

Cost Effective Multimedia E-Learning Application for Nigerian Higher Institutions

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Abstract The necessity of good reliable modern and cheap communication and information transfer within an institution cannot be overemphasized. However, the expensive cost of using internet subscriptions and telephone technology make this prospect difficult to actualize. In another vein, limitation in space of conducive learning environment vis-à-vis the number of students has made effective teaching and learning nearly impossible. In this research work, we designed and implemented an intranet-based communication and e-learning system, as a unified system, to offer seamless institution-wide communication, at low cost, and remote learning, by use of the local intranet networks already present in most Nigerian tertiary institutions. This system is to provide high quality VOIP Calls, Video Conferencing, Network TV, E-Classrooms, File sharing, cheap customized SMS, Audio/Video/File messaging, Search FM Radio Utility, News, Entertainment, and lots more. Some intranet related issues bothering on accessibility and duplicates were also addressed. This system was developed with Microsoft Visual Basic 6.0 and ASP.NET Visual Studio 2010.

Keywords Intranet, E-learning, E-classroom, VOIP, Video, Audio, Stream, Lesson Notes

1. Introduction

Technological advancements over time have brought numerous improvements to the way we communicate and shear information. The traditional means of communication are becoming rapidly obsolete and modern means such as the use of computer have almost completely taken over, translating to higher levels of efficiency in communication and information shearing. Communication is vastly carried out these days with mobile phones, computers and other devices to make calls, send emails, share files, watch TV,

listen to radio stations and lots more.

Computers have found vast usage in many aspects of life and using them for communication has been successful. Automatic routing of call lines at telecommunication offices, proper secured routing of emails to mail servers, good delivery of digital video streams and lots more have been achieved on the computer. These have reduced manual work and the long delays by humans in relation to the vast speeds attained by computers recently.

It is evident that some notable amounts of communication cost are being incurred by students and members of staff of Nigerian higher Institution daily in communicating with one another via phone calls or via subscribed internet. However this can be drastically reduced by the use of Intranet networks in institutions. Of great worries to Ojerinde [1] the registrar of Joint Admissions and Matriculations Board, 1.5m candidates jostle for 500,000 admission slots, in an article on Punch Newspaper dated March 21, 2012, reported by John Alechenu. This means that only 1 out of 3 candidates end up securing admissions yearly leaving roughly a staggering 66%. What then happens to this 66%? Where do they go? What then happens just after one year when another 66% is added to that accumulating backlog? Those are scary questions no one would really want to answer. All these are as a result of inadequate lecture venues and lecture hall leading to congestion in higher institutions according to Nigerian Universities Commission (NUC). This problem can be reduced by virtual E-Classrooms for students to take lectures from alternative and convenient places such as their rooms, the library or elsewhere most preferably within the Institution premises. Most students are cut off from the real world and news once they are in school as televisions are not available in their hostel rooms, but with the prevailing number of computers owned by students, they can stay connected through a network TV on an intranet network.

Thus, we seek to improve the communication and information shearing needs of Nigerian higher Institutions through the use of an Intranet base E-learning system as well

as seek to reduce the cost incurred in communication and information shearing across institutions and increase the quality of teaching and learning.

However, some Intranet systems have shown certain disadvantages which involve media accessibility and technology usability as well as information overload. Furthermore, intranets often contain out-of-date information, duplicated documents, and dead-end links, which decrease the relevance of the information employees need in their everyday work, Holtz [2]. These disadvantages would be catered for by the proposed system.

2. Literature Review

Advancing technology has changed the way information is produced, distributed, displayed, and stored. As Cutlip et al. (2006) fairly notes, the digital age makes communication faster than ever before with even those messages meant only for internal use becoming global in a matter of mere seconds. Bansler et al. [3] rate intranet technology as the great unifier – as an interactive and reflective medium that is multipurpose, richly networked, and offer's a seamless way to integrate text, graphics, sound, and video.

Lehmuskallio [4] sees the modern intranet technology support communication from various directions: top-down, bottom-up, and horizontally across the organization.

Amurgis [5] uses the same terminology arguing that the top-down communication can be seen as a one-way conversation crafting messages by corporate leaders for the rest of the company. Most intranets start this way but then proceed to bottom-up communication. Cornelissen [6] describes the complementary nature of corporate information and communication systems through the concepts of downward, upward and side-to-side communication which seems to correspond to [4] and [5] top-down, bottom-up and horizontal concepts.

Scott [7] mentions technology standards and organizational need as drivers in reaching two intranet objectives, firstly, to communicate across geographic, organizational and functional barriers and, secondly, to collaborate among sites and with suppliers and customers. She states that the intranet was originally welcomed as the solution to faster information systems, access to legacy system data, integration of incompatible systems, and progress towards the 'paperless office'. Moreover, intranets enabled work-flow management and research management. Damsgaard and Scheepers [8] created a model of success and failure of the intranet technology based on an in-depth interpretive field study of intranet implementations carried out in large Danish and South African organizations. They identified that there are essentially three existential crises and four different stages when implementing an intranet. The first crisis at the initiation stage emphasizes the intranet's dependence on resources that must be in place for the intranet to be implemented. Therefore, there is a need for the intranet to be supported by a sponsor who nurtures the

intranet. Without a sponsor there is a danger that the intranet cannot evolve beyond its experimental beginnings. The second crisis easily attacks at the contagion stage emphasizing the need for a critical mass of both content and users to co-exist for the intranet to self-expand and become self-sustaining. If this is not met, the intranet will stagnate and regress to being an experimental technology.

The third crisis, occurring at the control stage, deals with the planning and procedures that must be in place for the intranet to stay up-to-date and useful. If the intranet "grows wild", it eventually becomes chaotic. The wilderness of information becomes impossible to manage and update. Users will perceive the intranet content with mistrust and look for other ways to obtain data. Again, the result is that the intranet stagnates.

Thus, it can be noted that each of the above named stages, poses a key challenge that must be overcome in order to proceed to the next stage. If the challenge is not met, the intranet comes to a stop. Success and failure at each stage relates to the organizational "pervasiveness" of the technology. Ultimate success means that the intranet becomes institutionalized in the organization. Failure during any stage means that the intranet stagnates.

Schank [9], Roffe [10], Sambrook [11] and Tsai & Machado [12] refer to e-learning as "communication and learning activities through computers and networks (or via electronic means)". To be more specific, Fry [13] defines e-learning as "delivery of training and education via networked interactivity and a range of other knowledge collection and distribution technologies." Wild, Griggs & Downing [14] also had the same definition as [13] they defined e-learning as the creation and delivery of knowledge via online services in the form of information, communication, education and training. Bleimann [15] stated that e-learning is a self-directed learning that is based on technology, especially web-based technology. He also stressed that e-learning is collaborative learning.

The current proposed system strives to extend lectures outside the lecture halls to a lecturer-student collaboration over wide areas as far as the intranet network can reach. This is achieved by live video and audio streams with data push from lecturers to students connected to the same E-Classroom.

According to Burrus [16], innovative companies are beginning to embrace social networking tools as a way to enhance communication, information sharing, and collaboration, thereby allowing them to implement many innovative business practices.

One of these tools is Facebook through which large organizations can connect all of their employees. Some companies are already using an internal, secure version of Facebook. This has helped them to increase their internal networking and collaboration.

As an example of a smart use of Wikipedia, Burrus [16] mentions a large manufacturing company with engineers in locations around the world that increased problem solving and collaboration by creating an internal, secure version of

Wikipedia for sharing information on parts and service offerings as well as repair and maintenance instructions. Accordingly, companies could create a version of Wikipedia of their own to foster education and training as well as enhance information sharing.

Discussing the advantages of the new media, Holtz [2] states that wikis and blogs allow team members to create, edit, approve, publish and manage content all in one place, with virtually no training required. Another critical dimension of social media is that it actually makes information easier to find and filter. Additionally, social bookmarking allows any employee to bookmark any page he or she finds useful and tag it with relevant keywords. Other employees searching those keywords will find content their colleagues have already found useful. Sometimes this may even help employees and companies avoid “re-inventing the wheel”.

The previous research underlines the easiness of an intranet to reach all personnel at the same time all over the world. Cost-effectiveness is another clear advantage compared with, for example, face-to-face meetings or printed publications. Finally, characteristics offered by new social media can be easily adapted to company intranets, thus reaching possibilities that are not possible to be achieved by traditional communication tools. As a counterbalance to these advantages, there exist a few challenges to get an intranet used by all employees within a multinational. The main reported disadvantages are involved in media accessibility and technology usability as well as information overload. Furthermore, intranets often contain out-of-date information, duplicated documents, and dead-end links, which decrease the relevance of the information employees need in their everyday work. At Globemec, prior to the survey, the main reported challenges were connected to the difficulties in finding relevant information.

The proposed system features a central server for data management, which thus ensures elimination of duplicates, easier file access and thus solves some of the above listed issues.

Articulate Studio developed E-Learning software and authoring tool in 2009. This utility is majorly targeted at the internet, while the current proposed system sits on the intranet thus cutting intranet subscription costs.

Skype which is a VOIP system founded in 2003 by Janus Friis from Denmark and Niklas Zennostrom from Sweden. This system works over the internet majorly, but the current system is targeted at the intranet which thus cuts the cost of internet subscriptions.

Youtube is a video-sharing website, created by three former PayPal employees, Chad Hurley, Steve Chen and Jawed Karim, in 2005. It offers video streaming via the internet, but the proposed systems offers such with live TV capabilities via the intranet, which saves costs of internet subscriptions.

According to Stroll [17], RapidShare file-hosting site is one of the world’s largest filesharing sites with 10 petabytes of files on its servers, and handling up to three million users

simultaneously. The site runs on the internet. With all its pluses, it costs users internet subscription costs to access the service, unlike the proposed system that offers the filesharing service free via the intranet to members of an institution.

In totality, none of the above mentioned existing systems come with all the unified features of the proposed system, and thus giving the proposed system the advantage of centralization over the rest, and also the cutting of internet subscription costs by using the intranet in institutions.

This research is needful due to the congestion experienced in most universities in Nigeria, the limited amount of admission slots available for tertiary institutions, and the need for more improved but still cheap modes of communication and information sharing within tertiary institutions. This research makes significant improvement to general standard of living and much more organized ICT based methods of running day to day tasks.

3. Overview of the Current and Proposed System

Currently, most Institutes in Nigeria already possess wireless networks. These networks are majorly used for supplying internet connection to all or some restricted members of the institution. Using the Federal University of Technology, Minna as a case study, we observe that the wireless network is mainly used for supplying internet connection in the institution. In the campus at Bosso, only a limited personnel’s {staffs} are allowed access to this network. This is usually to limit the traffic and save bandwidth. But there exists no Intranet system is currently not being utilized. Intranet of course offers a large amount of bandwidth which can be used for transferring local content, which currently is not being used. This obviously is not an optimum state of resource utilization, since students could benefit from some intranet utilities since the internet is not available to them via the Bosso campus wireless network.

File transfer between staffs of the institution is done manually. Communication is done via cell phones through cellular networks. Television viewing is made available through common rooms which are not always readily available. Lectures are taken in classrooms and halls which are often most crowded and congested with students standing even outside, hanging by windows and not getting the best out of lectures or even a chance to ask questions.

Thus we can categorize these various problems that exist with the existing system into:

- i. Mode of data and information transfer,
- ii. Cost of communication,
- iii. Ease and convenience of carrying out several institutional procedures.

Since most at times, lecture halls are often congested, and there is diminished learning if students cannot find spaces to sit within the hall, learning and participation in lectures will be hindered having defiantly has a negative affect the

performance of students.

Since no internal based communication system exists within the institution, staffs and students are limited to paying network tariffs to make phone calls to one another within the same institution.

A few cases exist of lecturers asking students to submit their assignments online to internet based mail boxes. This would incur cyber café bills or internet subscription bills on students, because there is no local free means of communication exist within the institution.

Common rooms get congested with too many students, and often great clashes in what programs to be watched, since only on preference can be catered for at a time. There is no provision for handling per student preference of watching what programs suite each student personally needs; which could be news channels or educational channels.

Short Messaging Service (SMS), Multimedia Messaging Services (MMS) which are the major way of communication among students, are all via GSM Network Operators and are often expensive.

The proposed system (Intranet Based Communication and E-Learning System) is one that lets the members of staff and students have Voice-Over IP call functionalities. This feature makes it possible to call any person connected on the intranet from Computer to Computer and amongst other devices Wi-Fi capabilities such as cell phones, smart phones, tablets etc. The system also features Video calls for visually enhanced viewing of the end callers on both sides. The system also supplies intranet TV functionalities which makes several Live TV and virtual Television channels available to members of an institution which selection of channels on free will, right from their computers on the intranet. This feature lets institutions start up as many channels as they want and probably giving groups and religious bodies TV channels on the platform to reach their audience.

E-Learning is provided by the system. Lecturers can host E-Courses via specialized software tools in the system, and students can connect to the E-Courses and have lectures. This feature provides a visual video stream of the lecturer taking the course, a medium for the lecturer to send lecture notes and questions, a medium for the students to send questions and replies back to the lecture to support an interactive class experience.

The system provides a news channel for members of an institution to keep track of latest events and announcements in the institution.

File sharing utilities are also provided to let movement of files publicly and privately possible via the intranet network.

The system features an advanced messaging utility that provides an inbox for all members of an institution, with the capabilities of sending and receiving messages, files, voice messages and video messages. The system lets users chat with each other. The system provides an interface to let the users enjoy new jokes and keep them entertained. As the saying goes "All work and no play makes Jack a dull boy".

In addition, the current sole media streamer SEARCH FM

RADIO will be plugged into this platform using a utility interface for users to listen to the radio channel right from their computers. Current song pictures can be put up for the viewers to visualize what artistes are on air, or which persons are being featured in an ongoing program. Radio text can also be seen to describe what's running or talk on other events worth noting by the radio station. A response medium is also provided for users to send in replies, comments or suggestions during given radio programs where user response is needed, which of course doesn't cost anything to send compared to SMSs which cost the users money per response.

The system provides very cheap SMS sending functionality. It drastically cuts down cost of sending SMS to mobile phones since all SMS are routing via the server through the internet via given gateways. A unified purchase of large amounts of SMS by an institution thus means cheaper rates of SMS sending for the members of the given institution.

A specialized server has been built to handling all core routines and routings of all parts of the system including streams, authentications, file management, database management, etc.

A feedback mechanism is set in place to get user feedback and experiences while using this system. This is to help in serving the users better.

Other features like journals, image previews, and others exist to give the users a great experience of using the system.

The proposed system comes in two mediums which are:

- SLOC Social as a standalone executable program to be installed and run on a computer running Microsoft operating system, or on other operating systems using an OS Virtualization utility like VM-Ware.
- PICES a web version with most features to be run via browsers on all operating systems and even Mobile Phones and PDAs with Wi-Fi capabilities.

The proposed system has several benefits to any institution it is deployed to. The Voice-Over IP feature lets members of the institution call each other for FREE over the distance the institution decides to extend their network coverage to. Some Wi-Fi antennas can transmit as far as 45Kilometers, and thus meaning that major towns can be covered by the range of the intranet for an institution, thus giving members of the institution these features even at home in the institution. With the cutting of phone bills for calls in the given area, standard of living should increase for members of the institution, since lots of costs go into recharge cards and lots of calls are made between members of the institution to each other.

Lots of students have computers, but do not possess televisions in their hostels, the FREE television on the platform which offers the members of the institution TV on their computers via the intranet would keep them up to date on what's going on via news and programs, and also keep them entertained at less busy times. The institution can also set up their TV channels and advertisements and programs can raise some funds for the given institution.

File sharing becomes organized, easy, and increases collaboration among members of staff and can be achieved, anytime any location within the intranet zone. This would thus cut costs and inconveniences of manually transporting of flash drives and other copying mediums.

The inbox features thus supply an organized means of reaching each other with messages and files. The SMS feature also cuts a lot of cost of prices paid to network providers. For example, SMS messages to foreign networks via MTN network providers in Nigeria was about N15, while the platform can supply it at N2 via the gateways. This is a large price decrease, which in the long run would increase the standard of living of members of the institution this platform is being deployed in.

The presence of a central server which is the Sholi Studios Web server, to manage data routing, helps prevents multiple duplicates, increases ease of access with the File Sharing interface which supports searching and sorting by multiple categories and wildcards.

The benefits are not limited to the above, but just to mention a few.

4. Materials and Methods

The system was designed using a top-down approach which is a cardinal point in the development of the Intranet Based Communication and E-Learning System. The entire system was patterned using a modular programming system where the entire program was divided into some fragmented modules. This method of system development is to enhance clarity of program and easy debugging of the program and also to avoid complication.

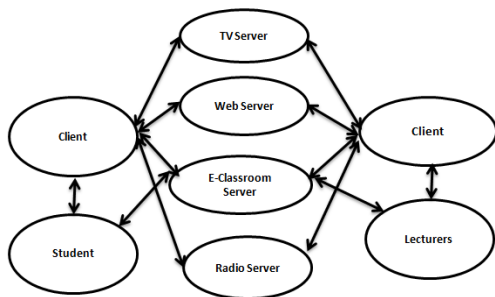


Figure 1. System Design Diagram

Figure 1 (System Design Diagram) show’s how the clients, that is the students and lecturer interacts with the different servers responsible for their corresponding functions. Thus the E-Learning platform comes in-between them to facilitate and enhance communication.

4.1. Database Design and Choice of Database

The database used in this system is tagged SHOLSDB meaning Systems Highly Optimized Language Structured Database. SHOLSDB was designed in 2008 by the

researcher. The database was first deployed in A-Learning System which won a Best Software Award at the NACOSS Convention in Jos 2008. This database has come to be the embedded database in the SHOLI STUDIOS WEB SERVER which is being used in this system to manage all routings and authentications.

4.2. Data Types

Some data formatting used in the database for user details include the following as tabulated in Table 1 (Specific data of Colum/Row) below:

Table 1. Specific data of Column/Row

Field name	Data Type	Field Size Length
Username	text	50
Password	text	50
Matricno	text	50
Department	text	50
Level	text	50
School	text	50
Phone	text	50
Email	text	50
Last name	text	50
First name	text	50
Other name	text	50
Gender	text	50
Sec question	text	50
Sec answer	text	50
Notifications	yes/no	1

4.3. Entity Relationship Diagram (E.R)

Entity relationship diagram, also called an entity-relationship model, depicts the graphical representation of entities and their relationships to each other, typically used in computing in regard to the organization of data within databases or information systems.

The entity relationship diagram as shown in Figure 2 (E-R Diagram illustrating relationship between Students and Lecturers in the e-classroom), below shows the relationship between a Student and a lecturer in the E-Classroom.

Figure 2 show’s that the entity “Student” has tow attributes his/her student id and student name as well. Also the entity “Lecturer” possesses tow attributes, the Lecturers id and course the lecturer lectures. Thus there exists tow

relationships between the entity Student and the entity lecturer. The lecturer lectures and gives out lecture material through the E-learning platform, and the students as well respond with question through the E-learning platform.

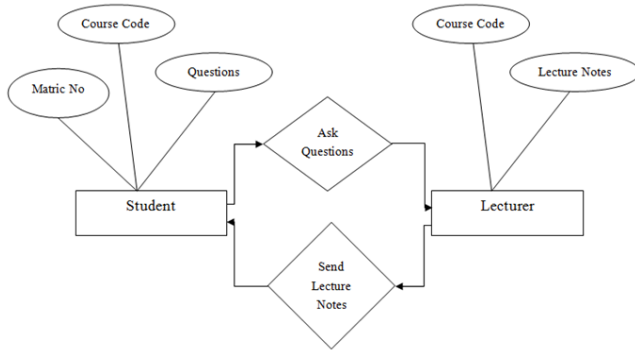


Figure 2. E-R Diagram illustrating relationship between Students and Lecturers in the e-classroom

4.4. Use Case Diagram

The Use Case diagram Figure 3 (Use Case Diagram how users access the client system), above shows the interaction of the user with the interface of the E-Learning platform as shown the very first start up interface is the legal notice page followed by a splash page which leads to where users can then log in or view the About page. So every other sub item below are all action when clicked that lead to interfaces for particular tasks the user wants to perform.

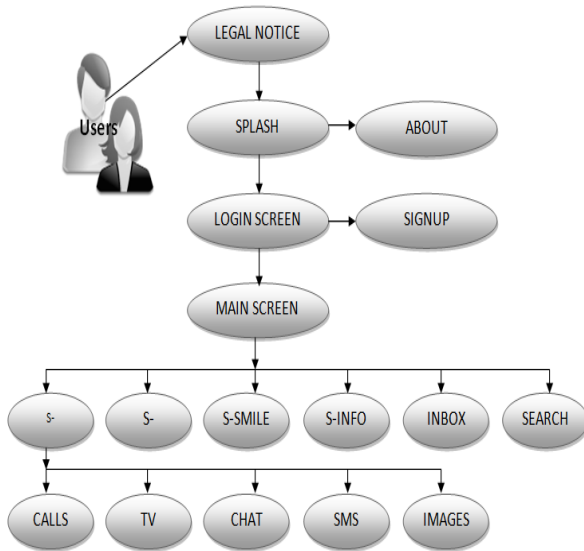


Figure 3. Use Case Diagram how users access the client system

4.5. Security Features

i. Server Query logs: Allows the administrator to see all requests to the server performed by user programmers including their IP addresses, client control details, request headers, etc which can be used to track down normal usage, intruders or hacking attempts

- ii. Password authentication: this is another good security features for checking all unauthorized attempts
- iii. Authentication of session and session timeout has been provided to prevent session hijacking.
- iv. Client IP addresses are recorded at every point in order to trace if an attack occurs.
- v. Site root files are authenticated to prevent cross-site scripting (XSS).
- vi. Check bounds and validation has been incorporated to prevent SQLIA.
- vii. REST web services were used to prevent direct contact to the database by clients.
- viii. System does not at anytime show password in plaintext.
- ix. File storage and management is carried out via FTP hosted on Internet Information Service (IIS) which provides lots of security features.
- x. Enter button on login was disabled to prevent automated key generators being used to randomly generate possible usernames and passwords to hack into user accounts.

5. Result and Discussion

5.1. Implementation Language: Choice of Programming Language

This has to do with the choice of programming languages used in this research which are Microsoft Visual Basic 6.0 and ASP.NET Microsoft Visual Studio 2010. Microsoft Visual Basic 6.0 was chosen because of its ease of use, and being a high level, it provides a beautiful structure for development. According to Larry (2008) at the NACOSS National Convention University of Jos, 95 percent of computers in Nigeria run on Microsoft Windows Operating Systems. Given this number, it is most appropriate to build desktop applications with the programming tools already designed by Microsoft for their operating systems, in which Microsoft Visual Basic 6.0 is a good example. ASP.NET Microsoft Visual Studio 2010 was chosen for the web services and web version because it is also a Microsoft product, and lets you script in Visual Basic.Net, and thus a unified working experience all through with Visual Basic syntax and semantics.

5.2. Overview of System Implementation

The system was built with Visual Basic 6.0 and ASP.NET Microsoft Visual Studio 2010. SLOC Social Standalone was built with Visual Basic 6.0 with Video LAN Chat 0.8.6i Janus CODECs for Encoding and Decoding byte streams via Winsock connections from Server to Client and Client to Client. INET Control was used to make Representational State Transfer (REST) web service calls to the SHOLI STUDIOS Web server for authentication, getting data, pulling files, etc. Internet Information Service (IIS) was used

to host the ASP.NET files for PICES which is the web version of Intranet Based Communication and E-Learning System. IIS was also used to host the File Transfer Protocol (FTP) for uploading files and direct downloads from and to client systems. Microsoft Windows Media Player Control was used to play ring alerts and other sounds. TRUEVISION SDK was used for Rich Graphical Content ranging from 2D painting to 3D rendering.

The resulting benefits of the system would be the provision of visual E-Classrooms to support larger number of students and produce convenience in contrast to congestions in the lecture halls. Better communication and collaboration would thus be enhanced with the VOIP audio and video calls. Intranet TV would thus improve learning and information flow. Members of the institution would have less costs of communication, therefore increasing their standard of living partially, since resources can be channeled to more useful aspects.

In summary, this research has been targeted at providing alternative and cheaper means of communication and achieving visual e-Learning via intranet networks. The motive of the study is highly influenced by increasing challenge of access as well as the carrying capacity in the tertiary institutions. For instance, Ojerinde [1] revealed that the ratio of applicants to admitted students is about 3:1 respectively. Also the high cost of mobile phone calls, SMSs via GSM networks, and internet subscription lead to the development of the intranet based communication system, with capacity to provide free or almost free communication medium within tertiary institutions, which include VOIP Audio/Video calls, TV, File Sharing, Search FM Radio, intranet mailing, etc. Some intranet network issues have also been catered for by the developed system.

With the need for more room to accommodate students into institutions, and the evident lack of space, this system would be a great solution for providing wider range of coverage for more students with the free intranet connection based E-Classrooms which can span wide ranges even outside the institutions environment. The resulting achievements of the system include cheaper costs of communication, less congestion in classrooms, improved entertainment, more collaboration and keeping members of the given institution current.

5.3. Program Interface

Some of the snapshots of parts of the software package include, but are not limited to these as follows:

The Login Interface is where usernames and passwords are inputted to open the system. Screen shots are included in the Appendix.

The Sign Up Interface lets new users register their details to obtain accounts to login with.

This Dialog is shown when the software cannot locate the server on the network.

This Dialog is shown when the user has entered an incorrect username or password.

This Main Interface provides access to major features of the system and provides Sign Out.

This Main Interface provides access to major features of the system and provides Sign Out.

This interface provides menus for Calls, TV, SMS, Chat, Images and adverts

This interface provides TV channels viewable on the intranet. Available channels are shown on the dropdown menu tagged "Available Channels". Refresh button retrieves up-to-date channel list. Watch button lets you start watching the selected channel.

The VOIP Interface lets users make audio or video calls to each other, by selecting the username of a user online and calling, or by entering the users associated number.

The Chat Interface lets users chat with other users available online

This interface lets users send real SMSs to mobile phones in over 180 countries. The message is typed in, and the number to send to. The From box determines to sender seen on the SMS.

The File Sharing Interface lets users download shared files on the server computer. Users can also share files from their PCs to another user or publicly for all users to see.

This dialog shows the progress of a file being downloaded from the file sharing interface via the intranet network. This is done via an FTP server on Internet Information Service(IIS).

This interface lets users read jokes and get SMS templates as a form of entertainment. Users can also rate the content viewed here.

The General News interface lets users see latest news. It is a webpage renderer, so news pages can be well designed externally and put on the server, and all client programmes can preview the full featured graphical news page on the software.

This utility is used to get user feedback. It is an essential tool to make sure the system serves the users as intended to. This also helps the management team in charge of the system get suggestions and better ways to improve the system to suit the users.

The Inbox Interface shows the messages and files that have been sent into the users intranet mail box.

This Create Message Interface lets users compose new messages to send to other users.

The Voice Message Interface lets users record voice messages and send to others users. They can preview their recordings before sending. This is helpful if the person being called is not online.

The Video Message Interface lets users record a video message and send to others users.

The Search FM Radio Interface lets users listen to the radio station of the Federal University of technology, or any pre-play listed radio stations available.

This interface lets the lecturer host an E-Classroom. Lecture notes can be entered here and sent to the students connected to the E-Classroom. Questions can also be received from students by the lecturer on this interface.

This interface lets the students connect to an E-Classroom. Lecture notes can be received here and students can send questions to the lecturer, while viewing the lecture visually and hearing the audio along side.

6. Conclusion

Without a doubt, having an intranet base communication system in place, by cuts the cost incurred in accruing internet bandwidth for routine communication and information exchange related activities. This evidently is of enormous economic importance as institution would be able to optimally benefits from Information Technology at drastically reduced cost in comparison to the use of the internet connection based alternatives. With this new system, Institution can now effectively handle more students. Streaming lectures live on the intranet would help address the inadequacy of lecture venue facilities and provide also a host of other functionalities to ease communication and information exchange. They include free calls (VoIP), free email, sms, mms, radio and social media services. This in turn translates to an increase in ease with which teaching and learning is achieved. The resulting benefits of the system would be the provision of visual E-Classrooms to support larger number of students and produce convenience in contrast to congestions in the lecture halls. Better communication and collaboration would thus be enhanced with the VOIP audio and video calls. Intranet TV would thus improve the quality of teaching, learning and information flow.

The research process has been a success, and it is highly hoped that this system would get deployed in most institutions in Nigeria, and probably other parts of the world at large.

This research with all its prospects still has some basic limitations most especially in developing countries. Factors such as steady electricity supply needed to power the equipments and client devices could be a serious limitation to the effective deployment of this system in most developing countries. A proposed solution would be to use inverters for uninterrupted power supply. The cost of purchasing the equipments and associated facilities could be another limitation. Furthermore, additional efforts could be put into developing more of this E-Learning System across other platforms such as Android OS, Linux OS, Mac OS and to expand the range of devices that can be used to cut across cell phones, tablet etc.

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