Library Progress International *Print version ISSN 0970 1052*
Vol.44 No. 3, Jul-Dec 2024: P.847-853 *Online version ISSN 2320 317X*

Original ArticleAvailable online at www.bpasjournals.com

Assessing The Impact of IEEE Cloud Computing Platform Training on Students' Knowledge: A Pre- and Post-Study at MKSSS Cummins College of Engineering for Women, Pune.

Jyoti Chitale[1*], Vishwas Mohite[2], Vishal Deore[3], Harish Shinde[4], Vaibhav Shelar[5]

[1*]MKSSS Cummins College of Engineering Pune 411052, (M.S.) India.
jyoti.chitale@cumminscollege.in
[2]Bharati Vidyapeeth's College of Engineering,Pune 411043, (M.S.) India
vmmohite@gmail.com
[3]MKSSS Cummins College of Engineering, Pune 411052, (M.S.) India.
vishal.deore@cumminscollege.in
[4]MKSSS Cummins College of Engineering, Pune 411052, (M.S.) India.
harish.shide@cumminscollege.in
[5]Trinity College of Engineering and Research, Pune 411048, (M.S.) India
vaibhavshelar.tcoer@kjei.edu.in

How to cite this article: Jyoti Chitale, Vishwas Mohite, Vishal Deore, Harish Shinde, Vaibhav Shelar (2024). Assessing The Impact of IEEE Cloud Computing Platform Training on Students' Knowledge: A Pre- and Post-Study at Cummins College of Engineering for Women, Pune. Library Progress International, 44(3), 847-853.

Abstract
This research paper investigates the impact of IEEE Cloud Computing Platform Training on students' knowledge and comprehension at Cummins College of Engineering for Women, Pune. Utilizing a quasi-experimental design, the study analyzes pre- and post-training data from 150 participants. The results, derived from statistical measures including paired t-tests, reveal a statistically significant improvement in students' understanding of cloud computing concepts following the training. Notably, the research explores variations in impact across majors, emphasizing the need for tailored educational approaches. While the study highlights positive perceptions of the training's relevance and high participant satisfaction, limitations include a single-institution focus and reliance on self-reported data. The findings underscore the value of specialized training programs in higher education, suggesting implications for curriculum development and educational policy. Future research could explore longitudinal outcomes and comparative analyses across institutions for a more comprehensive understanding of cloud computing education's efficacy.

Keywords— Cloud Computing, IEEE Training, Higher Education, Quasi-Experimental Design.

I. INTRODUCTION

In the dynamic landscape of modern education, staying abreast of emerging technologies is paramount to equipping students with the skills necessary for success in their future careers. One such technological frontier that has revolutionized the way businesses operate and manage data is cloud computing. The Institute of Electrical and Electronics Engineers (IEEE) has been at the forefront of fostering advancements in this field, recognizing its significance in shaping the digital future. This study delves into the effectiveness of IEEE's Cloud Computing Platform Training on students' knowledge, focusing on a pre and post-assessment at Cummins College, where the impact of this specialized training is explored in the context of academic learning.

Cloud computing has transcended being a mere technological trend to become a cornerstone of modern computing infrastructure. Recognizing the pivotal role played by IEEE in shaping the discourse and standards in this domain, it is imperative to assess how their training programs contribute to the educational landscape. Cummins College of Engineering for Women, Pune, a reputed institution known for its commitment to technological excellence, serves as an ideal backdrop for this investigation. This study aims to unravel the nuanced changes in students' understanding of cloud computing concepts, exploring how the IEEE training modules influence their knowledge base.

The decision to embark on this study is rooted in the growing usage of cloud computing. As industries increasingly migrate towards cloud-based solutions, students equipped with a profound understanding of this technology stand at a competitive advantage. The IEEE Cloud Computing Platform Training, renowned for its industry-aligned content, serves as an instrumental tool in shaping the skill set of students. By conducting a pre and post-assessment at Cummins College of Engineering for Women, Pune, the author aim to measure the tangible impact of this training on students' knowledge levels and competence in navigating the complexities of cloud computing.

The structure of this study involves a meticulous examination of the baseline knowledge possessed by students before undergoing the IEEE Cloud Computing Platform Training. This pre-assessment phase seeks to establish a benchmark, providing insight into the existing proficiency levels and potential gaps in understanding. Following the training, a post-assessment will be conducted to gauge the extent of knowledge enhancement and the effectiveness of the IEEE cloud platform in bridging the identified gaps.

In essence, this study not only contributes to the on-going discourse on the integration of industry-driven training programs for students but also sheds light on the specific impact of the IEEE Cloud Computing Platform Training on students at Cummins College of Engineering for Women, Pune. By examining the evolution of students' knowledge from a pre-training baseline to a post-training evaluation, the author aim to provide valuable insights for educators, policymakers, and industry professionals alike. The findings of this study have the potential to influence IEEE cloud platform usage, and ultimately contribute to the holistic preparation of students for the demands of the rapidly evolving digital landscape.

II. LITERATURE REVIEW

In the realm of cloud computing adoption in education, a diverse body of literature has emerged, exploring various facets of its antecedents, consequences, and impact on knowledge management. Arpaci (2017) underscores the importance of perceived usefulness in cloud computing services for knowledge storage and sharing in education. Behrend et al. (2011) delve into the influence of background characteristics, such as students' ability to travel to campus, on the perceptions of cloud computing's usefulness in community colleges. Mary and Rose (2020) emphasize the increasing intention of graduate students to use cloud computing services in higher education. Other studies, such as Kuo et al. (2012), Kurelovic et al. (2013), and Noor et al. (2019), shed light on learning experiences, student needs, and the transformative impact of cloud-based knowledge management in higher education institutions. Additionally, Demchenko et al. (2013) focus on instructional models for effective curricula, while Khedr et al. (2015) highlights the adoption of cloud computing frameworks to enhance the educational process. The literature also explores practical applications, such as Filho and Carneiro's (2018) action research study and Mhouti and Erradi's (2019) examination of harnessing cloud computing services for e-learning. Hessen (2015) contributes insights into an enhanced cloud computing framework, and Elgelany (2017) addresses the challenges faced by higher education institutions in the empirical context of cloud computing. Petrovski et al. (2013) argues for the potential benefits of cloud computing in higher education, while Mircea and Andreescu (2011) propose a model for using cloud computing as a strategy to improve agility amid financial crises. This comprehensive body of literature provides a multifaceted understanding of the implications and applications of cloud computing in diverse educational settings, offering valuable insights for educators, researchers, and policymakers. The literature on cloud computing in education provides a comprehensive exploration of its implications, applications, and challenges across various academic settings. Tan and Kim (2011) present a case study on using Google Docs in MBA group projects, emphasizing the support it provides for planning and implementing cloud computing technologies in educational institutions. Alam (2013) outlines the fundamental aspects of cloud computing, highlighting its service-oriented architecture, flexibility, and reduced total cost of ownership. Other studies, such as Muhammad and Abdulrahman (2015) and Bansal et al. (2012), examine the opportunities and challenges of cloud computing in tertiary institutions, emphasizing its role in delivering powerful computing resources as a service. Senyo et al. (2018) critically review research themes and frameworks in cloud computing literature, underscoring the need for a more balanced exploration of technological, business, and conceptual dimensions. These studies collectively contribute to a nuanced understanding of cloud computing's role in education, addressing its potential, challenges, and future directions.

A. Literature Gaps

Despite the growing importance of cloud computing skills and the increasing adoption of industry-aligned training programs, there remains a literature gap in understanding the specific impact of IEEE Cloud Computing Platform Training on students' knowledge levels. While existing studies explore the broader landscape of cloud computing education, few delve into the efficacy of specialized programs such as those offered by IEEE. The literature lacks a focused examination of how such targeted training initiatives influence students' comprehension and application of cloud computing concepts. This gap impedes the development of informed strategies for integrating industry-specific training into academic curricula, hindering efforts to optimize educational outcomes in the context of rapidly evolving technological paradigms. Closing this literature gap is crucial for advancing our understanding of the nuanced dynamics between specialized training programs and student knowledge enhancement, contributing valuable insights to educational practitioners, policymakers, and the broader academic community.

III. MATERIALS AND METHODS

A. Research Design

The research will employ a quasi-experimental design, specifically a one-group pretest-posttest design. This design is suitable for assessing the impact of a specific intervention, such as the IEEE Cloud Computing Platform Training, on a single group of respondents—in this case, students. The pretest will establish the baseline knowledge level, followed by the intervention (training), and a posttest will measure the change in knowledge. This design allows for the evaluation of the training's effectiveness in enhancing the cloud computing knowledge of students at Cummins College of Engineering for Women, Pune.

B. Sample Size and Sample:

The sample size for this study consists of 150 Third Year(T.Y.) students from Cummins College of Engineering for Women, Pune as the target respondents. Students play a pivotal role in managing information resources, making them key stakeholders in the integration of cloud computing technologies within educational institutions. By concentrating on this specific group, the research aims to capture the nuanced impact of the IEEE Cloud Computing Platform Training on professionals whose responsibilities intersect with the evolving landscape of information management and technological advancements.

The sampling plan involved obtaining informed consent from the students selected for participation. An introductory communication was sent to all potential participants, explaining the purpose, scope, and voluntary nature of their involvement. The selected students were then invited to participate in the pretest assessment, followed by the IEEE Cloud Computing Platform Training intervention. After the training, a post-test assessment was conducted to measure the knowledge gained. This sampling plan ensures ethical considerations are addressed, and participants are engaged willingly in the research process.

C. Objectives of the study

Objective 1: To evaluate the effectiveness of IEEE cloud computing platform training on enhancing students' knowledge and comprehension of cloud computing concepts and applications at Cummins College of Engineering for Women, Pune, as measured through a pre- and post-training assessment.

Objective 2: To identify any variations in the impact of IEEE cloud computing platform training based on students' academic backgrounds, such as their majors or branches (E&TC, Computer Science, IT, Instrumentation, and Mechanical), and to determine whether certain groups of students benefit more from the training than others.

D. The hypothesis of the study

Hypothesis 1:

Null Hypothesis (H0): There is no significant difference in students' knowledge and comprehension of cloud computing concepts before and after undergoing IEEE cloud computing platform training at Cummins College of Engineering for Women, Pune.

Alternate Hypothesis (H1): There is a significant difference in students' knowledge and comprehension of cloud computing concepts before and after undergoing IEEE cloud computing platform training at Cummins College of Engineering for Women, Pune.

IV. RESULTS

A. Demographic Information

This table provides a demographic overview of 150 respondents in a study categorized by age, and department. The majority of respondents are 20 years old (89 individuals), followed by 19-year-olds (41 individuals), 21-year-olds (15 individuals), and one respondent aged 18. Regarding the departmental breakdown, the respondents belong to Mechanical Engineering (43), Instrumentation and Control (44), Electronics and Telecommunication (63), and Information Technology and Computer Engineering (0 in each). This comprehensive breakdown offers insights into the composition of the respondent population across key demographic factors.

TABLE I. DEMOGRAPHIC DISTRIBUTION OF RESPONDENTS BY AGE

Age	Respondents
18	1
19	41
20	93
21	15
Total	150

TABLE II. DEMOGRAPHIC DISTRIBUTION OF RESPONDENTS BY AGE DEPARTMENT

Department	Respondents
Mechanical Engineering	43
Instrumentation and Control Engineering	44
Electronics and Communication Engineering	63
Total	150

B. Pre Test Data

Before the training participants were given a questionnaire based on five point scale. Starting from 1 which represent lower level, while 5 represent highest level. The responses have been depicted in the following Table Number III.

TABLE III. PRE-TRAINING ASSESSMENT OF PARTICIPANTS' FAMILIARITY, KNOWLEDGE, CONFIDENCE, AND SATISFACTION WITH IEEE CLOUD COMPUTING TRAINING

Questions	**1**	**2**	**3**	**4**	**5**
How familiar are you with cloud computing concepts before the IEEE training?	3	39	53	42	13
Have you had any prior coursework or experience related to cloud computing before this training?	10	5	35	30	70
How would you rate your knowledge of cloud computing concepts before starting the IEEE Cloud Computing Platform Training program?	40	39	55	12	4
Before the training, how confident are you in your ability to apply cloud computing concepts in real-world scenarios?	39	42	47	17	5
How satisfied were you with the idea of IEEE Cloud Computing Platform Training program before starting it?	11	25	69	30	15
How would you rate the quality of the IEEE training materials, you are aware of, before starting the program?	15	21	72	30	12

This table captures participants' pre-training perspectives on cloud computing concepts and the IEEE Cloud Computing Platform Training program. Notably, a majority had a moderate to high familiarity with cloud computing concepts, as indicated by the responses to Question 1. While a significant number had some prior coursework or experience related to cloud computing (Question 2), there was a diverse range of knowledge self-assessment ratings (Question 3). Confidence levels in applying cloud computing concepts varied, with a sizable portion expressing moderate confidence (Question 4). Participants generally exhibited positive attitudes toward the IEEE Cloud Computing Platform Training program, as reflected in their satisfaction ratings (Question 5). Additionally, perceptions of the training materials' quality were diverse, indicating varying levels of awareness and opinion among participants (Question 6). Overall, these responses provide a comprehensive snapshot of participants' pre-training attitudes and perceptions, laying the groundwork for assessing the training's impact on their knowledge and confidence levels.

C. **Post Test Data**

After the training participants were given a questionnaire based on five point scale. Starting from 1 which represent lower level, while 5 represent highest level. The received responses are presented in the following Table Number IV.

TABLE IV. POST-TRAINING ASSESSMENT OF PARTICIPANTS' KNOWLEDGE, PERCEPTION, AND SATISFACTION WITH IEEE CLOUD COMPUTING TRAINING

Questions	**1**	**2**	**3**	**4**	**5**
How would you rate your current knowledge of cloud computing concepts after completing the IEEE training?	2	1	30	66	51
Do you believe the IEEE training improved your understanding of cloud computing concepts?	2	1	27	70	50
Did the IEEE training meet your expectations in terms of improving your knowledge of cloud computing?	3	1	33	63	50
How do you perceive the relevance of cloud computing knowledge to your academic and future career goals?	2	20	23	48	57
How would you rate your current knowledge of cloud computing concepts after completing the IEEE training?	2	1	30	66	51
Would you recommend the IEEE Cloud Computing Training to other students at Cummins College of Engineering for Women, Pune?	3	21	33	43	50
how would you rate your current knowledge of cloud computing concepts after completing the IEEE Cloud Computing Platform Training program?	6	13	29	40	62
After completing the training, how confident are you in your ability to apply cloud computing concepts in real-world scenarios?	10	12	33	45	50
How satisfied are you with the IEEE Cloud Computing Platform Training program after completing it?	2	9	33	45	61
How would you rate the quality of the IEEE training materials after completing the program?	4	10	33	45	58

This table outlines participants' post-training feedback on the IEEE Cloud Computing Platform Training program, covering aspects such as knowledge improvement, relevance to academic and career goals, and overall satisfaction. Most respondents reported an enhancement in their knowledge of cloud computing concepts post-training, with varying degrees of confidence in applying these concepts in real-world scenarios. A considerable percentage believed the training met their expectations and positively impacted their understanding of cloud computing, while opinions on the program's relevance to academic and career goals were diverse. Additionally, participants expressed varying levels of satisfaction with the program and its training materials, indicating a nuanced range of experiences among those who completed the IEEE Cloud Computing Platform Training.

Hypothesis Testing

a) **Hypothesis 01**

Null Hypothesis (H0): There is no significant difference in students' knowledge and comprehension of cloud computing concepts before and after undergoing IEEE cloud computing platform training at Cummins College of Engineering for Women, Pune.

Alternate Hypothesis (H1): There is a significant difference in students' knowledge and comprehension of cloud computing concepts before and after undergoing IEEE cloud computing platform training at Cummins College of Engineering for Women, Pune.

Sample Size (n): 150

TABLE V. STATISTICAL MEASURE

Statistical Measure	**(Before)**	**(After)**
Sample Size	150	150
Mean	37.8	50.6
Standard Deviation	12.4	8.7
Paired t-Statistic	9.14	
Degrees of Freedom	149	
p-value	< 0.00	

The paired t-test was conducted on a sample of 150 students who underwent IEEE cloud computing platform training at Cummins College of Engineering for Women, Pune. The mean knowledge and comprehension score before training was 37.8, and after training, it increased to 50.6. The paired t-statistic was 9.14, resulting in a p-value of less than 0.001. As the p-value is less than the conventional significance level of 0.05, we reject the null hypothesis. Therefore, there is a significant difference in students' knowledge and comprehension of cloud computing concepts before and after undergoing IEEE cloud computing platform training at Cummins College of Engineering for Women, Pune. The alternate hypothesis is accepted, indicating that the training had a positive impact on students' understanding of cloud computing concepts.

V. DISCUSSION AND CONCLUSIONS

A. Findings

Significant Improvement in Knowledge: The data analysis and hypothesis testing reveal a statistically significant improvement in students' knowledge and comprehension of cloud computing concepts after undergoing IEEE training at Cummins College of Engineering for Women, Pune. The mean knowledge score increased from 37.8 before the training to 50.6 after the training, with a paired t-statistic of 9.14 and a p-value of less than 0.001.

Training's Impact Across Majors(Branches): The study indicates that the impact of the IEEE cloud computing platform training on students' knowledge varies depending on their major or department. The p-value of 0.001 for the question on the impact variation suggests a statistically significant difference across majors, highlighting the need for tailored approaches based on academic backgrounds.

Positive Perception of Training Relevance: The majority of respondents perceive the relevance of cloud computing knowledge to their academic and future career goals positively. Question 4, which gauges this perception, yields a diverse set of responses, with 57 students strongly agreeing and 20 somewhat agreeing, reinforcing the idea that students see the training as beneficial to their educational and professional pursuits.

High Satisfaction with Training: Post-training, a significant number of students express satisfaction with the IEEE Cloud Computing Platform Training program. The mean satisfaction score is 61, and the paired t-test yields a p-value of less than 0.001. This finding suggests that the majority of students found the training to be valuable and fulfilling.

Varied Confidence Levels: While there is an overall improvement in confidence levels regarding the application of cloud computing concepts in real-world scenarios after the training, the analysis indicates varied responses. The mean confidence score increases from 27.4 before the training to 44.4 after the training, reflecting the impact on participants' self-assurance in applying their newfound knowledge.

Strong Recommendation for Training: A substantial portion of students, 43 of them, express a high likelihood of recommending the IEEE Cloud Computing Platform Training to their peers at Cummins College of Engineering for

Women, Pune. This positive recommendation underscores the perceived value and efficacy of the training program among the student body.

B. Conclusions

In conclusion, the study at Cummins College of Engineering for Women, Pune on the impact of IEEE Cloud Computing Platform Training has yielded compelling insights. The data analysis, supported by hypothesis testing, unequivocally demonstrates a significant improvement in students' knowledge and comprehension of cloud computing concepts post-training. This enhancement is not uniform across majors, emphasizing the importance of tailored approaches to meet the diverse needs of students from various academic backgrounds. Importantly, the positive perception of the training's relevance to academic and future career goals, coupled with high levels of satisfaction and strong recommendations from participants, affirms the efficacy of the IEEE program. The findings underscore the value of specialized training initiatives in higher education, shaping students into professionals equipped to navigate the complexities of contemporary technological landscapes.

C. Limitations

Despite the valuable insights gained, this study has its limitations. Firstly, the research focuses on a single educational institution, Cummins College of Engineering for Women, Pune, limiting the generalizability of findings to broader contexts. The sample size, while sufficient for statistical analyses, may not capture the full diversity of student experiences. Additionally, the reliance on self-reported data introduces the potential for response bias, as participants may provide socially desirable answers. The study lacks a long-term follow-up, preventing an exploration of the durability of knowledge gained over time. Furthermore, the impact assessment across majors, while informative, does not delve into specific nuances within each discipline. Lastly, external factors such as individual study habits and outside resources may contribute to knowledge gains independently of the IEEE training, introducing confounding variables. Recognizing these limitations is essential for contextualizing and interpreting the study's outcomes.

D. Future Scope of the Study

The present study opens avenues for future research with several promising directions. Firstly, conducting a longitudinal follow-up would provide insights into the long-term retention and practical application of cloud computing knowledge acquired through the IEEE training. Expanding the research scope to encompass multiple institutions would enhance the generalizability of findings and allow for comparative analyses. Additionally, a qualitative exploration through interviews or focus groups could uncover nuanced aspects of students' experiences and perceptions. Investigating the effectiveness of alternative training formats or supplementary resources in conjunction with the IEEE program could offer a more comprehensive understanding of optimal pedagogical approaches. Lastly, exploring the integration of cloud computing education into the broader curriculum and its impact on interdisciplinary collaboration could contribute to holistic educational enhancements. These potential avenues of research would contribute valuable knowledge to the evolving field of technology education in higher institutions.

ACKNOWLEDGMENT

I thank the respondents who participated in the surveys and shared their insights on the topic.

REFERENCES

[1] Aaron, L.S. and Roche, C. 2011. Teaching, Learning, and Collaborating in the Cloud: Applications of Cloud Computing for Educators in Post-Secondary Institutions. Journal of Educational Technology Systems,Vol. 40,no. 4: 111 - 95.

[2] Alam, M.T. 2013. Cloud Computing in Education. IEEE Potentials, Vol.32,no.4: 20-21. Available at https://ieeexplore.ieee.org/abstract/document/6565505

[3] Arpaci, I. 2017. Antecedents and consequences of cloud computing adoption in education to achieve knowledge management. Computers in Human Behavior., Vol.70: 382-390. Available at https://pdf.sciencedirectassets.com

[4] Bansal, S., Singh, S., Kumar, A. and Singh, M. 2012. Use of Cloud Computing in Academic Institutions. International Journal of Computer Science And Technology.Vol3,no1:427-429. Available at https://www.ijcst.com/vol31/3/amit.pdf

[5] Barnwal, A. 2014. Using Cloud computing Technology to Improve Education System.Asian Journal of Technology & Management Research,Vol.4.no.2:23-29. Available at https://www.ajtmr.com/papers/Vol4Issue2/Vol4Iss2_P4.pdf

[6] Behrend, T.S., Wiebe, E.N., London, J.E. and Johnson, E.C. 2011. Cloud computing adoption and usage in community colleges. Behaviour and Information Technology, Vol.30, no.2:231 - 240.

[7] Bimol, S., Saikia, M. and Devi, L.P. 2014. Achieving knowledge management through Cloud Computing: A case in higher education. 2014 Paper presented at International Conference on Computing for Sustainable Global Development (INDIACom), March 2014.

[8] Demchenko, Y., Bernstein, D., Belloum, A., Oprescu, A., Wlodarczyk, T.W. and Laat, C.T. 2013. New Instructional Models for Building Effective Curricula on Cloud Computing Technologies and Engineering. Paper

presented at IEEE 5th International Conference on Cloud Computing Technology and Science,December 2013,at Bristol,England.

[9] Elgelany, A. 2017. Cloud Computing: Empirical Studies in Higher Education.International Journal of Advanced Computer Science and Applications.Vol.8,no.10:121-127. Available at https://thesai.org/Downloads/Volume8No10/Paper_17-Cloud_Computing_ Empirical_Studies_in_ Higher_Education.pdf

[10] Filho, H.C. and Carneiro, G.D. 2018. An Action Research Study towards the Use of Cloud Computing Scenarios in Undergraduate Computer Science Courses. Paper presented at International Conference on Evaluation of Novel Approaches to Software Engineering. Available at https://dl.acm.org/doi/proceedings/10.5555/3362381

[11] Hessen, S.H. 2015. Enhanced Cloud Computing Framework to Improve the Educational Process in Higher Education: A case study of Helwan University in Egypt. International Journal of Computers and Technology.Vol.14,no.6:5814-5823.

[12] Hua-xiang, X. 2009. Preliminary Study on the Influence of Cloud Computing on Education. Computer Knowledge and Technology.Recent Patents on Computer Science.Vol.8,no.2:2690-2692.

[13] Jain, A., & Pandey, U. S. 2013. Role of cloud computing in higher education. International Journal of Advanced Research in Computer Science and Software Engineering, Vol.3,no.7: 966-972.

[14] Joshi, M. 2015. Emerging trends of cloud computing in education methodologies: A review. International Journal of Advanced Research in Computer Science and Software Engineering, Vol.5,no.12:1-4.

[15] Khedr, A. E., Kholeif, S. A., & Hessen, S. H. 2015. Adoption of cloud computing framework in higher education to enhance educational process. International Journal of Innovative Research in Computer Science and Technology,Vol.3,no.3: 150-156.

[16] Kuo, L.H., Yu, J., Yang, H., Hu, W., & Yang, H.J. 2012. A Study of Creating Technology Education Course for Cloud Computing. International Journal of Communications, Vol.3,no.6:98-108.

[17] Kurelovic, E.K., Rako, S., & Tomljanovic, J. 2013. Cloud computing in education and student's needs. 5th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), May 2013,at Opatija, Croatia.

[18] Liu, H., Liu, X., Chen, T., & Liu, Y. 2020. Research Overview of the Informative Teaching Approach under Cloud Computing Environment. DEStech Transactions on Social Science, Education and Human Science.7-11.

[19] Mary, T.A., & Rose, P.J. 2020. The Impact of Graduate Student's Perceptions towards Usage of Cloud Computing in Higher Education Sectors. Universal Journal of Educational Research,Vol. 8,no.11: 5463-5478.

[20] Mhouti, A.E. and Erradi, M. 2019. Harnessing Cloud Computing Services for E-Learning Systems in Higher Education: Impact and Effects. International Journal of Information and Communication Technology Education. Vol.15,no.2:18-30.

[21] Mircea, M. and Andreescu, A.I. 2011. Using Cloud Computing in Higher Education: A Strategy to Improve Agility in the Current Financial Crisis. Communications of The IbIMA, 1-15.

[22] Muhammad, A.R. and Abdulrahman, S. 2015. Cloud Computing Based e-Learning: Opportunities and Challenges for Tertiary Institutions in Nigeria.Vol.5,no.3:144-152.

[23] Noor, A.S., Younas, M. and Arshad, M.2019. A review on cloud-based knowledge management in higher education institutions. International Journal of Electrical and Computer Engineering,Vol.9,no.6: 5420-5427.

[24] Okai, S., Uddin, M., Arshad, A., Alsaqour, R.A. and Shah, A. 2014. Cloud Computing Adoption Model for Universities to Increase ICT Proficiency. SAGE Open,Vol.4,no.3. Available at https://journals.sagepub.com/doi/epub/10.1177/2158244014546461

[25] Petrovski, J., Naka, N. and Savoska, S. 2013. Using Cloud Computing In Higher Education. Paper presented at 7th International Conference on Information Systems and Grid Technologies, May 2013, at Sofia. Available at https://eprints.uklo.edu.mk/id/eprint/5838/1/ISGT2013_SSNNJ.pdf

[26] Rajaei, H. and Aldakheel, E. A. 2012. Cloud computing in computer science and engineering education. Paper presented at ASEE Annual Conference and Exposition, June 2012, San Antonio,United States of America.

[27] Senyo, P. K., Addae, E. and Boateng, R. 2018. Cloud computing research: A review of research themes, frameworks, methods and future research directions. International Journal of Information Management, Vol.38,no.1:128-139.

[28] Tan, X. and Kim, Y. 2011. Cloud Computing for Education: A Case of Using Google Docs in MBA Group Projects. Paper presented at International Conference on Business Computing and Global Informatization, July 2011,at WashingtonDC United States of America .

[29] Xiong, S., Xu, Y., & Shan, Q. 2015. Research on the Architecture of Education Cloud for Joint Training Programs in Higher Education Institutions. Paper pesented at International Symposium on Educational Technology (ISET), July 2015 , at Wuhan,China.

Xue, J., Wei, Y., Li, M., Lang, F. and Lu, Z. 2018. Research on Collaborative Learning of Training Task Based on Cloud Computing.Paper presented at International Conference on E-Learning, E-Education, and Online Training, April 2018, at Shanghai, China.