IMPLEMENTATION AND STRUCTURE OF A DISTANCE LEARNING COURSE FOR THE FOOD TECHNOLOGY GRADUATE PROGRAM OF THE UNIVERSITY CENTRAL OF VENEZUELA

By

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ABSTRACT

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The purpose of this study is to define and structure the technical parameters required for a distance learning course implementation at the University Central of Venezuela (UCV) for the food technology graduate program. University of Wisconsin-Stout (UW-Stout) counts on an infrastructure that allows video, voice, internet, and web based learning software in order to delivery a Distance Learning (DL) course from different Internet service providers, phone companies, and the UW-Stout distance learning department. On the other hand, the Information Technology department of the University Central of Venezuela offers a videoconferencing service to groups or organizations, using a bidirectional digital communication on real time, of video, audio and data, and also a dial-up learning web based course. This study raised a scenario engaging technical implementations of a distance learning course, including Internet,

videoconferencing, voice and wide connections throughout other media based on other cases. Also, it provides a summary of the system implementation for a Distance Learning course to guide the Food Technology graduate program at the University Central of Venezuela in combination with the University of Wisconsin-Stout.

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DEDICATION

To Marian, for supporting and loving me,
To Ricardo, for being my brother and helping me,
To "El Doc" and Noris, for being my parents and believing on me,
To Maria Denise and Juan Carlos for cheering me up,
To Camila and Burundo, for smiling,

To all of you and God, thanks for being there …

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CHAPTER I

INTRODUCTION

Distance Learning (DL) technologies represent a new alternative of teaching. This technology is becoming more popular, many universities and institutes are delivering this method of teaching all over the world reaching remote learners, saving time and gaining more money without being restrained to a classroom or a school day.

Distance Learning is also known as distance education, Basically, DL is “learning from a distance”, from a convenient place such as home. However, it has to be located off campus in which the professor is not physically present, but the communication is simultaneous between professors and the student in an electronic way. These technologies, such a connection over Internet, networking equipment, applications, modems, fiber optics, television, satellites, microwave, and digital phone lines can offer flexibility in the answers of questions like where, when and how education is dispersed.

This study raised different scenarios engaging technical implementations of a distance learning course. It Includes Internet, videoconferencing, voice and wide connections throughout other media and provides a summary for the system implementation of distance learning course in the Food Technology course for graduate studies at the University Central of Venezuela in combination with the University of Wisconsin-Stout.

UW-Stout counts on an infrastructure that allows video, voice, internet, and web based learning software to deliver a DL course from different Internet service providers, phone companies, and the UW-Stout distance learning department. On the other hand, the Information Technology department of the University Central of Venezuela offers a videoconferencing service to groups or organizations, using a bidirectional digital communication and in real time, of video, audio and data, and also a dial-up learning web based course.

Statement of the Problem

The purpose of this study is to define and structure the technical parameters required for a distance learning course implementation for the Food Technology graduate program at the University Central of Venezuela in combination with the University of Wisconsin-Stout to create an education partnership between universities.

Research Objectives

The value of answering the question expounded above has five parts:

1. To define the technical requirements that involves the implementation of a distance learning course.
2. To establish technical contact between UW-Stout and the University Central de Venezuela.

3. To design the conceptual technical system for distance learning course that can be reached in Caracas - Venezuela.
4. To define the detailed design for the distance learning course.
5. To design a document to be used as guiding for future implementations.

Purpose/Importance of the Study

There are two reasons why this study should be performed. First, to create a technical document with the necessary information to implement a distance learning course at the Food Technology graduate program at the University Central of Venezuela. Second to create an academic-business relation between UW-Stout and UCV to bring future trades for both institutions.

Delimitation of the Study

The project was based on the technical design of the distance learning system for the Food Technology graduate program course at the University Central of Venezuela, located in Caracas (Venezuela), in association with the Learning Technologies department and the Food and Nutrition program at the University of Wisconsin-Stout. The project description and technical documentation took no more than four and a half months to be developed. The

research does not involve information to develop the content of the Food Technology course. It is only based on the system connection.

Limitations of the Study

The limitations of the project were:

1. A limited period of time to elaborate a report and implement the project.
2. Budget and costs related to the project.
3. Communication of the information between the University Central of Venezuela and University of Wisconsin-Stout.

Assumptions of the Study

It is assumed that designing a document with the necessary technical information and references of how to technically implement a distance learning course, the University Central of Venezuela can develop a course for the Food Technology program to be taught in combination with the UW-Stout.

Definitions of Terms

The terms defined on this section were taken from the McGraw-Hill's AccessTelecom Online Dictionary (Clayton, 2002).

ADSL = Asymmetric Digital Subscriber Line

Asynchronous = Refers to processes or activities that are not coordinated in real-time or chronologically.

Bandwidth = the difference in frequency between the top end of a channel and the bottom end. A good example of a bandwidth is sound. If you are listening to a sound, such as music, you notice the different pitches.

CAT 5 = Category 5. Twisted-pair wire of 22 to 24 AWG UTP or STP, where each pair of wire within the sheath has a different number of twists per foot.

Client = A device or application that is receiving computer services from a host or server system.

Concentrator = A device that provides a common connection location for several network devices; also referred to as a wiring hub.

DHCP = Dynamic Host-Configuration Protocol, a protocol that provides the specific service within a network of automatically configuring hosts/workstations within that network. DHCP is capable of automatically

configuring the IP address, subnet mask, default gateway, and DNS addresses.

Ethernet = a family of LAN protocols. Ethernet is one of the oldest communication protocols for personal computers.

FTP = File Transfer Protocol, a set of instructions for transferring files on a network that uses TCP/IP. TELNET is an example of an FTP. There are two parts to an FTP: the server part and the client part.

HTTP = Hypertext-Transfer Protocol, is the control software used by Web browsers and Web servers on the Internet to provide support to lower-level OSI protocols when transferring HTML(Hyper Text Markup Language) based files, which contain text and graphics information.

Hub = A central connecting point for network devices. In a star topology, it may be located at the center of the topology and contain several ports. A hub can also be a gateway between two different networks. Intelligent hubs also contain the network software and direct network communications.

IP = Internet Protocol, a network-layer protocol in the TCP/IP protocol stack that offers a connectionless or packetized internetwork service.

ISDN = Integrated Services Digital Network, It brings the features of PBX systems and high-speed data-transfer capability to the telephone network.

Kbps = Kilobytes per second

Local Area Network (LAN) = a group of computers connected together within a building or campus. LANs are the most detailed of computer networks because they deal with the applications and operating systems of computers.

Modem = A modem (modulator-demodulator) is a device that adapts a terminal or computer to a communications network. Modems used on telephone lines transmit at speeds up to 56 Kbps.

MUX (IMUX) = a shortened name for multiplexer.

Network = A communication system in which several computers and peripherals are interconnected for the sharing of files (data) and resources.

Network Operating System (NOS) = Software that must be installed in each networked computer to handle communications functions such as

transmission and receipt of messages, error checking and acknowledgments, re-transmission upon detected errors, routing, etc.

Pt to pt = Point to point connection, or Peer-to-peer, is a type of network in which each device (node) is equal.

Router = in communications, a router is a device that selects an appropriate travel path and routs a message accordingly. Routers are used in complex networks where there are many pathways between users in the network. The router examines the destination address of the message and determines the most effective route.

Server = a network computer that provides services such as printing, file management and storage, common applications, etc. to the other computers on the network.

Star Protocol = A communication configuration in which each node accesses another node by going through an intermediate central hub.

STS = State Telephone System.

TCP/IP = Telecommunications Protocol Internet Protocol, the standard communications protocol used for file exchange over the Internet.

Token Ring = A physical and logical LAN topology. The physical topology is the way that the computers and other devices are wired together. For a token-ring physical topology, the devices are wired in a ring.

UNIX = an operating system similar to MS Windows, only it is designed to operate on RISC (Reduced Instruction Set Computers), like those made by Sun Microsystems.

URL = Uniform Resource Locator, an Internet address. URLs consist of two parts. The first part is the protocol identifier and the second is the domain identifier. Uniform Resource Locators

UTP = Unshielded Twisted Pair, twisted-pair wiring that is unshielded, meaning it does not have a foil wrapping around the group of conductors within the jacket. Unshielded twisted pair is the most commonly used wiring for voice and data networks.

VPN = Virtual Private Network, is network that is based on TCP/IP protocols, accessible through the Internet, but only by those who have authorization.

WAN = Wide Area Network, nodes on the network may be located anywhere in the world.

CHAPTER II

REVIEW OF RELATED INFORMATION

This chapter compiles and organizes information about distance education and distance learning technologies, and present three similar cases, where the same technology was implemented. Also, present a summary for a distance education implementation.

What is Distance Education?

Nowadays, several definitions for distance learning have been defined. DE has become in one of the most popular technologies all over the world, to teach, to save time and money to the students. The Florida Center for Instructional Technology, College of Education, at the University of South Florida stated (Barron, 1999):

> "The teacher and students are separated by distance (this distance could mean different classrooms in the same school or different locations thousands of miles apart), the instruction is delivered via print, voice, video, or computer technologies, and the communication is interactive in that the teacher receives some feedback from the student. The feedback may be immediate or delayed."

Brief of Distance Education History

Distance education can be traced back in the 1700s, beginning with the print-based correspondence study in the U.S. In the 1870s, correspondence courses gained international popularity and in the 1900s private schools and universities offered correspondence courses to elementary, secondary, higher education, and vocationally oriented learners. In the 1940's, instructional radio and television became popular. In 1969, the Open University of UK was established, combining distance education programs using print and non-print resources (Fleischman, 1998).

During the 1970s, professionally designed and produced television series introduced adult learners to videotape programs focused on basic skills improvements, English as a second language, and GED preparation (Willis, 1993). In the 1980s, technology became more widely available introducing video teleconferencing and cable TV, interactive communications became more feasible, and two-way distance learning programs evolved (Willis, 1993). Efforts to incorporate technology with print resources became more involved in the 1980s, where typical audiences for earlier generations of distance education were adults.

During the 1990s, a huge set of two-way distance learning programs emerged as an assortment of hardware and communication tools became available. These technologies included Internet and intranets, local area networks, audio and video conferencing, telephone-based meetings, facsimile

transmission, cable television, and other wide area communications as microwave, satellite, closed circuit or low-power television (Fleischman, 1998). Since then, the evolution of distance learning is something classified as a technology, and everyday evolves.

Distance Education Categories

Distance education falls into two categories – synchronous or Online learning, meaning students are present at lectures, chat rooms, at the same time, or asynchronous, meaning they do an offline learning, meaning they do coursework on their own schedules.

The Online or synchronous learning initiatives are the ones where the student has access in real time to the material offered at the course. Some of the more popular are:

- E-mail, where professors and students send messages back and forth using electronic mail.
- Web sites, where students access a class site that contains elements like syllabuses, notes, related links and assignments, using a password to logon to the system.
- Chat room, when students and teachers class discussions and individual meetings are held in "real-time" chat.
- Message boards where professors use moderated topic boards to carry on extended class discussions.

- Streaming audio and video, when professor's lectures can be sent live or recorded in "real time" to a student's personal computer.
- Video conferencing, typically when a Video is sent over a phone line between a broadcasting station and a remote location, like a library or a conference room (for students). Questions are asked by telephone.
- Audio conferencing, that is similar to speakerphone methods companies' use.

Although, the Asynchronous or offline learning, students receive the course material in some other time. These initiatives are:

- Removable disk, CD-ROM's and other software carry class material.
- One-way vide7o broadcasting where classes are sent live or recorded via local television broadcasts, or by satellite or microwave.
- Snail mail when Videos, cassettes or paper arrived by regular mail.
- Students sometimes meet on campus or with tutors, "face to face" at special centers. Tests are, by necessity, open book or proctored.

Types of Connections

One of the most important subjects about distance education is the transmission and connectivity speed between the teaching site and the students. Distance learning technologies can use digital transmissions and some use analog. The tendency is moving toward digital systems. Traditional distance

learning techniques, such as telephone and videotape, in other words analog systems, starting to disappear.

The problem is that digital files, especially with audio and video, require a big capacity to transmit effectively and quickly. The transmission capacity of a cable or a technology is referred to as the bandwidth, also called pipes, and the greater the bandwidth, the greater the amount of digital information that can be transmitted per second (Verduin & Clark, 1991). There are several options available now or in the near future that will help to expand the bandwidth and increase the speed of information transfer. Some of these technologies are:

Standard Modems

Currently most modems have a standard speed between 28.8 Kbps and 56 Kbps. That speed can provide effective communications via e-mail and Web sites that do not have extensive graphics, and they are far too slow for most video applications. In addition, two modems of different speed will communicate at the slower of the rates, and factors as the amount of congestion on the Internet also affect the transmission rate (Feeley, 1997).

ISDN

Integrated Services Digital Network (ISDN) is a totally digital system designed to transmit information five times faster than standard modems. This

technology of communication is often used for Internet access and desktop videoconferencing. A single ISDN line with two channels can transmit data at 128 Kbps. ISDN has great potential for distance learning because it can use the existing copper telephone wire system. In order to implement ISDN on a large scale telephone companies need to upgrade their telecommunications equipment, and upgrade their computer interfaces and telephones.

Nowadays, ISDN costs and availability can vary radically. In some areas, ISDN lines are either very expensive or unavailable, but in others are available for nearly the same cost as standard voice lines. When evaluating the price of an ISDN connection, it is important to be aware of connection fees, monthly fees, and the charge per minute.

Dedicate Lines

The Dedicate Lines offers a faster and secure service, but they are expensive and need more technical expertise to be manage. These types of connections can support huge video and audio files, and extensive data transmissions. An example of this technology is the standard T1 line, which allows digital information to be transmitted at 1,544 Kbps, speed that is almost 54 times faster than a 28.8 Kbps modem. One of the advantages of dedicate lines is because they can be quite expensive to lease, you can lease a "fractional" T1 line through which they have access to a portion of the bandwidth.

Another example is T3 lines, which are even faster than T1 lines roughly equivalent to 29 times. The T3 lines can transmit data at 44.736 Mbps, but are extremely expensive. In most cases, T3 lines are used to connect parts of the Internet backbone or to connect supercomputers at government and research sites.

ADSL Modems

Asymmetric Digital Subscriber Line (ADSL) can transmit data to users at up to 9 Mbps, but the difference with the other technologies is that the return rate back to the ISP or the Internet is not as fast as only 640 Kbps. An advantage of ADSL technology is that it uses standard telephone lines; but on the other hand, as the ISDN, the telephone lines in many areas need to be upgraded to allow the rapid transmission of data and require an Ethernet card for the computer.

Cable Modem

Cable Modem is offered by cable companies to delivered Internet access through the same cable that delivers television signals to our homes. This is possible when you connect a cable line to a network card on your computer, and your area has been configured for this service. The main advantage of cable modems is the bandwidth. Cable Modems can bring data 400 times faster than a regular modem to your computer, but that speed it will depend on the network

card installed. Cable Modem offers one of the fastest technologies available and affordable for Internet access, and also offers a great potential for high-speed access to the Internet for schools and homes (Feeley, 1997).

One of the disadvantages of cable modems is that the transfer rate may be slowed if too many people in your neighborhood are all connect to the Internet at the same time. In addition, you must purchase a cable modem and have a computer with a network card on it.

Satellite Delivery

Satellite is another possible way to receive information from the Internet relatively fast and does not require the installation of telephone or data lines. Satellite delivery is usually one-way; meaning that cannot be send information back up to the satellite. To send information back to the Internet or the service provider commonly is use a telephone line. In most cases this configuration works well, because the information you receive could be video files, audio, Web pages, etc, and the information you send back is generally very small. Also, is not adversely affected by the number of users, but it could be expensive.

Distance Education Cases:

This section of the research provides a brief overview of the practical groundwork of the proposed research. It also attempts to justify the use of this

particular type of connection between UW-Stout and UCV. Thus, the following is a group of selected case studies that reveal some of the way other universities implemented learning technologies systems.

CASE # 1: FLORIDA INTERNATIONAL UNIVERSITY

In 1993, FIU (Florida International University) first implemented their videoconferencing units. Initially two PictureTel system 4000s were installed in the North and South campuses to connect the two campuses through distance education system. The University expanded the network to five group systems and two desktop units since then. The idea was to serve a videoconferencing connection between students and professors in both campuses, that are 30 miles apart from each other (Fadel, 1996).

Applications and Benefits

FIU uses videoconferencing in a number of ways including monthly faculty meetings, distance education courses, interviews with potential professors, group interactions, staff meetings, and interviews between potential employers and students, and also, forms a consortium with three regional universities in various languages, that is geared to offer students advanced level distance learning courses. The benefits of these applications include reduced travel time and costs, more classes offered, curriculum diversity, increased participation at meetings, improved

communication, larger employer pool for students and alumni, larger applicant pool for employers, and increased productivity.

FIU in combination with three regional universities formed a consortium that is geared to offer students higher level distance learning courses in various languages. Some of the benefits of these applications include: larger number of classes offered to students, increased contribution at meetings, improved communication, diversity in the program, reduced travel time, reduced meeting costs, larger employer pool for students and alumni, larger applicant pool for employers, and increased productivity.

Summary

FIU approached videoconferencing from two angles, at a university level and the career opportunities level. The network was implemented to connect the two campuses through faculty meetings and interviews for new faculty positions. Successfully, the university could interactively connect both campuses and also found other uses for videoconferencing, including distance learning, and the idea was to facilitate meetings without having to commute 30 miles from one campus to the other. Also, FIU's Career Center was launched in the process to serve videoconferencing for the employment process. They could attract companies to the University by having them hold interviews over video. This was a worthy proposition

for employers who could now increase their applicant pool and minimize their travel expenditures.

Today, The Florida International Network has six group systems and two desktops in sites located throughout the University. The network is run on an PictureTel Best Practices 5 AT&T switched network using ISDN BRI at all locations. Depending on the equipment being used, rates vary from 128 kbps to 384 kbps.

CASE # 2: NOVA SOUTHEASTERN UNIVERSITY

Nova Southeastern University is located in Ft. Lauderdale, Florida. The university offers field-based programs in more than 25 countries, including the Bahamas, Canada, England, Germany, Jamaica, Panama, and other U.S. cities. Courses are taught by more than 650 professors, highly trained full- and part time to a population of 15,300 students.

Applications and Benefits

The main benefit of this technology is that provided interactivity between students and professors at a low cost. At Nova, professors use videoconferencing and Internet to communicate with students at distant locations, or when they are required themselves to be in many places at once. Students use videoconferencing to learn in convenient environments. Using the technology of videoconferencing and Internet, the

university can reach more students effectively and fewer classes are disregarded. Also, faculty uses videoconferencing to recruit students, students are able to ask them questions face-to-face, and confidently decide to attend NSU (Bardenheuer, Heppler, & Kotulski, 1996).

Summary

NSU uses four basic forms of classrooms as strategic tools, including e-mail, travel, video, and audio. In 1972, the University began their distance learning services by sending professors to cities throughout the U.S. Usually professors spend the weekend teaching at one of these cities and students were taught at the main campus during the week. But was expensive, because most of the time the class required a plane ticket.

Now, NSU have installed a PRI and an AT&T G3 switch that allow them to have bandwidth on demand. Also, for the main campus, they count with the advantage of the higher bandwidth capability of 4000EXs, and Concorde 4500 systems. Additionally, the 16 port Montage Bridge can handle the increased multipoint volume. In addition, there are plans to start new programs to use the new technology.

The PictureTel System 4000EXs are located in other cities in U.S, like Arizona, Phoenix, Nevada, Las Vegas, and in all Florida campuses including Tampa, Orlando, Sarasota, Bradenton, and Ft. Lauderdale. The systems are Switched to 56 at 112 kbps and connected via ISDN. Located in Ft. Lauderdale, the M8000 Bridge can link through many sites as can be

connected into a single classroom. Additionally, desktops are located all over the campus to be connected to the system.

The use of electronic mail (E-mail) to deliver education with a program at the University was patented in 1986. Also, they offered classes using audio technology and videoconferencing.

CASE #3: UNIVERSITY OF MASSACHUSETTS AT AMHERST

The University Massachusetts Amherst offers distance learning programs to help students who live out of campus and want to participate in certain programs. UMass select the videoconferencing as a vehicle of distance learning. The operations began with two courses and managing three separate sites, four separate campuses, the president's office in Boston, and two community college campuses.

Instructors of distance learning classes use a special podium to control what they see and hear at any of the sites. From this one, they are able to show the content of the class to each site simultaneously, using overheads, videos, slides, controlling the camera, and writing in the tablet.

Applications and Benefits

Distance learning is the major application of videoconferencing at UMass and is expanding its connections with other schools. Some of the common applications uses at the university are: job interviews for

companies in distant locations, administrative meetings using videoconferencing over five campuses, and projects helping student getting involve in meetings with people across the country.

Instructors are able to teach classes in cities miles away from UMass without having to travel using the videoconferencing equipment for distance learning, and students can attend to class at UMass Amherst without having to be there or drive to get there, saving time and money. Also, another benefit of the videoconferencing equipment is students are able to have very prestigious guest lecturers from around the world and across the country. One of the most important courses is the Nursing program that received the Region I Exceptional Program Award of Excellence for its delivery and implementation of their course through distance education technology.

Summary

UMass began its operations with two courses offered in its first semester of use, where both graduate and undergraduate credit courses were taught in a multipoint and point-to-point from UMass campuses to Amherst campus, community college sites, and other institutions. There were three System 4000s in use at the University that used to run at 128kbps and were upgrade to 384kbps, because data rates did vary due to the IMUX. University Information Systems installed another ISDN line before long (Norris, 1996).

Today, UMass manages three sites while there are four separate campuses using speeds ISDN lines installed to run at 384 kbps. Instructors of distance education courses use technologies including doc cams, computers, slide projectors, Socrates, monitors, cameras and video cassette recorders. The UMass provides a contact list with network providers in case they have to manage any technical difficulties during the course, and sometimes a technical student sits in on the classes. Also, the network scheduling is shared. UMass hopes in the future to add additional ISDN lines to improve overall video quality.

CASE #4: DUKE AND EAST CAROLINA

In 1995, a program for the collaborative education of physician assistants and family nurse practitioners was develop after Duke University and East Carolina University responded to a call from the Robert Wood Johnson Foundation. Duke and East Carolina saw an opportunity to explore collaborative models of education of distance education, to improve access to health care in a large rural zone of the state, and to test a new way of delivering education. For the class of 2001 and the class of 2003, eighty-six students were enrolling in the program.

The course is delivered asynchronously using a Lotus Notes/Domino platform and, more recently, Blackboard TM. Over thirty faculties from the two universities have taught 35 courses over the last 3

years, where faculty has enjoy using the new educational delivery system. The partnership between these two universities and the foundation, have an excellent experience, and they approach using asynchronous learning delivery system is perhaps the most fundamental.

Applications and Benefits

The delivery system server is based in Lotus Notes/Domino platform, and provides online entry for all students and faculty through a single portal. The university resources are bringing to the student by a homepage that has navigational bar, and access to the Duke and East Carolina libraries on-line.

> “The online library also has a “miscellaneous resource” section: students can link to clinical/health resources where they can access online learning modules such as breath sounds or EKG interpretation, and they can link to numerous other resources including a “fun site” which includes everything from airline tickets to the Duke News Service” (Champagne, Hewitt, & Short, 2002).

Each online course has their own homepage that provides access to the coursework and content. For example, health professional students need to obtain from wide knowledge base information, to consult with others, to solve problems in clinical situations, to seek information, to be update and to learn as the data base expands. One of the benefits the

system brings is developing online course templates give the students and faculty the academic freedom to structure their online course as they choose.

> "All of our courses, however, have a similar look and use common navigational and educational components. In general, the course contains usual information such as the syllabus and calendar, a page for each "class" of the semester that organizes the week's learning activities, and an academic forum" (Champagne, 2002).

Summary

The program included online asynchronous delivery, dynamic interaction among students, shared knowledge, intellectual growth among students and faculty, and the development of collegial relationships. Bringing the university all these resources, students were creating access to our academic community. The mission of the program was to provide for residents in rural areas, educational opportunities for rural students and access to health care. The system is web-based and uses an asynchronous learning mode that provides the resources of both universities to rural students. That brings opportunities, not just coursework to everyone. Since they start the distance learning program, more software course packages have become available commercially in the market.

CHAPTER III

METHODOLOGY

The methodologies used in the study are literature review and Cisco Design Network. It is imperative to notice that the data collection is refers to information based on similar implementations of distance learning courses. The literature review was used to define using the interpretive method, analyze and describe the implementation of the distance-learning course at the University of Wisconsin-Stout. In order to complete the objective, the researcher followed theses procedures:

1. Analyzed the actual infrastructure at the University of Wisconsin-Stout and the UCV, used to teach a distance learning course.
2. Collected information about the actual infrastructure at the University Central of Venezuela used in distance education, presenting a requirements checklist for the implementation.
3. Followed the steps from the Cisco Design Networks Methodology, where:
    a. Identify Customer Needs.
    b. Design the Network Structure.
    c. Build a Prototype or Pilot for the Network Structure.

Most of this information was collected based on the researcher expertise as a network specialist and designer. Also, the Internet has been a valuable resource for obtaining information about the topic. Much of the material referenced in this document is available on the Internet. In the reference section, URLs (Uniform Resource Locators) have been included that are current at the time of publication. Although, there is no guarantee that this information will continue to be available at these locations due to the changing nature of the Internet and especially the World Wide Web.

Distance Learning Implementation Design

The following is a checklist of considerations that the University Central of Venezuela and the University of Wisconsin-Stout could use to implement distance learning instruction for the Food Technology Department. Items in the checklist are based on the research and experience of researcher, and the information collected from similar cases presented.

Distance learning at the UCV is limited to Web or computer-based activities with a slow connection. On the other hand, UW-Stout includes Web or computer-based activities and interactive television learning. The Web-based checklist is for receiving sites only and does not include curriculum development or other activities that involve course content.

The implementation design is divided into three categories: Actual System, where the researcher identified the actual network and systems; New

Network, and the infrastructure requirements including implementation Strategy and considerations to complete the project. As most distance learning methodologies, many of the considerations for both Web-based and interactive television learning are similar.

CHAPTER IV

RESULTS

This section pretends to show the information collected and reviewed on how to implement a Distance education course between the University of Wisconsin-Stout and the University Central of Venezuela. To a better understand, the researcher structured the results based on Cisco's Steps for Designing Scalable Networks.

Identifying Customer Needs at UCV

University Central of Venezuela (UCV) is one of the most important educational institutes in Venezuela. For the last 45 years, the IT department has been managing and implementing new technologies all over the campus. In addition, IT is responsible to maintain every network system, upgrade technologies at the UCV offering services like e-mail, web hosting, videoconference, equipment acquisition and repair, network port installation, student system control, and remote access.

Ms. Perez of University Central of Venezuela, program director for the Food Technology graduate course, and Mr. Fernando Martinez from the IT Department at the same university are responsible for implementing a Distance Learning course using new network technologies. It is important to mention that

the information collected in this report was used for technical purposes as a guide to implement the Distance Learning service between both universities.

UCV Organizational necessity

In order to accomplish the project the universities need to:

- Assign a contact person with technical background in networking and WAN technologies. The idea is to have a person in charge to share technical requirements. Moreover, planning and configuring the equipment and infrastructure that must be implemented.
- Assign a contact person with Distance education background and in this case the person in charge of the course.
- Improve the access to Internet because it is limited and slow.
- Improve the access to Internet for students that have to access via Dial-up from outside the campus.

Instructional Necessity of a Distance Education course at UCV

Audience:

- Students of the graduate program
- Students of doctored program
- Personnel from companies that have an extension level.

Terminal objectives:

- Incorporate a course of distance education in which students use technology tools.
- Implement a course for graduate level to promulgate information and techniques.
- Implement the specific requirements for a “Distance Learning course” of Foods Science and technology between the UCV and UW-Stout.
- Evaluate the course through the UW-Stout Lab and the UCV laboratory in Venezuela.

Issues: Distance learning course facility and communication needs

- Classrooms better equipped with appropriate Internet speed access, video, sound and image technologies.
- Technology for instructional delivery.
- Demands for customized instruction and training activities requiring different and additional space.

Client System and Applications

Specifically in the Food Technology program at the Human Development building, there are 30 personal computers with WIN 2000 pro and 12 Apple Macintosh computers with OS IX. The computers are

located in 2 different floors for laboratories. UTP Ethernet 10mbps connects all computers located at the Nutrition and Food Science building. IP addresses class C for all systems using DHCP.

The stations for the future DE classroom are connect to the campus backbone and have access to the new nutrition software that needs to be installed with a SQL database. Also, they need to have media capabilities. Two Windows 2000 as a departmental where actually running the Lotus LearningSpace 3.5, e-mail and print services; an application Server where is storage video, images, voice, and utilities and service software; and an UNIX Server where the Web page and FTP service are running. The backbone is in fiber optic. It is all over the campus and connects all switches and routers in each building and departments to the Main system located in administration building. The UCV does not have high Internet access.

Goals for the New Network

The main goal is to create a connection between the University of Wisconsin-Stout and the UCV to implement a Distance Learning course recommending a new platform, but trying to use the most of existing resources.

Current Distance Learning Network:

The following information was collected identifying the University Central of Venezuela (UCV) existing network for the implementation of a Distance Learning course for the Food and Nutrition graduate program.

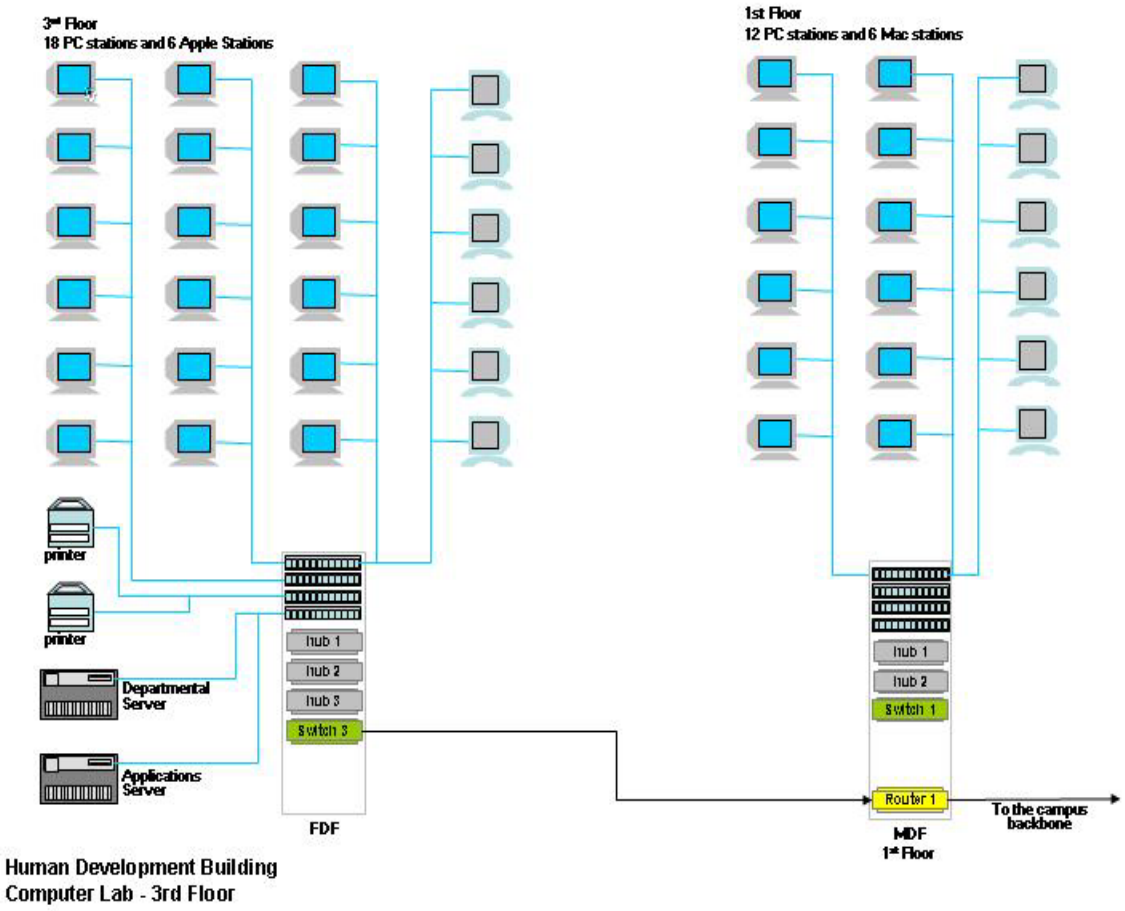

Figure #1: Existing Network Diagram (part 1)

The diagram in figure # 1 shows a logical structure of the local area network, and the actual equipment configuration for the Food technology

department on-campus. Figure #2, shows the campus, wide area network connections, and the Internet.

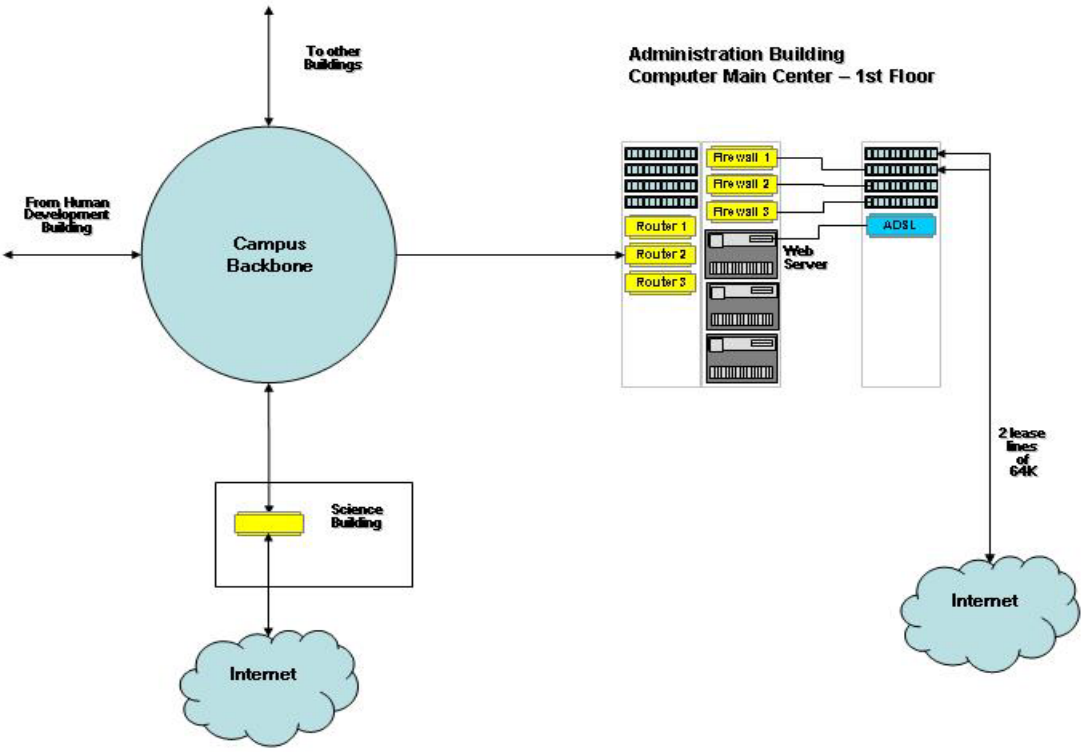

Figure #2: Existing Network Diagram (part 2)

Applications:

- Lotus LearningSpace 3.5 (to deploy the distance education course)
- Nutrition Software
- Microsoft SQL Server
- Student E-mail

- Web Server and FTP services, located at the administration building
- Internet explorer to access internet
- Media capabilities, for the DE course

Network topology and protocol:

- Star topology, for local area network use on buildings
- TCP/IP protocol, addresses deploy using DHCP
- Campus network includes a Token Ring topology that connects all buildings on campus and a leases line of 64K (old system) for access outside the campus

Cabling:

- UTP Ethernet CAT 3 (some buildings) and CAT 5, used for horizontal and vertical
- Campus Backbone in Fiber optic
- LAN Speed 10mbps

Type network:

- LAN, including Hubs and Switches in building
- Campus Network, using Routers to connect to the campus backbone
- Remote access, Low speed Internet access (2 lease lines 64k)

- Security, Firewall and NT authentication using the e-mail username

Equipment and facility location:

- Main system located in the administration building
- Human Development building
- 5 floors (only the 3rd and the 1st have computer labs)
- Distance learning classroom will be delivered/received on the third floor

Client System:

The Human Development building counts with an existing platform of clients of 30 Personal computers and 12 apple computers, in 2 computer laboratories segregated in two floors:

- Twelve (12) Personal Computers with Windows 2000 professional and (6) Power Macintosh G3 with Operating System IX at the first floor

- Eighteen (18) Personal Computers with Windows 2000 professional and six (6) Power Macintosh G3 with Operating System IX at the third floor

Server System:

The server system for the Food technologies department includes two Windows 2000 Servers and one UNIX server:

- Windows 2000 Departmental Server for E-mail log, file and print services
- Windows 2000 Application Server for media, video, images, voice, and nutrition applications
- UNIX server use for the Web and FTP services

Distance Learning Technologies:

Existing “Distance Learning Course” characteristics at the University Central of Venezuela:

- Computer Laboratory use Asynchronous Groupware
- Distance learning (DE) web based software
- Student access by Dial-Up from their homes
- Respond time is very slow accessing the UCV servers
- A facilitator to help student to access and understand the content and the system information of the DE course

Identifying the Actual System at UW-STOUT

UW-Stout is a former member of the Wisconsin Overlay Network for Distance Education Resources (WONDER). It is a consortium of University of Wisconsin campuses, Wisconsin Technical Colleges, and area School Districts that have come together for the purpose of sharing an electronic distance education network. The Network can be used to send and receive secondary and post-secondary credit courses, distribute professional development courses and workshops, conduct administrative video teleconferences, and to provide data communications between campuses and to the Internet.

WONDER is a state of the art fiber optic based digital video distance learning network. Even though separated by many miles, instructors and learners are brought together through this full motion, interactive system.

Distance Learning Technologies:

The University of Wisconsin-Stout offers the following technologies delivering a DE course:

Compressed Digital Video:

- Standards-based H.320 protocol for two-way videoconferencing between 2 or more sites
- PictureTel brand system

- System relies on digital telephone service (ISDN) to allow connection to worldwide sites

Standards & Carriers:

- Connection with systems utilizing switched 56 services is also possible Wisconsin State Telephone System (STS) is used for UW-Stout's in-state calls (pt to pt)
- PictureTel 4500 Series codec with Ascend Imux
- Three ISDN (6 telephone) lines allow Transmission rates from 56 to 384Kbs
- Multi-point connections utilize the UW-Extension Video Bridging services
- AT&T is designated carrier of choice for out-of-state and int'l connections, as well as for our non-University Clients (point to point)
- SPRINT is also used when possible as dial-around appears possible (point to point)

Applications:

- Lotus LearningSpace 3.5
- Blackboard V.5

Design the New Network Structure:

This section specifies implementation requirements for the distance-learning course of Foods Science and technology between the UCV and UW-Stout. UW-Stout will be delivering the course, and the Food and Nutrition computer lab at the UCV in Venezuela will be receiving it. The following aspects should be considering setup the DE classroom:

Project considerations:

- Time completion is 5 weeks, after all equipment is acquired.
- UCV technician training, 2 days for completion.
- Consulting costs include: equipment installation and configuration, testing, first month troubleshooting, Instructor and technician training, and documentation (Technical Support most be provided by the University).
- Equipment warranty will depend on the vendor.
- Special State contract Discount for Education.

LAN / WAN network considerations:

It is recommended to the UCV to acquire the following or compatible technologies:

- Manufacturer of connecting site's MUX or IMUX for UCV to UW-Stout.
- Long-distance service provider at connecting site for UCV-Service provider.
- The UCV transmission speed of connecting should be upgrade from 56 Kbps to 384 Kbps, which will give a faster Internet connection for both UCV and UW-Stout.
- No changes in the existing cabling structure of the University Central of Venezuela or UW-Stout are necessary.
- VPN devices will be added to the network
- It is recommended for better performance the UCV should replace the actual hubs with Cisco Switches
- Access to Blackboard system at UW-Stout to those students taken the course in Venezuela.

Video Teaching Requirements:

To save on international ISDN call costs, it is recommended to upgrade the existing PictureTel 4500 system at UW-Stout to a new Polycom ViewStationFX H.323 compliant IP based videoconferencing system. This will require the implementation of a VPN over the internet for security and may require a larger internet access line at UW-Stout and/or UCV. The ViewStation system needs approximately 336k for reliable video and voice transmission.

UW-Stout will need a standard instructor station in the distance learning classroom; this will facilitate the transmission of slides, transparencies, computer presentations, voice and video. In addition, two monitors will be needed; one for the outgoing signal and one for the instructor to view the students at UCV. The ViewStation FX will handle all the encoding and decoding of the video and audio signal.

Security:

Because of security concerns we recommend attaching the distance education equipment, specifically the ViewStation FX's to the internet through a hardware based Virtual Private Network from a yet to be determined vendor. This will allow the secure transmission of data to and from each site. Because Blackboard is already SSL web based, it should require no additional security.

Wiring:

Video cables from video switcher to cameras, video monitors, and network interface should be of high quality. All cables shall be concealed in conduit, wire mold, or floor molding, and should be supported to prevent stress and distortion damage and installed neatly. Also, cables should be labeled at each end and will be identified on the system drawing, and better if it is provided by installation vendor.

Staff:

Since the course includes equipment and technologies, a facilitator with technical skills should be in the classroom during the delivery of the course for support service purposes and to perform basic equipment troubleshooting.

Other Servers:

Students will require email service provided by the University. In addition, the existing web and applications servers should be sufficient for a distance program of this size.

Assignments/Grading:

Because this is a small pilot program, it is recommended adding the UCV students involved to the UW-Stout Blackboard system. This will facilitate all testing, assignments, handout distribution and grading for the program. Blackboard also provides a chat application, which could be used to supplement the video instruction or used if the video distance learning solution is unavailable for any reason providing redundancy in the distance learning design. This requires minimal bandwidth and only internet access so it will be accessible to students in the classroom as well as at home or other locations at UCV.

Other Considerations:

Circuits in the classroom should run at no more than 80% load, should be dedicated circuits, and if more than one is in place, they should be on the same phase and ground reference.

It is recommended that each university have a way of monitoring and measuring the audio and video signals directly before and after the codec demarcation. A network monitoring software or waveform monitor should be available for testing the video signal and SMPTE color bars should be available to be transmitted to the system from each site with audio test tone.

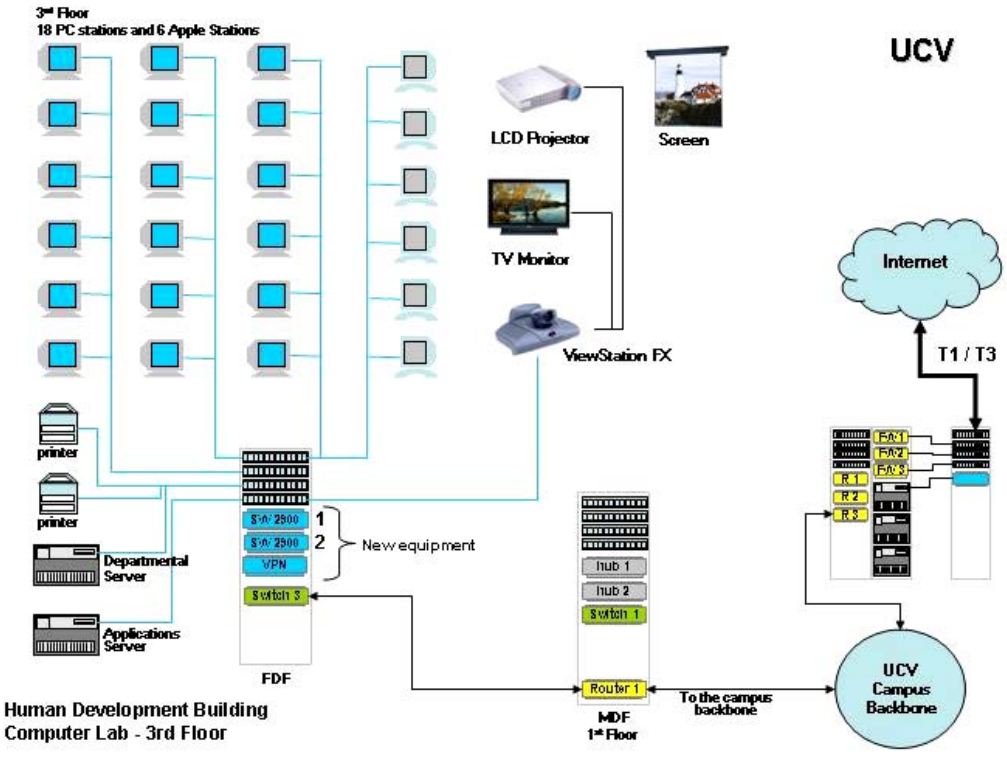

Figure #3: Network Diagram Proposed DE classroom

Also it is recommended for each DE classroom, a fax machine and a telephone with handset/speakerphone capability, with direct inward dial line access and full dial out capabilities. It's also recommended if the DE classroom have access to a photocopier (Parker, 1997). Figure # 3, shows the network design proposed for the DE classroom and WAN connections.

Build a Prototype for the Network Structure.

Set up a test session is necessary to try the compatibility of all sites. Unfortunately, the project was conceived under circumstances when the budget, but the project was freeze after the budget review at the UCV, specifically at the Food Technology Program. However, the information presented in this document could help as a future reference on the DE course implementation at the UCV.

CHAPTER V

RECOMMENDATIONS

The objective of this section is to present a checklist to be use as a milestone for the design and implementation of the distance learning course at the UCV. This section is extracted from the chapter 10th of the "Teacher's Guide to Distance Learning" web site at http://fcit.coedu.usf.edu/distance/chap10.htm, and compile four steps described below (Barron, 1999):

1. Conduct needs assessment.

"The needs assessment or analysis phase consists of four parts: course analysis, audience analysis, instructor analysis, and technology analysis" (Barron, 1999).

- *Course analysis.* The course analysis seeks to identify content areas that could be enhanced, expanded, or initiated through distance learning techniques. Begin by examining the instructional needs that are not being met and determining if distance learning could contribute. Potential areas could include courses that have a high demand, but few instructors; courses that are needed in geographically diverse locations; courses that would benefit from remote experts; and courses that could address special needs, such as homebound students.

- *Audience analysis*. Distance learning techniques are not appropriate for all students. In most cases, a great deal of motivation and the ability to work in a self-paced environment are essential. You should carefully examine the locations of the students also. For example: Will the instruction be delivered to schools or to homes? Can the students read? What are their learning styles? Is supervision required?

- *Instructor analysis*. With distance learning, facilitators and technical support teams are also necessary. For example, there may be a "teacher" who delivers the lesson via a videoconferencing system. The class is then sent to several schools throughout the area, and remote students participate. At each site, however, supervisors must be in the room with the students; technical support staff must make sure that the equipment is functioning.

- *Technology analysis*. There are many different technologies that can be used to deliver distance learning. Selecting the most appropriate technology depends on the content area, the learning styles of the students, and the existing hardware and software. For example, foreign language instruction requires an audio component, and Web-based education is impossible if the students do not have access to a computer.

2. Outline Instructional Goals and Objectives; Produce Instructional Materials

A well-structured distance learning course must place instructional objectives foremost. The technology should be as invisible as possible -- just another tool that teachers can use to effectively convey the content and interact with students. After the goals and objectives are outlined, the instructional materials can be designed and developed. It is important not to underestimate the commitment required for this step -- creating effective materials for distance learning is an extremely time-consuming and energy-consuming process. Regardless of whether the technology is audiotape or satellite video, ample time must be allocated to ensure that the materials are accurate, appropriate, and structured to maximize the benefits for distant students and to minimize the limitations.

3. Provide Training and Practice for Instructors and Facilitators.

Many of the techniques and skills used in a classroom teaching situation do not translate directly into a distance education approach. Teacher training programs are important to acquaint the teachers with the use of technology as well as to help with the re-design of the instructional strategies. In particular, most teachers need assistance and practice with:

- Effective strategies for implementing small group activities and individual practice

- Techniques for maximizing teacher/student and student/student interactions
- Successful approaches for integrating technology into the teaching/learning process
- Tactics for motivating students at a distance

Facilitators and support personnel are also crucial to successful distance learning experiences. If students are located at remote sites, facilitators will likely be the on-the-spot contacts for the students. It is important that they are fully integrated into the course and communicate frequently with the instructor. In addition, support personnel are important for both the instructor and the students to ensure that the technology functions as it should and does not cause undue frustration.

4. Implement the Program

After the training is complete and a pilot test has been conducted to ensure the technology is functioning, the program can be implemented. One important factor to keep in mind is the need to include structured activities. Timelines, deadlines, and feedback help to motivate students and provide the framework the students need to function in a flexible environment.

Another important aspect to keep in mind during the implementation phase is the need to emphasize interactions. Research

strongly supports the need for interaction in distance learning initiatives. Students of all ages respond positively when they know someone cares.

Conduct On-going Evaluation

Formative evaluation takes place throughout the development and implementation. At each step of the way, instructors and administrators should stop and review. In addition to querying the students, ask others who have implemented similar programs to assess the approach. Make revisions as often necessary. Evaluations can be conducted through surveys, achievement tests, interviews, or other methods. Careful analysis of summative evaluations can be used to identify both strengths and weaknesses of the distance learning course, content, and approach.

CHAPTER VI

CONCLUSIONS

This study began with the intent to implement the DE course it could not be completed. After evaluating the feasibility of this research, the researcher found that the current political and economical situation in Venezuela determined by the Government rules is an obstacle that cannot be controlled. The UCV is a State University and currently is not getting any financial help form the government. Therefore, it became clear that after discussing the topic with the head of the department of Food Technology at the UCV, the project was canceled under new premises.

However, the research presents a detailed guide for the design and implementation of a distance education course at the Food Technology department that could be use as a prototype in the near future.

The technical and conceptual infrastructure described in this research paper allows both parts (UCV and UW-Stout) to identify needs of implementation that were described in the sections “Chapter III and IV” between the pages 32 & 48.

REFERENCES

Bardenheuer, C., Heppler, T., & Kotulski, A. (1996). *PictureTel Videoconferencing Best Practices - Nova Southeastern University*. In Wainhouse Research, from http://www.wainhouse.com/files/best-practices/nova-southeastern-univ.pdf

Barron, A. (1999). *A Teacher's Guide to Distance Learning*. Tampa, FL. In Florida Center for Instructional Technology, College of Education at the University of South Florida, from http://fcit.coedu.usf.edu/distance

Champagne, M., Hewitt, D., & Short, N. (2002, August). *Access to Opportunity: The Duke-East Carolina Partnerships for Training Program*. Journal of Asynchronous Learning Networks. Volume 6, Issue 2. from http://www.aln.org/publications/jaln/v6n2/v6n2_champagne.asp

Clayton, J. (2002). *McGraw-Hill Illustrated Telecom Dictionary*. McGraw-Hill Professional, 756 pp. from http://www.accessmhtelecom.com.

Fadel, K. (1996). *Picturetel Videoconferencing Best Practices - Florida International University*. In Wainhouse Research from http://www.wainhouse.com/files/best-practices/florida-intl-univ.pdf

Feeley, J. (1997, August). Wideband Web. Digital Video, 42-48.

Fleischman, J. (1998). *Distance learning and adult basic education*. In C. Hopey (Ed.) Technology, Basic Skills, and Adult Education: Getting Ready to Move Forward. The Center on Education and Training for Employment, College of Education, The Ohio State University.

Norris, A. (1996). *Picturetel Videoconferencing Best Practices - University Of Massachusetts – Amherst*. In Wainhouse Research, from http://www.wainhouse.com/files/best-practices/univ-mass-amherst.pdf

O'Neill, M. & McHugh, P. (Eds.) (1996). Effective Distance Learning. Alexandria, VA: American Society of Training and Development.

Parker, A. (1997). A Distance Education How-To Manual: Recommendations from the Field. Educational Technology Review. 8, 7-10.

Willis, Barry. (1993). Distance Education: A Practical Guide. Educational Technology Publications. Englewood Cliffs, NJ.

Verduin, J. R. and Clark, T. A. (1991). Distance education: The foundations of effective practice. San Francisco, CA: Jossey-Bass Publishers.