AN OVERVIEW OF VIDEO CONFERENCING TECHNOLOGYAS A TOOL FOR EDUCATIONAL DEVELOPMENT

BY

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PGD/MCS/2007/1224

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A PROJECT SUBMITTED TO THE DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE, SCHOOL OF SCIENCE AND SCIENCE EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF POST GRADUATE DIPLOMA IN COMPITER SCIENCE.

APRIL 2009.

DECLARATION

I, Felix Christiana hereby declare that this project titled" An Overview of Video Conferencing Technology as a Tool for Educational Development" was carried out by me under the supervision of Mr. R. O. Olayiwola, of the Department of Mathematics and Computer Science, Federal university of Technology, Minna, Niger State, Nigeria.

DATE

FELIX CHRISTIANA
PGD/MCS/2007/1224

30 APRIL, 2009

CERTIFICATION

This is to certify that this project work titled" An Overview of Video Conferencing Technology as a Tool for Educational Development" by Felix Christiana with matric number: PGD/MCS/2007/1224 was carried out in the Department of Mathematics and Computer Science, Federal University of Technology, Minna, Niger State.

---------- 08-05-2009

Mr. R. O. Olayiwola
(Supervisor)

Date

Dr. N. Akinwande
(Head of Department)

Date

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Date

DEDICATION

I dedicate this project to the Almighty God who made it possible for me to undertake this Post Graduate studies and to all mothers who for one reason or the other have had to combine the roles of being mothers, being wives, being workers and being students all at the same time.

ACKNOWLEDGEMENT

This work like most research works is the brain child of the researcher, but the process of bringing it to fruition involved many hands and minds. I therefore first want to thank the Almighty God, my refuge and strength who among many blessings bestowed on me intellectual blessing and who Himself gave me the opportunity to further my studies in spite of all odds.

I am especially thankful to my Supervisor: Mr. R. O. Olayiwola for his untiring efforts, encouragement, guidance, availability and constructive criticisms which contributed immensely to make this project a success.

My sincere appreciation also goes to the Head of Department : Dr. N. I. Akinwande, Professor K. R. Adeboye, the PGD Coordinator for the Department: Mr. A. Ndanusa ,my Course Representative: Mr. David A. Omagu and all other academic staff of the Department for their effort in making the PGD Computer program worthwhile.

With a deep sense of unreserved gratitude, I wish to acknowledge my husband: Engr. Paul M.G. Felix for his all round support before, during and after this exercise.

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ABSTRACT

From ancient history, man has been in the habit of making his life better and as a Nation, the passion is the same. Less labour but efficient productivity, minimum stress and yet maximum result, reduced expenses but increased profit. These have been man's paramount objective as an individual, an establishment, an institution, an organization, a community and as a Nation. This project presents Video Conferencing technology which is one of the many offspring of Information technology as being a time saver, a cost reducer, a resource manager and many more. Hence, its vitality in the goal of educational development. The use of an application program (NetMeeting) to achieve a Videoconferencing which is practically affordable by configuring two systems to share information and designing a NetMeeting page for a conference was effectively demonstrated. The basic role of Videoconferencing as applicable to the major levels of education to improve their status and automatically the status of the educational system of the nation as a whole was also looked into.

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CHAPTER ONE

INTRODUCTION

1.1 General Overview

The development of any nation is tied to the development of her sectors (economic, educational, Industrial, Political, Agricultural etc) and the development of each sector is basically tied to the proper management of all that is entailed in the sector to enhance effective productivity. The introduction and application of information technology and its resultant effect in boosting educational development over the years cannot be overemphasized.

The terminology 'Videoconference' is an alloy of two words which are Video and Conference.

Video which is a more popular word is a type of its come together magnetic tape used for recording television pictures and sound, hence the word visual is easily associated with video.

Conference on the other hand, and especially in this context brings to mind the picture of a large official meeting at which people with the same work or interest come together for the purpose of training with respect to their

common interest or for the purpose of discussing views pertaining to certain areas of their common interest.

Integrating the two words therefore, in a lay man's language, a video conference by implication is a way of bringing people together, person-to-person, as individuals or in groups without having to travel great distances on a means of communication such as the video.

In the Computer or Information technology world, Video Conference can be defined as a set of interactive telecommunication technologies which allow two or more locations to interact via two-way video and audio transmissions simultaneously. It has also been called visual collaboration which differs from video phone in that it is designed to serve a conference rather than an individual.

Another word for Videoconference is Video teleconference which is so called because in simple terms, users are able to sit at a conference and interact with a resource person, a trainer, a conference leader, director, a counselor, a business partner, (to mention but a few.) on a television screen irrespective of the location of the individual on screen.

Practically, Video Conferencing uses telecommunication of audio and video to bring people at different sites together for a meeting. This can be as simple as a conversation between two people in private offices (point –to-point) or involving several sites (Multipoint) with more than one person in large rooms

at different sites but at the same time. Besides the audio and visual transmission of people, video conferencing can be used to share documents, computer- displayed information and chalkboards or Whiteboards.

In today's climate of continually looking for new ways of cutting costs, be it in business, education, or government, the investment in a video conferencing facility should prove to be a valuable asset.

One way of cutting costs, is in what could be referred to as employee downtime, which occurs when an employee is being paid for traveling. in all businesses, employees at some time will have to travel to meet with colleagues and/ or customers and much more in the field of education where conferences take place more often than not and both tutors and students must participate in such conferences, field trips, seminars, researches and all sorts of educational trip at one time or the other for one reason or the other and notably at all educational levels, cost cutting is a priority as these journeys incur non-recoverable costs such as transport fare, air tickets, fuel , meals, overnight accommodation and most costly, staff time.

However, when video conferencing technology is applied, the above mentioned costs could be avoided and employees becoming tired and less productive or fatigue taking the toil on participants either young or old, at the primary, secondary or tertiary levels can be prevented.

Video conferencing technology is useful to the teaching community, to researchers, to administrators and in all parastatals , it is an indispensable new technology that should be brought more to light and judiciously utilized to enhance national development and much more specifically, educational development.

1.2 Background of the Study

Historically, simple analog video conferences could be established as early as the invention of the television. Such videoconferencing systems connected via cable. During the first manned space flights, two radiofrequency (UHF or VHF) links were used, one in each direction. TV channels routinely use this kind of video conferencing when reporting from distant locations for instance. Then mobile links to satellites using special trunks became rather common. This technique was very expensive though and could not be used for more mundane applications, such as telemedicine, distance education, business meetings and so on, particularly in long – applications.

Attempts at using normal telephony networks to transmit slow-scan video, such as the first systems developed by AT & T, failed mostly due to the poor picture quality and the lack of efficient video compression techniques. The greater 1MHZ bandwidth and 6Mbit(s) rate of picture phone in the 1970s also did not cause the service to prosper.

It was only in the 1980s, that digital telephony transmission networks became possible, such as ISDN (Integrated Services Digital Network) assuring a minimum bit rate (Usually 128 Kilobits) for compressed video and audio transmission. The first dedicated systems such as those manufactured by pioneering VTC firms, like PictureTel started to appear in the market as ISDN networks were expanding throughout the world.

Video teleconference systems throughout the 1990s rapidly evolved from highly expensive proprietary equipment, software and network requirements to standards based technology that is readily available to the general public at a reasonable cost.

Finally, in the 1990s, IP (Internet Protocol) based videoconferencing became possible and more efficient video compression technologies were developed, permitting desktop or personal computer (PC)-based video conferencing.
In 1992, CU-SeeMe was developed at Cornell by Tim Dorcey et al, IVS was designed at INRIA< VTC arrived to the masses and free services, web plugins and software, such as NetMeeting, MSNMessanger, YahooMessanger , SightSpeed, Skype and others brought cheap albeit low quality video teleconferencing.

In 1995, the first public video conference between the continent of Africa and North America occurred on June 24, (2.00-3.00pm). It linked a technology fair at Fort Mason in San Francisco with a techno "rave" and Cyber-deli in

Woodstock, Cape Town for one hour, using a simple PictureTel system via ISDN. "Cognitive dissident and communications activist David Robert Lewis initiated the video conference and Peacecast on the San Francisco side and Freddie Bell answered the call in Woodstock, Cape Town. Because of different ISDN standards, a video bridge via Boston was used to achieve the call.

Consequently, the International Telecommunication Union-Telecommunication Standardization Sector (ITU-T) developed a family of recommendations for conferencing services over different network media which are:

- H.310: Broadband over Asynchronous Transfer Mode (ATM) networks.
- H.320: Narrowband over Integrated Services Digital Network (N-ISDN) (Digital telephone circuits).
- H.322: Narrowband over LANs (Local Area Networks) that provide Guaranteed Quality of Service (Qos) an improved method of Internet protocol (IP) transmission.
- H.323: Narrowband over Packet Based Networks (IP) that do not provide Qos.
- H.324: very narrow bandwidth over the existing General switched Telephone Network (GSTN).

All of the above recommendations are commonly referred to as the H.3xx Umbrella video conferencing standards. Each recommendation defines a set of protocols, some mandatory, others optional that must be implemented by manufacturers of H.3xx equipment to ensure interoperability of terminals and

software applications specific to and between the other H.3xx recommendations. The Sketched diagram below shows where H.323 fits into the H.3xx family of recommendations.

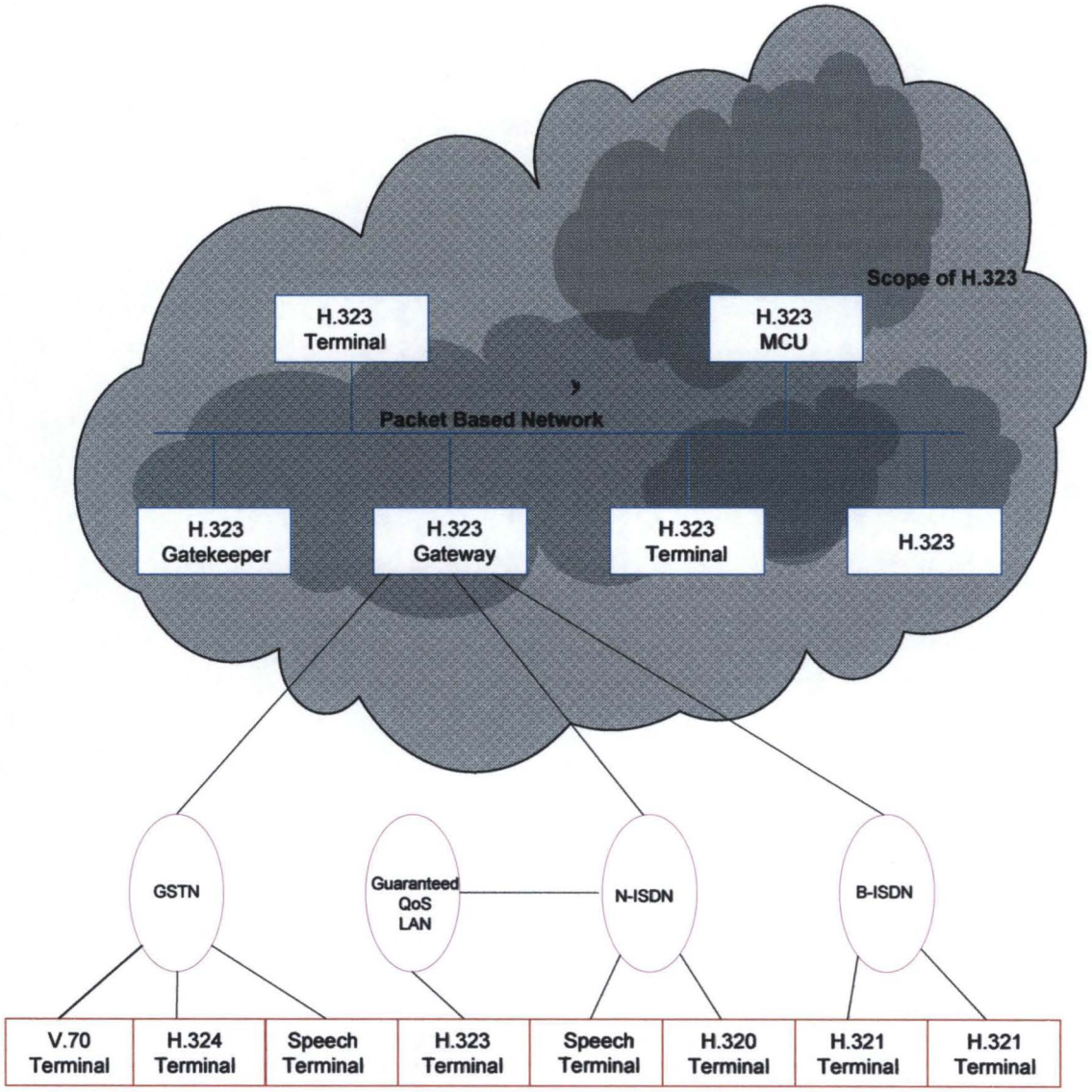

FIG.1.2.1

H.3XX CONNECTIVITY

It should be noted that the Packet-based network is enclosed in a cloud , the cloud represents any Packet-based network such as: Local Area Networks (LANs) Wide Area Networks (WANs), Metropolitan Area Networks (MANs) and the Internet.

The International Telecommunications Union' (ITU's) study group 16 first approved the H.323 specification in 1996.version 4, edited by Paul Jones of Cisco Systems Inc is expected to be ratified very soon. The standard is still very broad in its scope, including provision for stand-alone video conferencing devices as well as embedded personal computer and applications. It deals with point-to-point and multipoint conferencing, multimedia and bandwidth management, call control and interfacing with other H.3xx networks.

1.3 Objective of the Study.

This project is aimed at forming the basis or encouraging the implementation of IP video conferencing at all levels of our educational sector to enhance the optimal educational development we so much desire as a Nation.

1.4 Significance of the Study

The procedure by which an activity is carried out goes a long way to determine the profitability of that activity. A lot of human and financial resources are wasted when undue expenses are incurred in the process of carrying out a particular assignment or executing a certain task.

This study hence reveals its relevance in its critical analysis of result oriented procedures which could be achieved without much expenses via the application of video conferencing in the day to day activities running at all levels of educational institutions.

Professional advice can be given to investors, establishments and so on that want to implement this new technology to improve their status and increase their productivity not only in the educational sector but other sectors as well.

Other relevance of significance of the study includes selecting suitable video conferencing facilities for effective professional practice.

This research should be instrumental in recommending a specific type of video conference system that would benefit specific institution, establishment and educational level.

1.5 Scope and Limitation of the Study

Due to financial constraints and limited time, the researcher could not carry out a comprehensive study all over the states of the Federation.

1.6 Definition of Terms

- ***ATM:*** Asynchronous Transfer Mode. The international Standard for cell relay in which multiple service types like voice, video or data are conveyed in fixed length (53 byte) cells. It is designed to take advantage of high – speed transmission media like E3, SONET and T3.

- ***B-ISDN***: Broadband Integrated Services digital Network
- ***BANDWIDTH***: in the context of this project, it is the capacity of a communication link normally measured in bit(s)
- ***CHANNEL***: Communication path wide enough to permit a single RF transmission. Multiple channels can be multiplexed over a single cable in certain environments.
- ***CODEC***: Codec/decoder compressor decommission '
- Integrated Circuit device that typically uses pulse code modulation to transform analogue signals into a digital bit stream and digital signals back into analogue signals.
- In voice over IP, Voice over Frame relay, and voice over ATM, a software algorithm is used to compress /decompress speech or audio signals.
- ***DNS***: Domain Name System. System used on the Internet for translating names of network nodes into addresses.
- ***FIFO***: First-in, first-out. Refers to a buffering scheme where the first byte of data entering the buffer is the first by retrieved by the CPU. In telephony, FIFO refers tona queuing scheme where the first calls received are the first calls processed.
- ***FIREWALL***: Router or access server , or several routers or access servers, designated as a buffer between any connected public networks and a private network. A firewall router uses access lists and other methods to ensure the security of the private network.
  - ***PTP***: File transfer protocol. Application Protocol, part of the TCP/IP stack used for transferring files between network nodes.

- ***GATEKEEPER***: The component of an H.323 conferencing system that performs call address resolution, admission control and subnet bandwidth management.
- ***GATEWAY***: In the IP community, an older term referring to a routing device. Today, the term router is used to describe nodes that perform this function, and gateway refers to a special purpose device that performs an application-layer conversion of information from one protocol stack to another.
- ***IP***: Internet Protocol. Network layer protocol in the TCP/IP stack offering a connectionless internetwork service. IP provides features for addressing, type-of-service specification, fragmentation and reassembly and security.
- ***ITU***: INTERNATIONAL Telecommunication Union. An organization established by the United Nations to set international telecommunication standards and to allocate frequencies for specific uses.
- ***JANET***: The private network for the Uk's education and research community.
- ***LAN***: Local Area Network. High speed, low error data network covering aa relatively small geographical area.
- ***LATENCY***: Delay between the time a device requests acces to a network and the time it is granted permission to transmit. Or delay between the time a device receives a frame and the time that frame is forwarded out to the destination port.

- ***PACKET***: Logical grouping of information that includes a header containing control information and user data.
- ***PROXY***: Entity that in the interest of efficiency, essentially stands in for another entity,also they are special gateways that relay one H.323 session to another.
- ***PSTN***: Public Switched Telephone Network. General term referring to the variety of telephone networks and services in place worldwide.
- ***QOS***: Quality of Service. Measure of performance for a transmission system that reflects its transmission quality and service availability.
- ***RAS***: Registration, Admission and Status protocol. Protocol that is used between endpoints and the gatekeeper.
- ***RTCP***: RTP Control Protocol. Protocol that monitors the QOS of an RTP connection and conveys information about the on-going session.
- ***RTP***: Real-time Transport protocol. Commonly used with IP networks. It is designed to provide end-to-end network transport functions for applications transmitting real-time data over multicast or unicast network services.
- ***MULTICAST***: Single packets copied by the network and sent to a specific subnet of network addresses which are specified in the Destination Address Field.
- ***UNICAST***: Message sent to a single network destination.
- ***VPN***: Virtual private Network. Enable IP traffic to travel securely over a public TCP/IP network.

CHAPTER TWO

LITERATURE REVIEW

2.1 IP Videoconferencing Technology

VideoConferencing as earlier stated, is a way of bringing people together person-to-person, as individuals or in groups, without having to travel great distances. hence it is said to occur where two or more people come from two or communicate electronically with each other from two or more geographically or physically separated locations using audio and video (Like a phone call with video).

By using a camera, microphone, monitor and a videoconference codec (Compressor-Decompressor) at each location, videoconference participants are able to participants are able to participate in live, interactive video conferences with other sites with similar equipment. Each site's codec is connected to other sites using digital transmission systems, such as ISDN (Integrated Services Digital Network) (Dial-up digital phone lines or the internet (H.323).

Video conferencing has been available since 1950s (Lochte, 1993) but until recently, its role in public education has been marginal. Its traditional home has been in corporate training, post –secondary distance

and the likes; hence video conferencing has its foundational application in education. Recently, this situation has begun to change as several large-scale, national and international projects have introduced videoconferencing in the industrial world, the economic, the political, the Agricultural and others. (Advanced Broadband Enabled learning, 2004)

In the coming years, Videoconferencing will be a part of every parastatals and Ministry because as things are presently, there is no establishment, institute or organization that does not carry out activities involving staff training, communications and conferencing. Green (1999).

In the past, there have been problems with videoconferencing. It has been extremely expensive. The cost of videoconferencing over telephone lines was equivalent to the cost of six long distance calls per site. It was complex and the collection of sophisticated equipments associated with videoconferencing could be daunting to those who were already engaged in complex activities. Steadily, these issues are being resolved.
Kegel (2004).

Complex compression algorithms reduce the amount of bandwidth that Videoconferencing requires and the ubiquity of high speed, high bandwidth networks, like the Alberta Supernet make bandwidth less of a concern. At the same time, efforts to standardize and humanize many aspects of the technology that were once idiosyncratic and proprietary

diminish its complexity. Kinginger (1999), Litterest (2004) and Parrot (1995).

It is the combination of the factors above that have precipitated the introduction of videoconferencing into the mainstream of first the educational settings and gradually into other settings where trainings, tutoring and conferences are inevitable activities.

The term videoconferencing should be understood to refer specifically to IP video conferencing. In the 1990s, IP (internet Protocol) based video conferencing became possible and more efficient video compression technologies were developed permitting desktop or personal Computer (PC) - based videoconferencing. Digital Communications Konsult (2007).

2.2 Review of Previous Applications of VCT

Barshinger and Ray (1998), Pachnowski (2002) and the Ward Melville Heritage organization (2002) report on the use of videoconferencing to take trainees in their organization on virtual field trips. The authors demonstrated that compared to conventional field trips, there was fewer concern about costs, transportation, safety and time.

Cifuentes and Murphy (2002) evaluated the effectiveness of distance learning and multi media technologies. Trainees participated in collaborative activities and shared multimedia files during interactive

Videoconferences. The use of the technology was found to facilitate an expanded learning community. The tutors developed empowering multicultural relationships and the trainees developed a multicultural understanding and positive self-concepts as reported by the authors.

Hepburn and McMillan (2004) conducted an economic evaluation of a Videoconferencing program in a northern rural remote school district. Each of the districts five high schools was equipped with sophisticated videoconferencing suites that included document camera, electronic whiteboard, multiple monitors, cameras, microphones personal computers and desktop videoconferencing units for each of the personal computers.

Hepburn and McMillan estimated the annual cost of the suites at $445,000. To conduct a cost effectiveness analysis, they also collected year-end achievement data on students whose courses were delivered entirely through videoconferencing suites and they compared this with similar data from students in the district who took face-to-face course, correspondence courses or audio graphic courses. The authors employed a Quasi-experimental research design and processed their data using quantitative data analysis techniques. They concluded that when costs and student achievement are considered together, videoconferencing delivery was more cost-effective than the alternatives. They provided sufficient data for readers to draw their own conclusions.

In Wales, videoconferencing is being used for judicial purposes where only members of the legal profession, judges and lawyers are involved in settling an aspect of a case.

Green (1999) evaluated a large literacy project funded by the United States Department of Education in which a collaborative learning environment was established between eleven schools. Green's assessment of the project after four years of operation showed that students had made substantial gains in English reading proficiency. In addition, the percentage of students who successfully completed their college preparatory coursework increased. The author also notes that attendance was higher for students who participated in the project than it was for those who did not.

Siraj-Blatchford et al (2000) explored the use of video conferencing with young children at the primary level using the technology as a free play activity. The use of Videoconferencing increased the children's awareness and understanding of the technology.

Scrubland's (1999) doctoral dissertation focuses on the perceptions of fourth to sixth grade students who used videoconferencing as a learning tool. Her results showed that Videoconferencing was effective in increasing student's perceptions of their ability and achievement scores, and that the effect persisted across grades and gender.

Yost (2001) evaluated the use of videoconferencing with young children. Two Kindergarten classes participated in daily Videoconferencing interactions. The author concludes that the children enjoyed the experience, increased their understanding of technology and enhanced their awareness of their environment.

Cavanaugh (2001) conducted a meta-analysis of distance education studies published between 1980 and 1998. Focusing on instructional activities and interactions between the attributes of learners and technologies, she identified differential outcomes of two distinct approaches to distance delivery. Programs that used interactive technologies such as Videoconferencing too enhance traditional instruction yielded greater effects on achievement than programs that used interactive technologies as the primary tool to deliver instruction. Cavanaugh concluded that interactive media are most effective when they are used moderately to achieve specific goals, in combination with other methods and activities.

Thurston (2004) investigated the use of Videoconferencing to support international collaborative projects among primary school classes.
The goal of the project was to promote multicultural education and awareness. Students in Scotland and the United States that the students'

use of language to define ethnicity became more complex and their attitudes towards ethnic minorities became more inclusive.

Shaklee (1998) evaluated changes in children's understanding of science when exposed to remote scientist engaged in scientific activities. Students involved in the activity were in a combined second, third and fourth grade classroom. Videoconferences with the scientists were associated with improvements in the student's understanding of science.

Pachnowski (2002) describes the use of Videoconferencing as a tool to prepare for and ultimately replace field trips. She argues that virtual field trips are cost effective and reduce problems such as student transportation, safety and time limitations. Pachnowski explains how to find a virtual field trip provider, what features to look for, how to prepare a class for the experience and costs. Bringing Videoconferencing technology into schools, she argues opens up new opportunities for curriculum enrichment, cost savings and learning benefits.

Hung and Tan (2004), the authors present situated learning as a theoretical underpinning for taking students out of the classroom through Videoconferencing, and they suggested activities and outcomes that are consistent with this theory. The authors suggest that 'bringing the community into the classroom, through connecting students to scientists, experts and professionals, enhances their learning. Through

telementoring, students learn about collaboration, contextualized reasoning and the manipulation of tools to solve ill-defined problems.

Gage, Nickson and Beardson (2002) evaluated the use of Video conferencing in the study of mathematics by high school students. The technology provided an opportunity for students to collaborate with other classes. Teachers reported that the collaborative activities were valuable, noting that students frequently worked on problems beyond the normal curriculum. Students valued the opportunity to communicate with others in presentations and discussions of mathematical problems.

Burke, Beach and Isman (1997) report on a project in which Videoconferencing was used to support collaboration between four teachers' and their students. Teachers initially used the technology to expand their communication possibilities and to access consultants and specialists. Students used Videoconferencing to interact with each other. They reported that a community of learning developed during the project.

Hearnshaw (1998) evaluated an eight-week course delivered by Video conference. The author concluded that the academic content should determine the optimal mode of delivery and video conferencing is considered to be beneficial to support dialogue.

Videoconferencing is often incorporated into educational environments because it affords rich interaction between participants. Wagner (1994), however, cautions users to distinguish between characteristics of the medium, which she calls interactivity and the process that learners actually engage in, which she calls interaction. Wagner encourages researchers to document and describe learner interaction rather than assume they are using interactive, real-time communication media to their full potential.

Gilham and Moody (2001) discuss the use of rudimentary Video conferencing systems to assist youth re-enter their schools and communities after periods of incarceration. Using desktop Video conferencing, community members, correctional personnel and teachers work with incarcerated youth to assess their academic vocational performance and other needs. The authors characterize the process as convenient, affordable and such peaceful.

Thorpe (1998) reports on a research study that linked three Welsh Secondary schools. The children (all of whom were diagnosed as special needs student) participated in weekly multipoint video conferences. The main goal was to improve student's social skills through communication with peers. The researcher found that social and communication skills were developed, the technology motivated the students, self –esteem

was enhanced and the technology provided a structure that helped some students to focus.

The Scottish Council for Educational Technology (SCET) (1999) reports on issues and outcomes associated with special needs students receiving instruction through videoconference. They present series of case studies as practical examples of successes in using the technology. The report highlights the potential liberating benefits for students with special educational needs and their teachers.

The British Educational Communication and technology Association (2002) evaluated the use of video conferencing in five rural primary schools. The authors identify important factors for success, including a champion to lead the project, pedagogical and technical training and the opportunity for participants to engage in collegial dialogue.

Geelan and Fiege (2004) discuss a professional development program that sought to develop the skills and knowledge needed to effectively teach in a virtual presence learning environment. Online communications were continually available to teachers. This professional development concept and online delivery was deemed successful.

Hayden (1999) focuses on the impact of video conferencing sessions to support constructivist applications and learning experiences. Desirable

characteristics of Videoconferencing that support constructivists learning environments were identified.

Barfurth (2002) evaluated the LearnCanada project and the perspective of teachers on the use of broadband video conferencing for professional development. The teachers were overwhelmingly supportive of the use of the technology for professional development purposes. Success requires countering issues such as time, money, and scheduling which are seen as barriers inhibiting the widespread use of videoconferencing.

Montogomerie, Davenport and King (2003) examined two uses of broadband networks and broadcast quality video. An evaluation on the use of full motion video by students is provided. The use of video conferencing in a rural and remote Canadian school district pilot project builds on this initial study. The authors conclude that full motion video environments can address social and economic needs of educational institutions. The pilot project also implemented various educational technologies in high school classes (real-time video conferencing, interactive whiteboards, individual computers equipped with work group software, proviso of asynchronous access).

Donegan (2002) evaluated the cost effectiveness of Videoconferencing and online software sharing. Videoconferencing was used to provide support, assessment and training to professional. The experience of

using low-cost video conferencing and online software sharing was very positive.

Wells (2001) examined the concerns of individuals responsible for implementing new curricular requirements for instructional technology. The study concluded that there is a need for balance.
There are perceived positive aspects of distance systems (service and teaching) where the use of video conferencing is inevitable.

Videoconferencing allows the learning context to be projected beyond the physical classrooms; therefore it can meet the needs of students who have been displaced from their normal school context.

2.3 Equipment (Hardware and Software)

Video conferencing requires special technical consideration due to the synchronous nature of the activity- failure of synchronous equipment including audio and video is not tolerated by participants who are left with few fall back alternatives.

Network failure, slowdowns, equipment incompatibility and excessive complexity have plagued videoconferencing as compared to less technologically sophisticated delivery systems. In addition, hardware standards, protocols and equipment have been in continuous state of rapid change since videoconferencing was first used in schools.

However, costs have been decreasing, hardware standards (notably H.323) are being adopted and reliability and easy use equipment have been increasing significantly.

Much of the earlier educational videoconferencing littérateur was based on integrated services Digital Network (ISDN) systems alone. These systems are more expensive to operate than current IP based systems, but until recently were more reliable .The advent of high speed, high bandwidth fiber optic networks allow for more cost effective videoconferencing than earlier systems and offer potential for higher quality video, audio and text transmission than earlier systems.

There are a large number of hardware and software options available to support videoconferencing and few unbiased comparative studies conducted in authentic educational contexts. Standalone systems, commonly referred to as set top boxes are the most expensive choice. They offer enhanced service and can support multiple large screens, thus they are usually the first choice for classroom based delivery.

However, advances in hardware based desktop systems and software based systems running on high performance machines may also provide a satisfactory, low-cost videoconferencing alternative for some educational applications. Motamedi (2001)

Of critical importance is audio quality. Participants may tolerate poor video but the loss of audio effectively ends a Videoconference. For this reason, room design and a choice of quality systems that include echo cancellation are critical for successful educational videoconferencing. Robles(1997).

Increased capacity in data transmission is important for Videoconferencing, especially when multiple sites are linked.Howeveer; it has been shown that increasing the quality of the video channel does not necessaruily result in measurable increases in the quality of the dialogue or learning outcomes.

As in many other applications of Educational Technology, other factors such as instructional design and learning activities have a more of a pronounced effect on outcomes than any particular attribute of the medium used to support the instruction. Clark (2000).

Hardware and Software solutions that automatically record Videoconferencing sessions and provide them in streaming video format for later viewing offer import asynchronous advantages. This recording capacity can be useful for students who miss classes, student and teacher assessment and for research purposes. Such recording features are commonly provided in IP based audio graphic systems, but are as yet not standard features of video conferencing systems.

CHAPTER THREE

SYSTEM ANALYSIS AND DESIGN

3.1 The Technology Behind IP Videoconferencing

The H.323 videoconferencing is designed around four main components:

Endpoint or Compressor/ D compressor (CODEC):

This unit is the direct interface the user interacts with. It basically consists of:

a. A camera and microphone for capturing the local video and sound.
b. Video and audio OUT ports for output of remote video and audio.
c. An encoding /decoding internal mechanism for the necessary conversions of video/audio signals.

The endpoint can come in various forms from a dedicated hardware unit to a PC –based solution plat formed on combinations of software and hardware.

An endpoint is not an optional item in a videoconference. It is also referred to as codec.

Multipoint Control Unit (MCU)

This unit is only required when a videoconference session requires more than two endpoints. It basically provides multiplexing service to videoconferencing. The MCU consists of the subsystems that perform the transcoding and mixing of video/audio streams of the multipoint conference. The MCU is mostly a dedicated hardware unit.

The implication therefore is that a Multipoint Control Unit (MCU) is an essential component when videoconferences are held between three or more endpoints.

An MCU consists of two other types of components, a mandatory Multipoint Controller (MC) and optionally one or more Multipoint processors (MP).

The multipoint controller manages call control signals and determines the capabilities of endpoints and therefore negotiates the communications parameters. Depending on the Multipoint Conference topology, the MC can determine whether to nicest separately to all stations (this sends individual data packets separately to each terminal) or multicast (Sends a single data packet addressed to all participating terminals) the video and audio streams.

An MCU is required when a multipoint videoconference is to be managed centrally. Here all endpoints establish a point-to-point connection with the MCU and negotiate their own communication parameters. It is ideal if all endpoints transmit and receive than same bandwidth h because problems

can occur if the MCU has to switch between different bandwidths and may become overloaded.

The MCU sends each endpoint a mixed media (audio and video) stream.
The multipoint processor manages the mixing, switching and processing of the audio, video and data streams among conference endpoint
Where a Multipoint videoconference is not centralized, it is the responsibility of the MC to ensure communication compatibility between endpoints. It is left to the terminals themselves to multicast their outgoing media streams and to re-mix the incoming media streams.
The use of multicast within H.323 conference is not currently common and it is not supported by most main line products.
Although an MCU is a separate logical device and is optional in an H.323 network, it is sometimes found combined with a gatekeeper, a gateway or terminal.

Gatekeeper:

In an enterprise with large videoconferencing investments, endpoints and other components need a gatekeeper to provide registry ser ices and policy enforcement.
The gatekeeper organizes registered H.323 components into administrative entities called zones and it should be noted that there can only be one authoritative Gatekeeper in zone.

A gatekeeper, although technically optional component, is often referred to as an H.323 enabled network. If a gatekeeper does exist, all endpoints (terminals, gateways and Mucus) must be registered with it. A network where H.323 equipment exists is often called an H.323 zone and an H.323 zone can only have one registered gatekeeper controlling it.

Many control messages are routed through the gatekeeper and this provides the network with a level of management control.

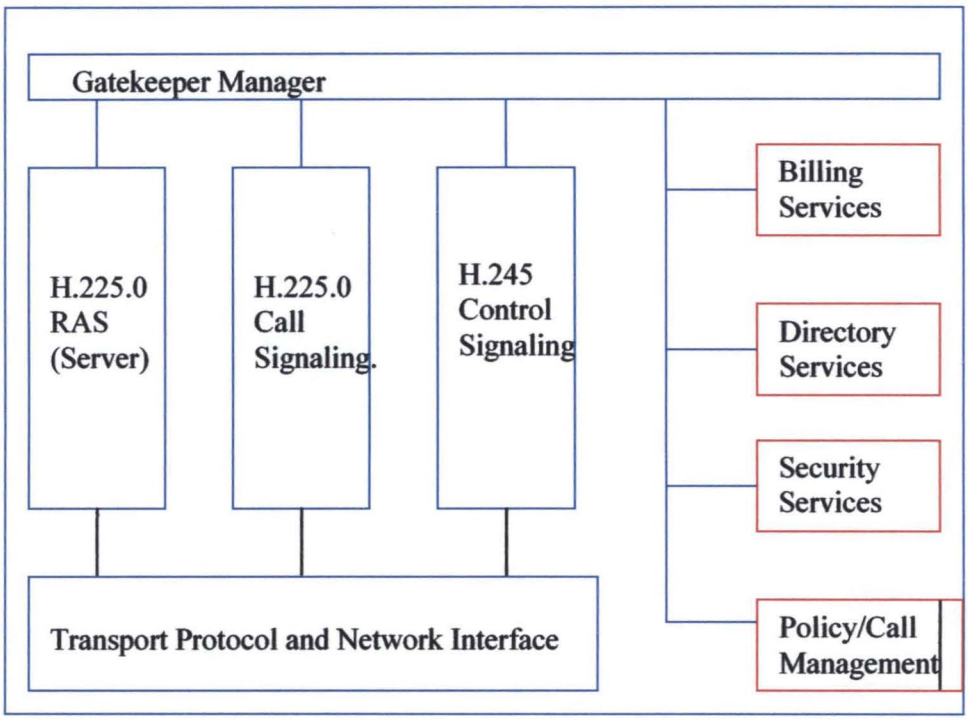

FIG.3.1.1 GATEKEEPER COMPONENTS

A gatekeeper provides several services to all of its registered endpoints, including the following:

Address Translation

A database /lookup table, maintained by the gatekeeper provides translation between aliases, such as translation between international phone numbers and network addresses .this is much in the same way as IP network names are translated to numeric addresses by the Domain Name System. (DNS)

For users linked to JANET (The private network for the UK's education and research community) a JANET H.323 addressing scheme is being designed so as to be consistent with schemes in use elsewhere.

Admission and Access Control of Registered Endpoints.

A gatekeeper can control the access of H.323 traffic to an H.323 zone. Access may be managed or limited for a number of reasons; the number of simultaneous H.323 calls must be restricted so that e-mail and other network services are not adversely affected.

Bandwidth Management

The monitoring and management of available bandwidth is important not only for the successful transmission and quality of video traffic but also for maintaining the required capacity for normal day-to-day network use.

Network administrators can manage bandwidth by limiting the number of simultaneous H.323 calls. These limits can be governed by the time of day

and available bandwidth they are also likely to be closely related to the volume of expected network traffic.

Routing Capability

A gatekeeper can route and re-route all calls originating within its network. This capability has many benefits: accounting call charges, security purposes, maintaining bandwidth during calls. The routine g capability of a gatekeeper can also help to ensure a level of quality of service.

Terminal:

An H.323 provides terminal provides real-time bi-directional multimedia communications. To support a conference a terminal must as a minimum requirement support audio communication. Strictly speaking video and data sharing are optional. However, as this project is concerned with videoconferencing, the video component will also be regarded as essential. Data application sharing remains an optional extra.

Virtually any modern PC, desktop or portable can be turned into an H.323 compliant terminal. There are a variety of products that can be added to a PC to achieve this objective. Products such as NetMeeting and Linux Meeting are not exclusively designed for this purpose but when bundled with simple video capture hardware they can provide a low cost entry-level facility.

However, these sometimes suffer from compatibility problems especially in multipoint conferences when a variety of terminal devices are involved. Products provided with special hardware that implements the H.323 protocols are designed for videoconferencing and provide a higher quality facility which will often bypass the problems associated with the former option. The most sophisticated option is an H.323 dedicated videoconferencing device. These deal with all aspects of videoconferencing and are available from several manufacturers.

Videoconferencing proxy

Though it was stated that there were potentially up to four components in an H.323 network, this still remains true.

However, for security, consideration should be given to a fifth component, proxy. An h.323 proxy is a special form of gateway that relays communication between the endpoints on H.323 IP networks. Instead of a terminal directly transmitting to a distant terminal it will transmit to the proxy which in turn transmits to the distant terminal. As far as terminals outside your network are concerned, the traffic appears to originate from the proxy.

A videoconference proxy may be a separate unit but it is more common for the proxy to be combined with a gatekeeper.

Below is a diagram that shows a number of inter-connected networks where all of the H.323 components including the proxy are conceptually attached to a network. A proxy may also be used to assist in signaling to request improved quality of service from the network.

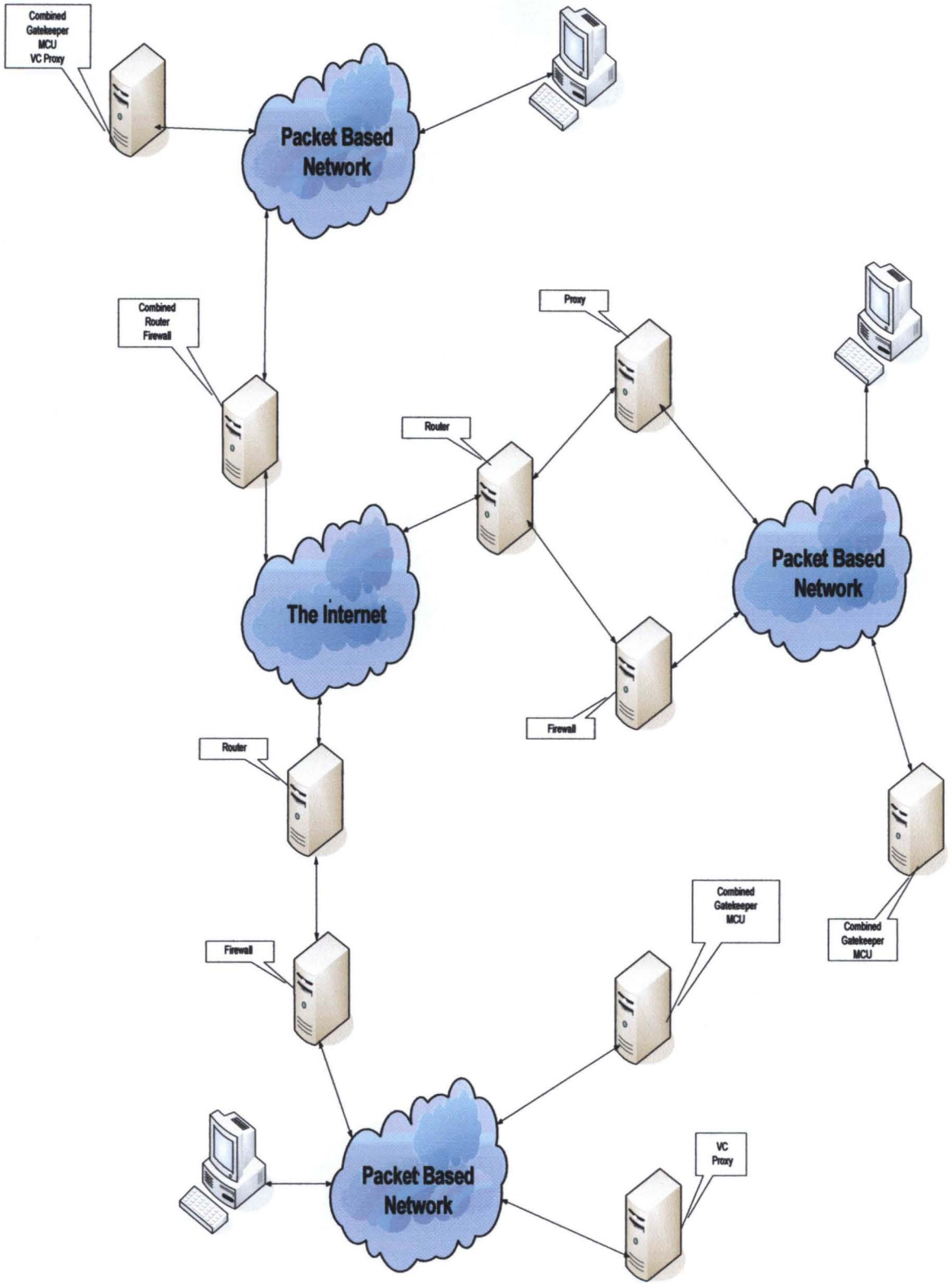

FIG.3.1.2 H.323 COMPONENTS

3.1 Types of Videoconferencing

There are significantly different types of videoconferencing.

Point-to-point videoconferencing:

This is a videoconference where a link is established between two H.3xx compliant terminal endpoints. With the possible exception of a gateway where necessary, no other specialized components are required for this type of conference.

Person –to –Person

Person-to-person is an example of point-to-point videoconferencing which involves just two terminals or endpoints. The terminals could be PC based or be dedicated conferencing units such as polyspan view stations.

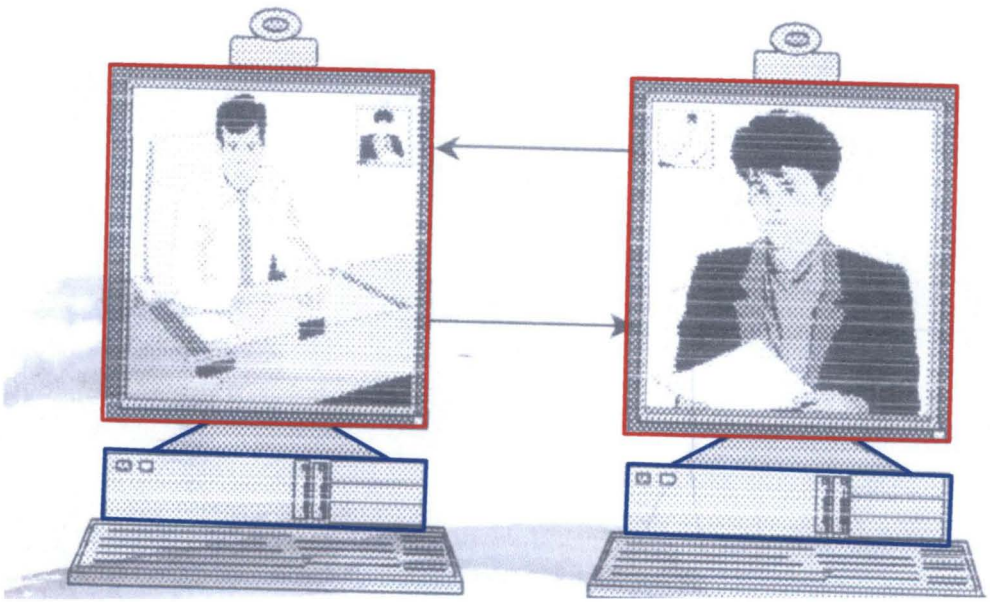

FIG.3 2.1 PC VIDEOCONFERENCING SYSTEMS SHOWING PERSON-TO-PERSON VIDEOCONFERENCING.

As the diagram shows, only two terminals are involved. By coincidence, they are both PC based systems running H.323 compliant applications. As long as the application software and hardware components are compliant with the H.323 standard the conference will succeed. Thee users should be unaware of any differences in the application software running on each machine.

The connection is established by one of the terminals making a call to the other .the endpoints could be situated anywhere. They might both be in the same building or be in different offices situated in different parts of the country or of the world.

Only two H.323 compliant terminals are involved and only one person is using each terminal.

It should be noted that the terminals in the figure are also shown using picture in picture. (Item is PIP). The PIP facility displays on screen, a superimposed smaller image of the site. PIP allows the local site to monitor what the remote site is seeing, which allows for any adjustments to be made at the local site in order to enhance the remote site's viewing.

Person-to-Studio.

Person-to-studio is the second example of a point-to-point Videoconferencing. Like the person-to-person videoconference, there are just two terminals or endpoints involved; Once again, the endpoints could be any type of terminal device. The difference here is that at one terminal there is one individual whereas at the other there are many. The system is interactive therefore any

of the individuals involved can speak to the others and assuming the seating arrangements are properly made they are all able to see each other.

It is common practice to have more advanced features associated with the terminal on the studio side of the conference. For instance the terminal may support audio tracking.

Audio tracking is a feature whereby the audio signal (current speaker) is picked up from the microphones and automatically causes the camera to pan over to capture the current speaker. Also, at the studio site it is common practice for there to be two video monitors, one to view the local site and the other to view the remote site, rather than having both depicted on one screen.

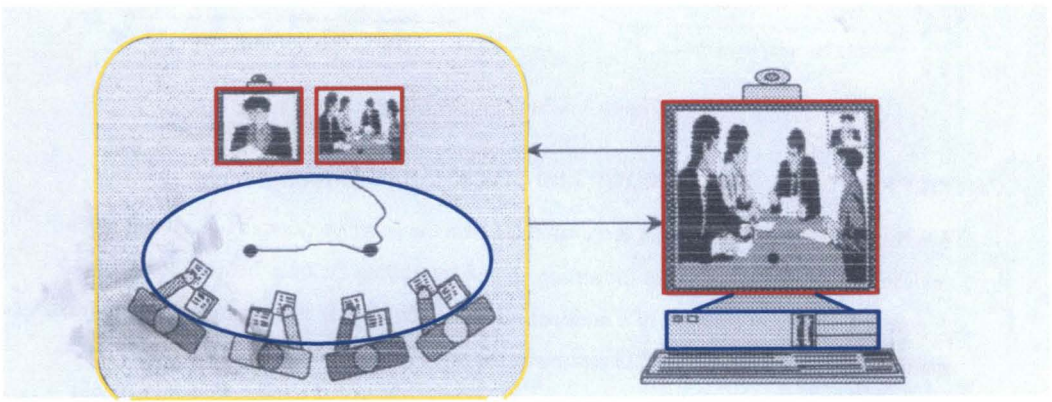

FIG. 3.2.2 PERSON- TO- STUDIO VIDEOCONFERENCING

From the above diagram, it can be seen that a teacher presenting a lecture to a remote class of students or an expert presenting a paper for a conference might use this system.

Studio-to-Studio

A studio-to-studio Videoconference is the final example of a point-to-point connection .it would be expected that both ends would have the more advanced features similar to those mentioned in the preceding person-to-studio example. An example of where a studio-to-studio conference could be used is collaboration between different school classes. A school in Niger State could establish a connection with a school in Lagos.

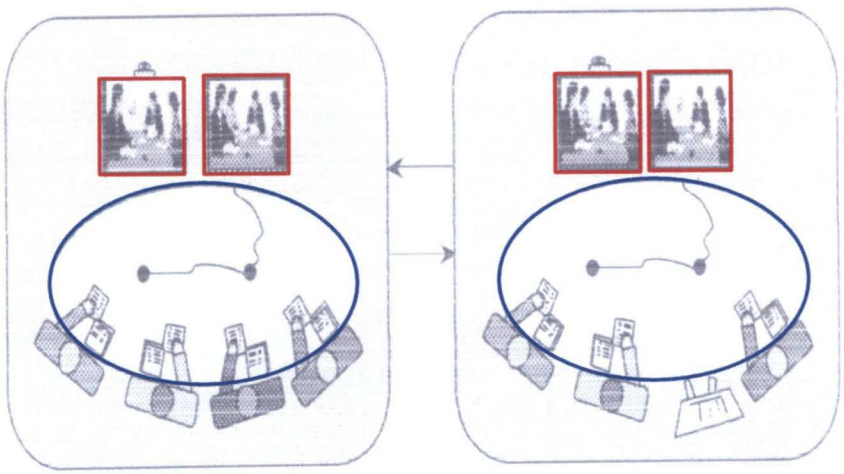

FIG. 3.2.3 STUDIO-TO-STUDIO VIDEOCONFERENCING

Multipoint Videoconferencing (Multiple desktop and Studio locations)

Multipoint Videoconferences are more complex than the previous examples given and require additional management features for setting up and controlling the links between terminals.

There are a number of ways by which a multipoint Videoconference can be managed. The main focus of control lies in how to switch between video streams and the current speaker. Here we lay emphasis on three possible solutions; they are continuous presence, Voice Activated Switching and Chairperson Control.

Continuous Presence:

Continuous presence (or celebrity squares) is a process where the video stream's of remote Videoconference participants are simultaneously displayed on the local screen. During the call set-up phase of a multipoint Videoconferencing, each terminal negotiates with the MCU to establish its own operating parameters. The number of video terminal is established during this phases.

The advantages of simultaneous output are only really apparent when the number of locations is not greater than the capability of the terminal. It is instantly oblivious who is speaking and participants can indicate visually when they would like to contribute.

One disadvantage is the possibility of distraction. A participant's body language and obvious disinterest in the proceedings can have an adverse

effect on the other participants. There is also the problem of processing, the greater the number of streams, the more demands placed on the MCU. These demands therefore not only place a practical limit on the number of locations that can be displayed, but also results in reduced image resolution. There is also the problem of which views to display. When there are more sites than can be displayed the MCU switches between streams. The normal regime is that the current speaker is always displayed and then a first out (FIFO) regime is adopted.

Voice Activated Switching:

Voice Activated Switching is the default mode and is used for 95% of all JANET Videoconferences. This mode of conference control relies on the MCU switching the transmitted video stream to that of the current speaker. Closer inspection of the multipoint Videoconference reveals that voice activated switching is in use. As with any of the control modes, the video streams from all locations are transmitted to the MCU. It is the MCU's responsibility to switch to the current speakers

audio and video and re-transmit them back to the remote sites.

Another feature of this method is that the current speaker does not get their own video back; rather they get the video of the previous speaker. The effect of the current speaker receiving the previous speaker's audio and video is that it gives the impression of giving a direct reply.

Chairperson Control:

Chairperson Control is a mode where one site controls who are allowed to speak by means of either hardware or software control. An example of Chairperson Control could be in the resolution of legal issues where bad judge can physically intervene during legal debate between solicitors and/ or barristers.

However, chairperson control is a feature that is not supported by all MCU manufactures. There are also problems associated with endpoint compatibility; therefore this mode of conference control would not be given serious consideration.

3.3 Design and Specifications Analysis

An Example of a Complex IP Videoconferencing Infrastructure.

- H.323 Videoconference Codec with voice-activated conference control capability connected to Twin wall mounted 50 "plasma screen.
- One VIU 4300T converged network appliance for firewall /gateway traversal.
- Polycom MGC-25 Multipoint Control Unit (MCU0 for 10–sites multipoint stream transcoding and bridging.
- Document camera plus polycom People+ content for increased collaboration.

- 900 hours network video encoder for session recording and streaming.

- Authoritative H.323 gatekeeper for effective resource management.

Specifications Analysis

The table below analyses the devices and software necessary to achieve the above infrastructural design.

TABLE 1 SPECIFICATION ANALYSIS

S/N	SPECIFICATION	DEVICE/SOFTWARES	ANALYSIS
1	❖ General ❖ Support four independent monitor plus a projector. ❖ On demand multipoint conferencing for up to 6 sites ❖ Streaming capabilities. ❖ Capability to record meetings and/or stream video calls. ❖ Integrated presentation and collaboration system. ❖ XGA out for high resolution graphics.	Endpoint/Codec	This feature could be more economically offered as embedded functionality in endpoints, however, its downsides are: ❖ Loss of scalability factor(a fundamental requirement for this implementation) ❖ Endpoint: embedded MCU has diminished performance like inability to cascade conferences due to limited back plane capacity.
2.	❖ Main camera ❖ Ultra-quiet, ultra fast action pan/tilt/zoom. ❖ -Auto focus ❖ -Voice activated positioning ❖ -Tilt range +/- 25° (up/down)	Pan -Tilt –Zoom (PTZ) internal or external Cam.	
3.	❖ Video features ❖ -H.264, H.323	endpoint /codec	
4.	Audio features ❖ Full duplex audio, automatic Gain control. ❖ automatic noise suppression ❖ Real-time Audio level meter/tonal speaker test .	microphones	These could guide internal microphones embedded in endpoints as well standalone external microphones designed for medium to large audiences.

	❖ Audio mixer , mice, VCR, telephone , line – In.		
5.	Network features. ❖ Automatic IP calling, ISDN capable. ❖ Down speeding over IP. ❖ Easy call placement ❖ TCP/IP, DNS<WINS<DHCP, ARP, HTTP, FTP, Telnet Support. ❖ T120 interface for Microsoft NetMeeting.	MCU and endpoint.	ISDN capability turns the: ❖ Endpoint into a mini gateway of its own giving it capability to connect to ISDN. ❖ MCU into a full-scale enterprise gateway device which can connect IP – based endpoints directly to ISDN based systems.
6.	Bandwidth ❖ Optimization for low and high bandwidths. ❖ Maximum Data rate IP up to 6 Mbbps in multisite/2Mbps ISDN. ❖ Network interface : 10/100 Mbps.	MCU and Endpoint	All features are standard MCU functions.
7.	Multilingual support ❖ English ❖ French ❖ Portuguese	All devices and software's	
8.	Accessories ❖ Screen: Two dual 50" plasma.	Display	

A Simple IP Videoconferencing Infrastructure

It should be noted that apart from dedicated videoconferencing that is use of hardware infrastructures alone where all the necessary equipments are put together to achieve videoconferencing, there is the alternative of using a software package to achieve the same.

In this instance, the basic infrastructure or hardware involved are simple and are determined by the number of participants.

A typical and current software package which when installed and rightly configured with the systems to use in the connection achieves videoconferencing perfectly.

Equipments

- personal computers (PC)
- Camera (web cam)
- Speaker
- Mouth piece(optional)
- Cross cable

3.4 Firewalling and security:

The firewall is a set of security mechanism that an organization implements to prevent unse4cured access from the outside world to its internal network.

An organization with its own internal network (intranet) whose users also requires access to the internet, usually installs a firewall to prevent unauthorized internet users from accessing the internal network.

Firewalls usually work by blocking access of certain network protocols to specific ports. The firewall can also control what internet resources the organizations users may access. The firewall is generally installed on a specific computer located in such a manner that no incoming requests can by-pass it and gain access to the internal network. Firewalls usually include or

work in conjunction with a proxy server. (Acts as an intermediary server that makes network requests on behalf of internal users so that organizations ensure security and control of services.

CHAPTER FOUR

APPLICATION PROGRAM FOR VIDEOCONFERENCING: NETMEETING.

4.1 NetMeeting Overview.

Netmeeting is a collaborative computing tool designed to allow two or more people to enter a virtual meeting from geographically dispersed locations. It provides a virtual space within which the participants can communicate via voice, video, chat or whiteboard and can share applications and documents.

Netmeeting software provides access to a variety of resources , including developer tools, loading areas, communication forums and product information services including updates, enhancements, addition of new web properties and other new features are included in the terms of use.
Unless specified, the services of Netmeeting software can be used for personal and non-commercial use. The software can be downloaded for use by the end user according to the license agreement.

Generally therefore, the services provided by Netmeeting software include e-mail services, bulletin board services, chat areas, news groups, forums, personal web pages, calendars, photo albums, file cabinet and other messages and communication facility which enable one to communicate with

others. Communication services are only to post, send and to receive messages.

Netmeeting software minimizes travel expenses and provides online communication facility. This facility6 is called the virtual meeting and this will take place in real time and will yield real results.

A virtual meeting can include anonymous brainstorm and surveys of solution ideas, verbal discussion of ideas, categorization and voting for fast decision making.

4.2 System Requirement

Netmeeting runs on Windows 95, Windows 98, Windows NT/2000 and XP Platforms. It is used for communication and collaboration across the internet or a Local Area Network (LAN) using transport protocol (TCP) and Internet Protocol (IP)

The user's physical connection to the network is irrelevant to the operation of Netmeeting though there are user-adjustable settings for matching the conference bandwidth to the network medium.

Prior to loading Netmeeting, Microsoft's Internet Explore, version 4.0 or higher must be present on each user's computer. Netmeeting is not compatible with any other browser and requires internet Explorer to I install and operate properly.

4.3 Directory Services:

Directory services allow a person find the basic information required to connect both and collaborate with one or more persons. The minimum information typically required to complete a connection to someone is that person's network address. This ca n take the form of an e-mail address, internet protocol (IP) address or user name on a particular Internet Service Provider (ISP)

There are directory listings that can provide one or more of these pieces of information given the proper name of the person in question.

Once the required address of each intended conference participant is obtained, the conference host can place a call top each and establish the conference. Communication and/or collaboration can then commence.

It should b e noted that if users know the IP address of each other, they can connect point-to-point without having to log on to a directory server except if preferred so as to identify all available users. Once they log on, they can select the user(s) they wish to communicate with without being required to know the Internet address beforehand.

4.4 The NetMeeting Setup

The first step in using Netmeeting is to take inventory of your hardware. You can perform some of NetMeeting's most basic tasks with hardware that is standard to most computer systems, the computer, the monitor; modem, speakers and sound card are basic.

For example, to use the text based chat features or hear others talk to you, if you have other peripherals, you'll be able to take advantage of some of net Meeting's other communication features.

If you have a video camera attached to your computer, you can send live video of yourself to the other party and with a microphone, you can carry on voice conver4sation.

FEATURES

CHAT

Chat services allow participants to have REAL-TIME TWO-WAY TEXT COMMUNICATIONS IN FULL DUPLEX. This type of service is better , for example than instant messaging because the chat participants see each keystroke as it occurs, which feels more natural for users.

Participants in a meeting can use chat to communicate in the absence of audio support, or when bandwidth constraints make audio support unusable. In other words Chat is a text messaging feature that allows users to communicate in real-time, providing a written archive of this communication. It can therefore be used between two or more participants. A special option allows two participants in a multipoint inference to have a private chat within the group.

WHITEBOARD

The Whiteboard feature allows users to create, review and modify text and graphical information in a collaborative way. Generally, all participants can add to or modify the contents of the Whiteboard at any time, though access control rules can be applied to restrict this as desired. Information created or modified in this manner can be incorporated into other document types for final release.

Meeting participants can simultaneously review, create and update graphical information displayed on a White board.

NetMeeting's Whiteboard is object-oriented, rather than pixel-based, allowing users to select specific objects to highlight or modify.

The Netmeeting Whiteboard claims to be T.126 compliant (T.126 is an Internet Whiteboard protocol) which means it should be compatible and able to be used with other T.126 compliant Whiteboard tools.

FILE TRANSFER

The file transfer feature allows users to send data between one another. Access controls can usually be established to limit the ability for others to access files on your computer. Some collaborative tools also provide user-selectable constraints on the type and size of files that can be transferred.

The sender selects a file from the standard Windows file pull-down menu (like health reports), selects the recipient(s) from the user name pull down list(like Helen in ward 2) and clicks the send button.

The transfer status (sent) is displayed. Each file transfer recipient sees a pop-up window. The window shows the status of the incoming transfer, the name of the alleged sender and a warning about potentially malicious code. Also, the receiver of the file has option to close, open or delete the file either during the transfer or after the transfer.

PROGRAM SHARING

Program or application sharing services allow a program on one participant's computer to be shared with other call participants. The initiator can then pass control to another participant, allowing real-time modifications to be made by the second participant.

This feature is generally used to broadcast a presentation (such as Microsoft PowerPoint) to the participants for comments, enabling the initiator to make live modifications. Program sharing enables participants to share the software application loaded on a single machine rather than receiving an individual installation on each computer as a prerequisite to varying and modifying the material being presented.

ONE-TO-ONE AUDIO/VIDEO CONFERENCING

Audio services allow participants to communicate through audio (voice and Multimedia material) To use these services, the participants must have multimedia capabilities in their computers. (Speakers and microphone or a telephone interface).

Video services allow participants to use video cameras to see each other during the conference. In order to transmit video, a participant must have a video camera connected to their computer.

The quality of both video and audio transmission is directly related to the bandwidth of the network medium used for the conference. In general, lower network bandwidth results in lower quality of audio.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Discussion

Modern educational system, like other modern social and economic systems have become increasingly complex. The complexities of educational systems and their institutions , particularly in Nigeria and other developing countries, tend to be characterized by such phenomena as: student population, diversities in the directions and dimensions of programs and operational goals and procedures; inadequacy of funds and other material resources even into eh face of excruciating inflationary spirals , conflicting models, policies , their theories and methodologies advocated or adopted for implementation and perhaps most importantly, the inadequacy of information and distribution of the same and the non-application of strategic management possibilities of which videoconferencing is typical.

Ironically, there is an increasing demand by the Nigerian public that the education enterprise should produce good results hence the need for the implementation of suggested technologies to achieve stated educational objectives much more than before.

The essence of videoconferencing as a tool for educational development is therefore to help solve educational problems related to time management,

information dissemination, cost effectiveness, institutional growth, development and productivity by making the best possible use of available resources, making the teaching and learning process interesting and result oriented in a changing environment growing steadily more complex.

It is indisputable that to effectively fulfill its roles of social and economic development, as well as the development of individuals, educational institutions must be well managed and the process of educating minds must always be abreast with technological advancement.

5.2 Conclusion

Videoconferencing is an educational technology that overcomes many of the objections that people have to providing education in any setting other than the face-to-face classroom.

It overcomes the lack of interaction associated with correspondence study, it provides a rich repertoire for communication unlike pure computer conferencing and audio conferencing and it allows teachers and audio conferencing and it allows teacher and students to engage in the types of teaching and learning activities to which they are accustomed with a lot of varieties.

As earlier affirmed in the course of this project, it was in the past that videoconferencing technology was extremely expensive in its application

at any level, now it has been phased and standardized in such a way that affordability is easier and implementation achievable without extensive expenses. Much more interesting is the simplicity of utilizing videoconferencing with only very simple infrastructures.

One of the major problems militating against Education in Nigeria is that there seems to be no consensus about the actual meaning and goals of education and research, others include lack of centralized planning, Administration and control, shortage of manpower, shortage of finance amongst others all of which can be improved upon via the application of videoconferencing.

Moreover, if indeed Nigeria's philosophy of education is based on the integration of the individual into a sound and effective citizen, it then implies that every possible way to achieve the specific educational objectives at all levels must be explicitly explored , a better way of doing things is the answer, reducing costs, minimizing risks, enhancing effective productivity and management of resources and people, making work and study much more interesting, actualizing dreams , ensuring effective communication to mention but a few are all achievable via videoconferencing technology hence the introduction and presentation of this ancient yet new technology: VIDEOCONFERENCING.

5.3 Recommendation

Education when properly conducted is not just for reading , writing and speaking but brings about other virtues, it brings political, economic and social emancipation so that the concept of national transformation is realizable through education because national transformation relates more to the behavioral aspect of members of the society hence the need for additional change.

In view of the above, the researcher hereby recommends the application of IP videoconferencing in the classrooms to enhance effective communication, bring the outside world into the classroom, create a large exposure forum for learning and make the teaching and learning process more interesting at the primary, secondary and tertiary levels.

The issue of manpower training cannot be overlooked. There should hence be training of manpower to qualify individuals (tutors, resource persons, engineers in the school departments to set up simple and complex videoconferencing infrastructures when required.

The researcher wishes to emphasize that policy implementation should be given vital consideration in the application of videoconferencing technology. Nigeria too many is full of intellectuals that formulate beautiful ideas but the implementation of such ideas do not see the light of the day. It is therefore recommended to all authorities in question to see to the implementation of

national policy on Education (revised) provision that "all products of technological age should be used in solving various educational problems" amongst them obviously is the videoconferencing technology which is yet to be given full exploration.

The researcher also recommends that the government should provide the needed infrastructure and personnel at any cost knowing that education all over the world are an expensive venture and more so, educational technology .this is to further reduce the cost in the implementation of a videoconferencing technology in the school system or settings.

Visually –enhanced distance education can be particularly useful for deaf and hard of hearing students. It supports signing language communication, the transmission of audio conversations, and text messages. With high quality videoconferencing, students and teachers can communicate directly through signing and lip reading hence it is recommended for such institutions of learning in Nigeria.

Generally, the researcher hereby recommends the application of videoconferencing technology to achieve the following:

i. Good training and support for teachers and other school based personnel.

ii. Establishing leadership and a vision that promises significant advantage for all participants.

iii. Achieving a clear understanding of costs and learning effectiveness.

iv. Engaging learners through effective interaction between and among students and teachers.

v. Developing instructional designs and learning activities that are congenial to videoconferencing and to particular teacher's styles (like inquiry based, constructivist, and instructional system design).

vi. Synchronizing class schedules, schools timetables, and curricular goals across participating sites.

vii. Simplifying facts and operations involved in certain taught concepts especially the sciences.

viii. Developing and implementing a variety of behavioral management and etiquette expectations many of which are generic to all classroom teaching but some of which are unique to videoconferencing.

ix. Creating learning programs for a wide variety of activities.

x. Creating a forum to take care of special needs students by minimizing the social effects of physical disability of letting them see and feel the world and letting the world see and feel them.

The following are also a few recommended pointers to make your videoconferencing more effective and efficient.

i. Do not cause echo. Echoes are a leading problem in videoconferences. Use a system that has good echo canceling capabilities. If this is not possible, use a headset or provide external echo-cancellation equipment. Remember, you will not hear the echo that you cause, but every one else in the conference will.

ii. Mute your microphone in the software when you are not talking for some length of time where microphones are used. Some systems cause noise that capture the conference even with the microphone switch turned off.

iii. Adjust your color. Set color or saturation to maximum and then adjust the hue. Back off on the color only if it is too grayish. Most clients' mare too pastel with the default settings.

iv. Eliminate background noises near microphones or generally in the conference room example fans.

v. Provide good lighting on your face. Do not use back lighting.

vi. Allow for small time delays. Start talking and keep talking and don't hesitate because you see or hear something unexpected. Small delays are always present. Don't keep asking "Can you hear me?"

vii. Label your site clearly with an attractive sign or with a character so other people know where you are.

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APPENDIX

VIDEOCONFERENCCE NETMEETING INTERFACE