Fig 2.Framework of Cloud Computing representation with SaaS, PaaS, IaaS.

4. Cloud-Based Learning Architecture

[7] Describes the introduction of Cloud computing architecture in distance learning as a method that can be implemented to increase scalability and flexibility, however this instructional model will integrate the traditional classroom to become more dynamic and operational. To implement this model the cloud service will have a middleware, computer physical memory and a processor. All this modalities needs to be integrated with tools that will hasten the process of distance learning like; a set up for educational institutes, campus network architectures and web based technologies. The proposed architecture will yield numerous advantages like **[**15**]** powerful computing methods and storage capability, security and virtualization, this will be aimed at having an environment that will allow different pedagogical approaches [8]**.** The proposed architecture uses very limited resources. Learners and practitioners can interact by first by sending these resources [9] a REQ (request) to the server, the server will then authenticate the user by performing verification and thereafter user thereafter providing the service specified after sending an acknowledgement to the user.

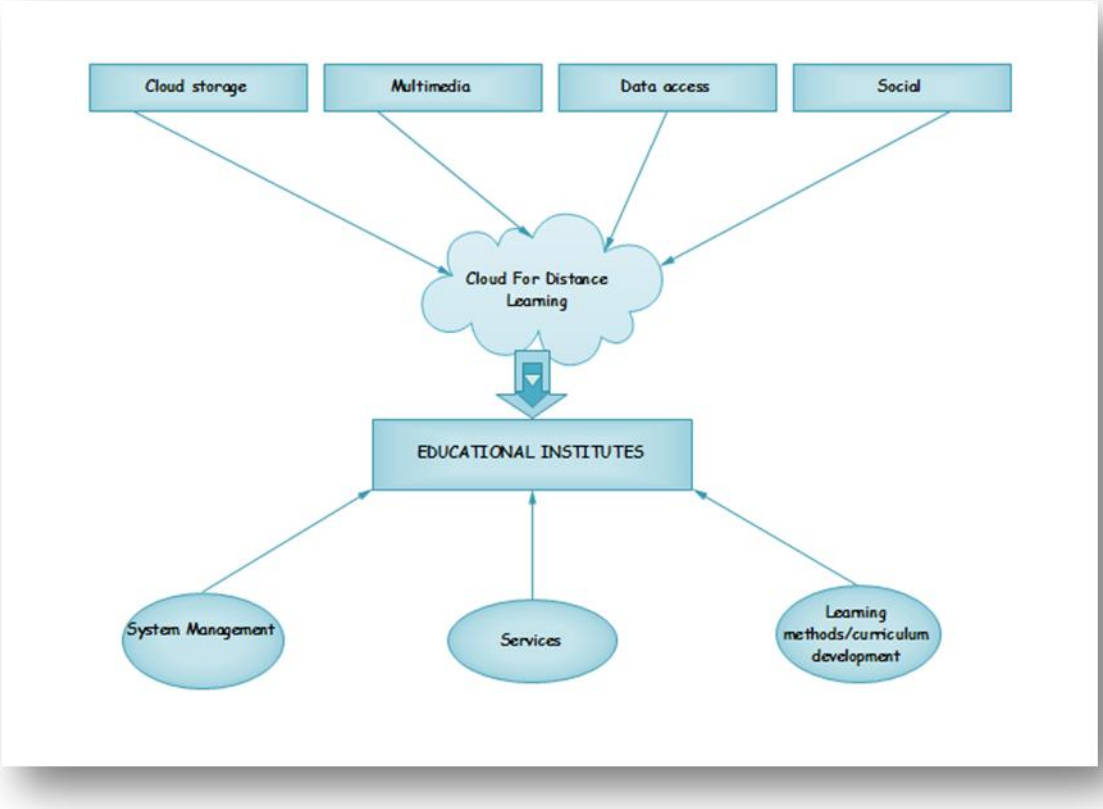

Fig 3.Cloud computing interconnection for educational Learning.

4. Implementing Cloud Computing In Distance Learning.

Vital concern shared by practitioners, learners and institutes in implementing cloud computing services is how well they integrate into their systems. Cloud computing relies on subsisting technologies like grid computing,

virtualization, web services and of course the Internet, to provide on-demand services [12]. These technologies must work harmoniously. Essentially there are three foundations upon which universities can implement cloud computing. These have been variously mentioned as Infrastructure as a Service, Platform as a Service (PaaS) and Software as a Service (SaaS).

Infrastructure as a Service (IaaS) allows the cloud to be used as a digital site where data can be stored and protected. It permits university administrators to more efficiency control their resources at much reduced costs [13, 14]. With IaaS, universities can avail access to enormous processing power, voluminous storage space as well as networking components and middleware.

Platform as a Service allows the cloud to be used as a platform where access to other services, and more advanced and more dedicated applications, can be made. Indeed, PaaS not only allows users to access advanced services but also allow creation of unique and new services which can in turn be hosted on the platform themselves [13, 14]. It is this very concept that makes cloud computing extremely versatile allowing users to use the cloud as a spring board where users can either use it to access other services, create that application or service, or both.

Software as a Service allows cloud computing users to make use of a wide range of applications and software online. Typically, the Internet hosts thousands of applications online some of which are free while others are not. SaaS gives users access to all these.

To implement cloud computing, the university will have to conduct business analysis, build a business case, source a cloud service provider (CSP), plan and implement the solution, possibly with the assistance of a third-party system integrator. The main concerns during the implementation phase is to ensure that the cloud meets business requirements in terms of functionality and performance, provide the expected efficiencies and benefits, adequately protect institutional information, comply with legislative and regulatory requirements and integrate with existing processes and systems .

The business analysis will lead to the creation of a business model will help universities determine factors such as performance and resource requirements, lifecycle cost estimation, and required risk treatment measures. The university should consider how they would counter cloud service disruption or cancellation. Towards this end, they should put in place robust business continuity and disaster recovery procedures. During this analysis stage a number of other considerations should also be understood. These include the user characteristics, the data characteristics in terms of size and quantity, the average usage rates or transactions per second, usage changes for the various system actors and scaling over time in terms of number of users.

The other concern is an assessment of risks and how they impact on the value proposition [14]. This will enable the institutions to ascertain the quality of the cloud solution, its value for money, its ability to seamlessly integrate without business or technical difficulties and its ability to enable business continuity after a disaster.

The business analysis and the risk assessment provide a basis for determining requirements in terms of functionality, industry-recognised standards, performance, manageability, security and compliance with legislative and regulatory obligations. Functional requirements for IaaS, will relate to the provision of processing speeds, memory, storage and operating systems. Those for PaaS, will specify the development and operating environment SaaS requirements will be specified in the same manner as those of non-cloud solutions. Performance is mainly examined from the user's perspective and metrics of interest from this perspective include availability, reliability, responsiveness and throughput. Manageability is considered mainly from the point of its ability to configure and manage cloud-based services. A security assessment should consider confidentiality, integrity, authentication, authorisation and threat management.

Institutions must also build a business case that provides justification for cloud solution weighed against other alternatives such as non-cloud solutions. The business case will also provide a reference point for re-evaluation in future. The next step would be to prepare an exit strategy which documents the institutions contingency plan to migrate records securely from one solution to another while maintaining business continuity. The migration may be from a non-cloud to a cloud platform or vice versa. Also to be prominently included is how data stored by the cloud service provider will be archived, where it will be archived, the method to transfer it, how it will be destroyed and how destruction will be verified together with the security requirements associated with these processes. Liabilities on either party should be clearly specified in the contract stipulations and cover breaches beyond the life of the

agreement. It cannot be overstated that before a binding contract is signed, prior understanding of the university's terms will provide a basis to ensure its business and security requirements are adequately met and perhaps exceeded.

With the foregoing settled, the institution should then determine the most appropriate model. Options for consideration include managed services, outsourcing, in-house delivery, cloud computing or a hybrid of either. The final decision depends on the business problem being addressed. With this done the institution will then proceed to put in place internal capabilities and resources needed to manage the cloud service on a daily basis. These operations include monitoring performance and service levels, responding to incidents and service disruption managing configuration documentation and coordinating planned upgrade and system outages.

5. Conclusion and Future Work.

This work presents a coherent approach to educational computing networks. Learners and practitioners experience the benefits of distributed systems on the internet around the world. Futuristic advancement of cloud computing will aim at attaining integrated multi-core processors and powerful implementation of virtualization thus leveraging the powerful hardware, expandable bandwidth for communication, which will further realize explosion of distance learning application domains. This will be adequate in resource contribution to distance learning. The architecture of Cloud computing reflects diversity, flexibility and scalability. In its implementation cloud computing will be effective in educational computing at a lower cost.

REFERENCES

[1] J.Cappos I.Beschastnikh, A.Krishnamurthy, T.Anderson. Seattle: A Platform for Educational Cloud Computing.

[2] H.Rajaei , A.Aldakheel, 2012. "Cloud computing in computer science and engineering education" American Society for Engineering

[3] M.Armbrust, A Fox,R Griffith,A.Josepth,R.Katz,A.Konwinski,G.Lee,D.Patterson,A.Rabkin,I.Stoika,M.Zaharia., Above the clouds: A Berkeley view of Cloud Computing, UC Berkeley EECS, (2009).

[4] K.Verma, S.Dubey, M.Rizvi,"Mobile Cloud A New Vehicle For Learning: m-Learning Its Issues And Challenges". International Journal of Science and Applied Information Technology (2012). Vol 1.No.3.

[5] D.Madan, A.Pant, S.Kumar, A.Arora. "E-learning based on Cloud Computing" International Journal of Advanced Research in Computer Science and Software Engineering.2012 Vol 2(2).

[6] S.Vitkar,cloud based model for e-learning in higher education. International Journal of Advanced Engineering Technology vol 9(3) 2012.pp.38-42.

[7] A.Masud, X.Huang. "An E-learning System Architecture based on Cloud Computing", World Academy of Science, Engineering and Technology2012.

[8] M. Al-Zoube,S. El-Seoud, M.Wyne. Cloud Computing based E-learning system. International Journal of Distance Education Technologies, Vol 8(2), 2010.pp 58-71.

[9] S. Noor, G.Mustafa, S.Chowdhury, M.Hossain, J.Fariha**.** A Proposed Architecture of Cloud Computing for Education System in Bangladesh and the Impact on Current Education System. International Journal of Computer Science and Network Security, 2010VOL.10 No.10.

[10] T.Govindasamy, Successful Implementation of e-Learning Pedagogical Considerations. Internet and Higher Education, Vol 4, 287-299.

[11] N. Sultan, "Cloud computing for education: A new dawn?" International Journal of Information Management, vol. 30, pp. 109-116, 2010.

[12] H. Wu, C. Dan, A. M'hammed, "Exploring Cloud Computing for Distance Learning", Online Journal of Distance Learning Administration, vol. 14, 2011.

[13] A. Fern´andez, D. Peralta, F. Herrera, and J.M. Ben´ıtez "An Overview of E-Learning in Cloud Computing", Workshop on Learning Technology for Education in Cloud (LTEC'12), pp 35-46, 2012.

[14] M. Jalgaonkar, A. Kanojia, "Adoption of Cloud Computing in Distance Learning", International Journal of Advanced Trends in Computer Science and Engineering, Vol.2 , No.1, pp 17-20, 2013.

[15] S.Satpute, B.Deora," Cloud-Based Storage for Education. Journal of Advanced Research in Computer Science and Software Engineering Vol 4 is 3 pp 77-80.

BIOGRAPHY.

Kebande Rigworo Victor ,works as a Lecturer and Researcher at Department of Computer Science ,Egerton University ,Njoro,Kenya.Currently pursuing PhD. He holds an MSc Computer Science(2009),MBA (2009)and Bsc(2007) computer science,from Periyar University and University of Madras,India.He has more than 10 research papers.His research interests are ,AI,software engineering,security and distributed systems.

Kenneth Otula Sigar –working as assistant lecturer in the department of computer science, Kabarak University. He attained M.sc in computer science in 2007.His current research interests are distributed systems, cloud computing, systems security, and information systems.

George Yogo Odongo attended Makerere University in Kampala where he was awarded a Masters in Data Communications and Software Engineering in 2011. This was after graduating with a Bachelors degree in Computer Science from Egerton University in 2007. Presently, he is pursuing an MBA in Operations Management. He is currently The Principal ICT Technologist at the department of Computer Science, Egerton University. He has published articles on network management and published a book on C programming. His current research interests include Artificial Intelligence, Distributed systems, Security and Networking.