses	Total number of respondents
Improvement in data storage	25%	150	600
Enhanced security	25%	150	600
Cost effective	25%	150	600
Improved learning options	25%	150	600

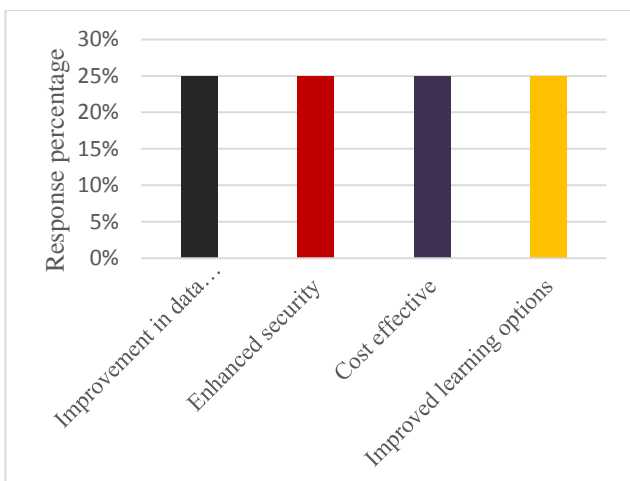


Figure: 6 Comparative analysis of using Improvement in data storage, Enhanced security, Cost effective, Improved learning options, and Response percentage.

Q7) What type of cloud computing courses are given by school to students?

Options	Response percentage	Number of responses	Total number of respondents
Full time	33%	200	600
Part time	33%	200	600
Online	16%	100	600
None	16%	100	600

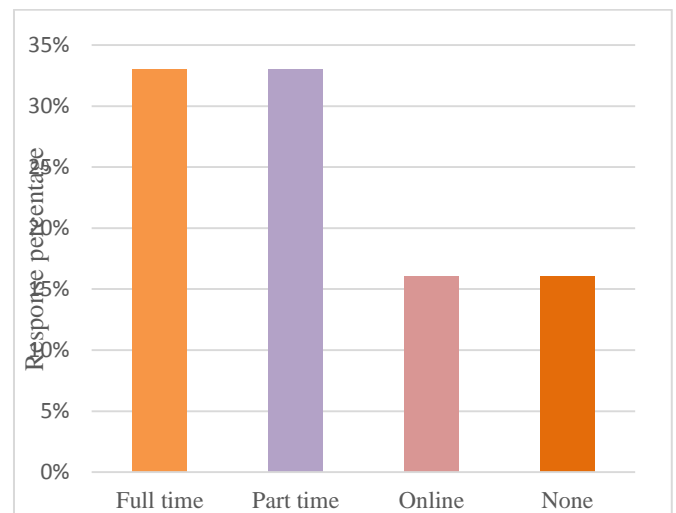


Figure: 7 Comparative analysis of using full time, part time, Online, None, and Response percentage.

Q8) Linking school data in a cloud network will be more secure. What is your opinion?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	33%	200	600
Agree	16%	100	600
Disagree	25%	150	600
Strongly disagree	25%	150	600

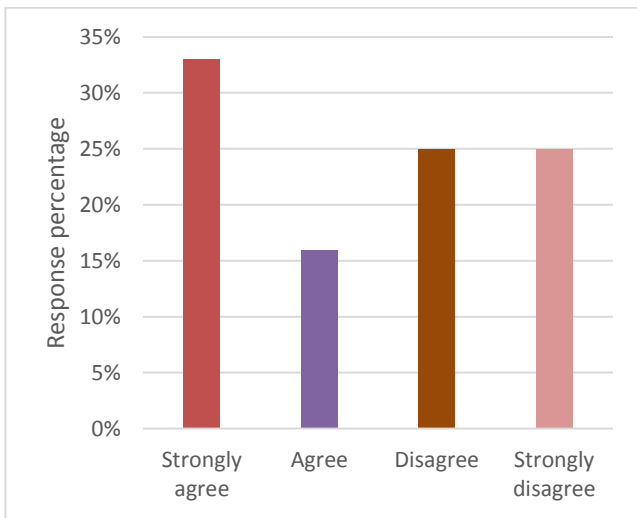


Figure: 8 Comparative analysis of using Strongly agree, Agree, Disagree, strongly disagree, and Response percentage.

Q9) To what extent do you think that an awareness is required among students and lecturers in the school about the importance of Cloud training?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	50%	300	600
Agree	16%	100	600
Disagree	16%	100	600
Strongly disagree	16%	100	600

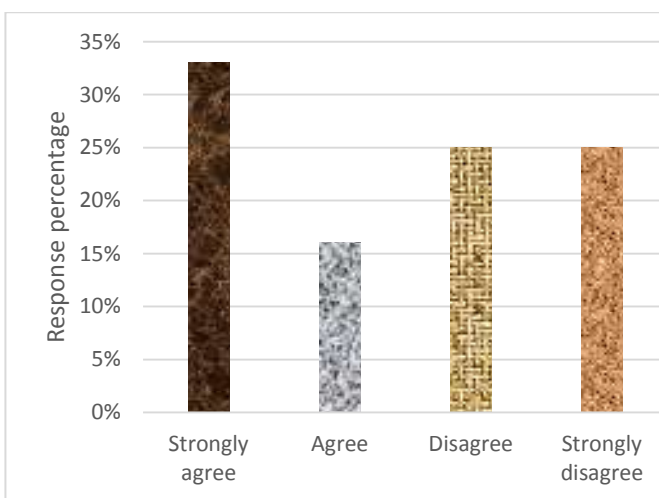


Figure: 9 Comparative analysis of using Strongly agree, Agree, Disagree, strongly disagree, and Response percentage.

Q10) How far do you agree that all the school switching to a cloud community network can make huge changes in IT structure of Madhya Pradesh education?

Options	Response percentage	Number of responses	Total number of respondents
Strongly agree	33%	200	600
Agree	16%	100	600
Disagree	41%	250	600
Strongly disagree	8%	50	600

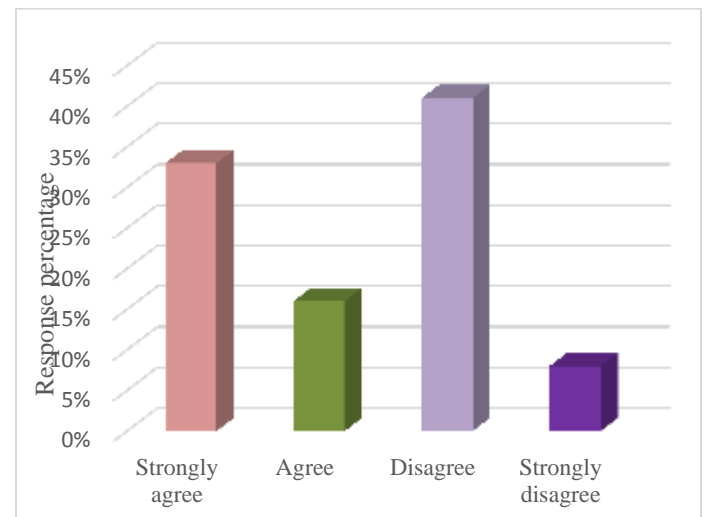


Figure: 10 Comparative analysis of using Strongly agree, Agree, Disagree, strongly disagree, and Response percentage.

CONCLUSION

This study focused on examining the implementation of cloud computing (CC) in Madhya Pradesh schools from the perspectives of experts and students. Overall, the validity of this study was relatively high. One key finding is the importance for school education in Madhya Pradesh to capitalize on future innovations that enhance their core activities. The research also found that CC has the potential to elevate educational standards going forward. Importantly, the research suggests that IT-related programs should incorporate CC to better prepare school education and its stakeholders for the implementation of this technology. This comprehensive approach ensures a thorough understanding of the factors

influencing cloud computing adoption. Finally, despite the recognized strategic and operational benefits of cloud computing in ICT innovation, school education institutions (SEIs) have not fully embraced its adoption. Therefore, there is a pressing need to identify the factors affecting cloud computing adoption among HEIs. To address this gap, the present research develops and proposes a conceptual model to examine the drivers of cloud computing adoption within SEIs. The findings of this research observed the following five categories of cloud-based education for school that are leveraged through quality education parameters as perceived by faculty and students: the naming of parameters mentions as CQES (cloud quality education system)

- CQES-1 (>90% rating given by faculty and students of private school of Madhya Pradesh)
- CQES-2 ($\geq 80\%$ and $< 90\%$ rating given by faculty and students public school)
- CQES-3 ($\geq 70\%$ and $< 80\%$ rating given by faculty and students rural)
- CQES-4 ($\geq 60\%$ and $< 70\%$ rating given by faculty and students remote area schools)
- CQES-5 ($<60\%$ rating given by faculty and students of trust-based schools)

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