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# Development Of An Information Technology Plan For A Virtual Enterprise Program At A Community College

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VIRTUAL ENTERPRISE PROGRAM IT PLAN

**Development of an Information Technology Plan for a  
Virtual Enterprise Program at a Community College**

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Master of Science in Computer Information Technology

## Abstract

This project proposed a technical solution to support the development of a Virtual Enterprise program at a community college. The college is located in a rural area that does not have large manufacturing or service-based businesses generating jobs.

Consequently, many jobs are created by entrepreneurial endeavors. Traditional small start-ups are risky though. Many young people must leave the area to get better, higher-paying jobs. Individuals, especially students, need an opportunity to try out promising business ideas for practice, using a virtual global market on the Internet. A program of this type would provide valuable business experience to students from all vocational disciplines, enhancing their preparation for employment. The community might retain more of its talented people, and benefit from further economic growth.

To encourage entrepreneurial endeavors in the community, the goal of this project was to develop a plan that details the technical and classroom resources as well as the activities necessary to implement a Virtual Enterprise program at the community college. The plan would discuss requirements for the facility, personnel, servers, workstations, local area network, Internet access, software, projectors, multimedia classroom equipment, fax machines, and furniture. The plan would address the various needs of the multiple stakeholders. The Virtual Enterprise facility would simulate an office environment where students have office space and equipment.

According to the Marion Kauffman Foundation (Kauffman, 2001), entrepreneurial studies is one of the fastest growing fields of study in the business administration discipline with over 1500 programs currently being offered at four-year

colleges in the United States. The national trend indicating increased interest in entrepreneurial education is clearly evident in the local community as well. A recent business plan competition funded by a wealthy businessman who owns both local and national businesses was well received by the local community, with over 200 applicants attending the first kick-off meeting. The Virtual Enterprise program and facility is envisioned to support community college students, high school technical preparation programs, and the local community.

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## Chapter One: Introduction

### The Problem

College of the Redwoods' business curriculum needed an innovative program to encourage students from all disciplines to consider entrepreneurial endeavors, and to help bridge the gap created by the huge digital divide. Advanced technologies and skills are increasingly required for competitiveness, yet rural start-ups often struggle due to limited IT resources, access, knowledge, and skills. Interest in entrepreneurship has increased as information technology (IT) has enabled small companies to compete better in the marketplace and as globalizing and downsizing has forced those seeking brighter futures to consider alternatives to traditional corporate jobs. Many students eventually want to own their own businesses, but lack of practical knowledge and experience can limit their success.

### Description of Existing Situation

This community college has four campuses and two branch campuses located on the Lost Coast of northern California, a beautiful rural area that faces economic challenges due to its remoteness, as well as its sparse and low-density population. The college serves a district that covers an area roughly the combined size of the states of Massachusetts and Rhode Island, yet has only about 3% of their population (U.S. Census Bureau, 2006). This economically "distressed" region falls into a category similar to that of the rural South and Appalachia regions as determined by the Corporation for Enterprise Development (CFED). The "diseconomies of scale and increased costs of

doing business” (CFED, 2003) in the region are reflected in the lack of large manufacturing or service-based businesses generating jobs. Traditional, natural resource-based jobs such as logging have been declining for years. Consequently, many individuals are attempting entrepreneurial endeavors. Small start-ups are risky though. All of these factors result in many young people leaving the area to get better, higher-paying jobs.

Programs that encourage entrepreneurial endeavors within the community are needed, especially for e-commerce. The local economic development community has consistently emphasized the importance of promoting micro-enterprises, since they are the fundamental source of future growth. In addition, over 85% of business students sampled at the college indicated an interest in starting their own business (C. Gaines, personal communication, August, 2005).

The college must meet the needs of its community by offering innovative programs to support this demand. The college wanted to investigate a web-based, Virtual Enterprise concept that could be incorporated into an innovative academic program. Although business courses are offered, a program was needed that provides a more practical approach, helping to bridge the gap between theory and practice. Virtual Enterprise courses would offer students an opportunity to try out promising ideas using simulated businesses.

Students could develop and manage enterprises in a virtual learning environment that is creative and stimulating. Non-business majors would particularly benefit from learning about e-commerce functions such as marketing. Using the Internet as the simulated global market, students could trade their products and services using e-

commerce strategies with a worldwide network of 4,000 “firms” (i.e. other Virtual Enterprise groups) in more than forty countries. The Virtual Enterprise concept began in Europe as a way of teaching business principles and entrepreneurship to apprentices. Anne Cremarosa (2004), in her PhD dissertation, describes this hands-on approach as “empowering to students”, since they are “active participants instead of observers”. She notes that when students “take on the various roles within the organization, they tend to become more responsible for their actions”, and that they “see the connections between profitability, team success, and individual work skills.” As they figure out the ways to make their businesses successful, students “develop problem-solving tools that will aid them for a lifetime” (Morgan, as cited in Cremarosa, 2004). Although a small number of U.S. colleges have joined in this grassroots Virtual Enterprise effort, an organized plan describing how to implement a Virtual Enterprise program was apparently lacking, making it more difficult for small community colleges.

The college wants to help lead the community as it defines its future. Offering an innovative Virtual Enterprise program could be a way to improve the development of the community workforce and economy. The college can choose to offer inventive and cutting-edge curricular programs since it has autonomy from the State for program development. Fairly independent, the college can adapt to local needs and serve a more nontraditional role (Liston, Swanson, 2001). Unfortunately, funding to start or support such a new program is usually hard to get. The college has been fortunate to receive funding from a private benefactor to start a pilot program. Once a pilot program has been initiated, the courses have to be self-sustaining.

The Virtual Enterprise program is a good way to promote IT in a manner that is perceived as being practical from the local community's standpoint. Enrollment in IT-related courses such as computer networking and programming has been declining over the last few years in the district, making it particularly difficult to justify keeping certain courses. If courses are perceived as having a direct and material benefit, they are more likely to remain viable for a longer period of time. Eventually, as prosperity increases, the overall demand for IT education should increase.

Although a Virtual Enterprise program would provide an interdisciplinary, business-simulation curriculum designed to prepare students for entrepreneurial success, launching this new program would be challenging. Limited resources dictate that the new Virtual Enterprise laboratory IT infrastructure design must also support other courses. Internet technologies must be available so that students could set up simulated businesses, and then buy and sell products and services online. Communications technologies such as videoconferencing are required, since students may interact with other Virtual Enterprise groups.

Without pre-existing guidelines to draw from, information technologies need to be researched and analyzed. Strategic elements from successful programs may exist elsewhere in the country, requiring evaluation for suitability within the community college environment. The college needs an IT implementation plan, which it can eventually share with other community colleges that have similar goals.

### Project Goal

This project proposes to research and analyze the IT and classroom resources needed to launch and support a Virtual Enterprise program at the community college. An

IT implementation plan will be developed that could provide directions and insight that could help other organizations that want to launch similar programs.

### Project Scope

This thesis covers the IT aspects of initiating a Virtual Enterprise program for the community college. The implementation plan specifies the requirements for the facility, personnel, servers, workstations, local area network, Internet technologies, software, projectors, videoconferencing equipment, multimedia classroom equipment, fax machines, and furniture. The plan will address the various needs of the multiple stakeholders. Finally, the plan describes anticipated startup costs.

Although many aspects of this project could be used by other community colleges interested in starting a Virtual Enterprise program, this project focuses on issues that are specific to College of the Redwoods. This project does not address funding issues in detail or pedagogical approaches about how to incorporate Virtual Enterprise into the curriculum. Design aspects are the focus rather than implementation issues. The project reflects the design considerations for implementing a Virtual Enterprise program to support entrepreneurial studies within a business discipline, and does not address design considerations for colleges that will implement Virtual Enterprise within other disciplines.

### Project Issues

Three main project issues have been identified: 1) facility flexibility, 2) lack of existing Virtual Enterprise examples for community colleges in California, and 3) management of internal politics.

An appropriate existing facility or room must be found and designed to support the new Virtual Enterprise program. In addition, the facility must serve as a laboratory for any of the existing information systems or business courses.

There are few, if any, community colleges in California that have successfully implemented a Virtual Enterprise program to support entrepreneurial studies. This lack of existing examples will make the design a more difficult challenge since other implementations will need to be analyzed for common issues. Due to schedule limitations, conflicts, and costs, site visits to existing colleges with Virtual Enterprise programs is not possible. Although voice and electronic communication provides a means for learning from others, there is no substitute for being on-site and getting a sense of physical space and work environment issues. In addition, not being able to witness student reaction to the Virtual Enterprise learning environment will be a challenge.

As a teacher, rather than a member of the IT staff, I will need to be able to effectively communicate my requirements and will be subject to their existing schedules and priorities. The Virtual Enterprise program will impact other departments within the college necessitating interaction with several different colleagues. Managing conflicting interests will also be a challenge.

### Definition of Terms

*Americans with Disabilities Act of 1990 (ADA)*: enacted by Congress in 1990 “to establish a clear and comprehensive prohibition of discrimination on the basis of disability.” (ADA).

*Practice firms*: The European equivalent of the Virtual Enterprise program in the United States.

*Virtual Enterprise*: “a technologically driven business simulation program” in which students manage a virtual business while learning business principles and entrepreneurship (IVE, 2005).

### Summary

The administration at College of the Redwoods has received the Virtual Enterprise project proposal with enthusiasm and has given approval to pursue this challenging opportunity. Financial support is often difficult to get since the California budget is tight, however through private contributions the project will be partly funded. The college tries to increase individual opportunity within its rural district, while helping the community to “build a foundation for improved prosperity” (Rubin, 2001). An IT implementation plan will define the resources required for a Virtual Enterprise program, and will help provide the college with a more concrete and complete picture for launching the program. The plan would be a step towards bridging the gap created by the huge digital divide. The plan would also provide directions and insight that could help other organizations that want to launch similar programs.



## Chapter Two: Research and Methodology

### Investigate and Review Existing Systems

The Virtual Enterprise program concept was introduced to the Information Systems department after the business instructor learned about it during a conference trip. Actually creating a program would require further study, so the project started by looking for community college implementations. The plan was to evaluate these other systems, and to glean strategic IT elements from these programs for the college. Surprisingly few systems were found.

Dr. Jonathan Deutsch, a fellow of the City University of New York (CUNY) Institute for Virtual Enterprise (IVE) and Assistant Professor in the Department of Tourism and Hospitality at Kingsborough Community College (KCC) located in New York, became the main point of contact for information about Virtual Enterprise programs. KCC was the first university-based institution to implement a Virtual Enterprise program in the United States in 1997. KCC offers many services to support other institutions wishing to participate in the global Virtual Enterprise program. Dr. Deutsch provided information about curricular issues and technology used in their Virtual Enterprise program.

Dr. Deutsch also provided contacts in both California and Washington. A business instructor at Reedley College in California, Dr. Anne Cremarosa was the only post-secondary contact in California. Reedley has been offering Virtual Enterprise courses for over three years. Unfortunately, the program at Reedley is suffering from low enrollments and they were forced to cancel the course during the fall 2005 semester.

Charles Loomis and Anita McEntyre, instructors of entrepreneurship and business respectively, were the contacts at Shoreline Community College in Washington.

The level of detail received in the responses from the contacts was varied. Launching a Virtual Enterprise program requires dedication and work outside the normal teaching workload, so it wasn't surprising to find that some contacts weren't willing to assist more. Some faculty responded to the initial overview questions, but not to the more pointed technology questions unfortunately.

The instructors at Shoreline provided more information. They implemented a Virtual Enterprise course in a regular classroom with one day a week in an existing computer lab using wired Ethernet. No video conferencing equipment was utilized. They recommended using a facility with a conference table permanently set up in one part of the room, along with workstations for each student in the remaining room space (A. McEntyre, personal communication, January, 2006).

Dr. Deutsch and Edgar Troudt, the Technology Officer for CUNY IVE, offered many details concerning their mature and extensive setup. They use a dedicated computer lab with thirty personal computer stations using wired Ethernet. The lab also has a photocopier, fax machine, scanner, and telephones. There is an adjacent room with conference table and video conferencing equipment that uses a separate Integrated Services Digital Network (ISDN) line rather than an Internet-based IP connection. The software used is a Microsoft Office Suite, Intuit Quickbooks, Microsoft Frontpage, some custom Java-based web applications, and an Internet browser program. Dr. Deutsch suggested a wireless technology using all laptop computers and a smart board. Mr. Troudt suggested that the ISDN approach to video conferencing was not ideal and would

rather use an Internet-based approach (E. Troutt, personal communication, January, 2006).

From this input, it was clear that a room configured with a conference table and Internet-based video conferencing equipment, along with standard personal computers with Internet access would satisfy the technology requirements for a globally-capable Virtual Enterprise course.

### Research Methods

Research for this project was performed using the Internet, using ad hoc surveys, and through discussions with department colleagues, with college staff, with campus lab technicians, and along with faculty at other colleges with Virtual Enterprise programs.

Several Internet sites were used to provide background, technical, and product information about the facility remodel and information technology equipment. Specific Internet searches were performed to find information about setting up a Virtual Enterprise program at a community college. While no specific information exists about setting up a Virtual Enterprise program, the Institute for Virtual Enterprise website provided a substantial amount of general information (Institute for Virtual Enterprise, n.d.). Additionally, the Regis University Interlibrary loan program was able to provide a copy of a dissertation related to Virtual Enterprise (Cremarosa, 2004).

An ad hoc survey was prepared for the initial contact with faculty at other Virtual Enterprise colleges. The following eight questions were asked of each faculty member:

- How large is the facility?
- How many computers are used?

- What types of computers are used?
- What other equipment is used by the faculty or student?
- What network technology is used?
- Is the Virtual Enterprise classroom connected to the campus backbone?
- What type of video conferencing equipment is used?
- What software do you use?

The ad hoc survey responses were reviewed by the business instructor and the author. Follow up questions were created and further discussions with each respondent ensued.

Meetings with lead faculty from several disciplines within the Information Sciences department were held. The following topics were informally discussed:

- Facility issues (e.g. new facility, existing classroom, on-campus, off-campus)
- Interest in supporting and participating in the Virtual Enterprise program
- How each instructor envisioned their students participating
- How each instructor envisioned the Virtual Enterprise program in their curriculum
- How each instructor envisioned the Virtual Enterprise program utilizing different disciplines, departments and divisions
- Community involvement in the Virtual Enterprise program, and usage of the facility
- Staffing and release time
- Recurring costs funding
- Specific equipment and software needs from each discipline

Meetings with staff associated with ADA compliance, maintenance, facilities, purchasing, and campus IT support were conducted. In each meeting, an overview of the program was given followed by questions specific to that person's role. The main focus was to determine if there were any barriers to success from that person's perspective. Additionally, information regarding college procedures and policies related to this project were discussed.

Some of the most important meetings were with the lab technicians and campus IT support staff. These individuals dealt with technology on a daily basis, and they knew what works and what doesn't work for the college. They also would be responsible for maintaining and troubleshooting the equipment. It was imperative that the solution met their satisfaction. They presented certain barriers that restricted the options, and they offered suggestions that resulted in a better solution.

### Life Cycle Model Used

The project was completed using the scope, develop, and launch phases of the Traditional Project Management (TPM) life cycle (Wysocki, 2003) over a period of nine months, with a completion date of May 9, 2006.

#### Phase I – Scope Phase

Phase I specified the various IT-related portions of the overall Virtual Enterprise program to be covered in this project. Meetings were held with administrators, staff, and faculty from the local campus as well as with faculty from other campuses where Virtual Enterprise programs exist. The goals and objectives defined addressed the needs of the

stakeholders. The various technologies relevant to the infrastructure were investigated. Project success measurements were defined, along with assumptions, issues, and problems. A Project Overview Statement was prepared. (See Appendix A.)

#### Phase II – Develop Project Plan Phase

Phase II identified project activities, estimated activity durations, identified resource requirements, and estimated costs. Detailed review and analysis of the IT resources was necessary to develop the project plan. A Work Breakdown Structure, a Resource Breakdown Structure, and a Project Timeline were prepared. (See Appendices B, C, and D.) The project began in August 2005 and was scheduled to finish in May 2006.

#### Phase III – Launch Phase

College personnel from the Business and IS departments plan to work together with various other organizations to implement the Virtual Enterprise program. Once the implementation plan was approved, Administration took charge and will control the program launch. The timeline, as scheduled by senior administration officials, shows all the purchasing, room remodeling, and equipment installation completed by the Spring 2007 semester. The purchasing department will place the orders needed to acquire the equipment identified during the Fall 2006 semester. The facility remodel will be handled by maintenance and facilities personnel during the winter break, starting in December 2006 and ending in January 2007. Communications equipment installation and configuration will be handled by the college's IT staff during the facility remodel. The

author and the business instructor will monitor implementation progress, and provide support when appropriate.

### Milestones

The Work Breakdown Structure and the Project Timeline (see Appendices B and D) listed the five main planned tasks and their schedules. These tasks included: 1) determining stakeholder requirements, 2) identifying a facility suitable to support Virtual Enterprise courses, 3) designing a room layout that establishes a business environment, 4) identifying the information technology equipment needed to support the program, and 5) presenting design diagrams along with materials lists to senior administration for approval. To help keep track of these tasks, each was further broken down into subtasks. The Timeline helped monitor project progress.

Two milestones were critical to the project. The first critical milestone (Task 2.4) was Senior Administration's approval of the facility. The first facility chosen was rejected, which created the more complicated scenario of finding a facility that could support regular courses as well as Virtual Enterprise courses. Once a suitable facility was approved, the project moved forward with the layout design and equipment analysis. The second critical milestone (Task 5.) was Senior Administration's approval of the facility layout diagram along with the materials lists. This approval signaled the end of the project and the transfer of control over to college staff responsible for construction and installation.

### Deliverables

The outputs of this thesis project include the following nine items:

- Professional Project Proposal (MSC 696A)
- Project Overview Statement (Appendix A)
- Work Breakdown Structure (Appendix B)
- Resource Breakdown Structure (Appendix C)
- Project Timeline (Appendix D)
- Facility Layout Diagram (Figure 1)
- Materials Lists (Appendices E and F)
- Communications Network Diagram (Appendix G)
- Professional Project Summary (Chapter 5 summary)

### Resource Requirements

The resource requirements for this project include the following eleven items:

- Facility for twenty workstations, an instructor's station, and a conference room
- Personal computers
- LAN (local area network)
- Internet connection
- Web server - Internet Information Server (IIS)
- File server
- Video conferencing equipment
- Long distance phone capabilities
- Office equipment such as fax, phone, and copier



- Office and digital media related software
- Office and classroom related furniture

### Project Contributions

Developing the IT implementation plan for the Virtual Enterprise program benefits the college by providing specific directions on adopting innovative technologies and strategies for teaching entrepreneurship, and by arranging a smooth launch of this pilot program. Once launched, the Virtual Enterprise program should benefit both students and the community. The attention generated from this new program should stimulate enrollment at the college, and attract students that might otherwise go elsewhere for their education. New curriculum will be developed that allows students to apply what they have learned in other classes in a simulated and safe business environment. Students will get to experience what it is like to run a business and will learn from leaders in the community through consulting workshops. Local businesses will be able to use the professional video conferencing equipment in the entrepreneurial center. The community also stands to benefit from talented, and skilled, students that stay in the region to launch their tested enterprises.

### Outcomes

The selection and administrative approval of a suitable facility allowed the project to move forward with the finalization of the facility design and equipment selection. Now that senior administration officials have approved of the facility design and

materials list, the project is ready for implementation by the college's facilities, maintenance, and technical staff.

### Summary

Research about how to set up a Virtual Enterprise program focused on ad hoc surveys and discussions with faculty at colleges with existing Virtual Enterprise programs. Although little information about how to set up a Virtual Enterprise program is available in print or on the Internet, the project benefited from the experience and knowledge of the faculty at Kingsborough Community College, where the first collegiate Virtual Enterprise program was started in the United States.

Management of the project followed a traditional project management life cycle consisting of a scope, project plan, and launch phase. The majority of the project was performed during the scope and project planning phases. The approval by senior administration of the facility design and equipment lists was a major milestone that allowed the project to transition into the launch phase where college staff would take over the management of the facility remodel and equipment installation. The Virtual Enterprise program promises to benefit the college, the students, and the community through its innovative interdisciplinary approach and accessible technological resources.

## Chapter Three: Project Analysis and Design

### Stakeholder Requirements

As a project leader, ensuring that the vision to launch a Virtual Enterprise program at the college met everyone's satisfaction proved challenging despite the enthusiasm for the project due to the number and variety of stakeholders involved. The stakeholders included administration, faculty, and the community. Administration wanted a facility that would not take away any existing classroom space, and also requested ADA compliance for the redesign. Faculty expressed the need for the facility to be professional in appearance, close in proximity to the academic departments that would participate, and convenient for the students. Rather than expand these efforts to involve students in the process, it was decided that they would be indirectly represented by faculty for planning purposes. This focus aimed to get the program off-the-ground as soon as possible, allowing for future refinements.

The principal faculty stakeholder was the business instructor who first discovered the Virtual Enterprise concept and was actively promoting the idea at the college. First and foremost, his requirements were that the facility had to look and feel like an office environment. This office environment needed to be a non-traditional, anti-cubical layout. He wanted a clustered layout with available common areas and mobile furniture to facilitate group work. In addition, his view included the following requirements.

- Students would need to make presentations to community members
- Students should be able to participate in video conferencing with other Virtual Enterprise students

- Students should be able to take their computer to any other virtual department or the conference room.
- Students should be able to make local and long distance calls
- Students should be able to send and receive E-mail remotely
- The system should be able to host the virtual company's website

One of the key factors identified as a potential for longevity and success of the program was the involvement of other disciplines. Faculty members from various departments were approached to identify requirements that would make the involvement of their students worthwhile. Accounting faculty identified specific accounting hardware and software. Digital Media faculty identified specific hardware and software needed to support graphic design, video capture, editing and production. The computers needed to support the digital media requirements were more advanced than the other office-oriented computers. The Computer Information Systems (CIS) faculty identified the need for students to experience system crashes, networking equipment troubleshooting and maintenance without interfering with the existing stable general computer lab that was next door.

Although students represent another stakeholder position in this project, no formal surveys or interviews were performed. Instead, students in certain business-related classes were informed of the project and kept abreast of its progress by the business instructor. The students were reported to be enthusiastic about the project. It should be noted that at every meeting and discussion with faculty about the project, the faculty were careful to consider students' interests.

The college staff imposed several constraints related to the facility and technology supported. The main facility requirements were the adherence to the college's ADA policies and the elimination of any wiring runs along the floor. Technical Support Services stipulated that they would not support any wireless technologies on the campus backbone and would not support the maintenance of Apple computers. None of these constraints provided a barrier to completing the project, but they did limit the options available.

The community members were asked for their input during the department's advisory board meetings. The number one requirement was a video conferencing system that local business members could use to conduct overseas meetings. Currently, no such video-conferencing system exists that is available to local businesses.

### System Requirements

To meet the needs of the stakeholders, multiple facility requirements were identified. Administration's principal choice for a facility was an off-campus building in the downtown business district that is primarily being used to attract professionals to take courses while minimizing the commute time and time away from the office. Since the program will have many ties to local businesses, the facility was an option. However, there were several negative factors that ruled it out. First, no network infrastructure had been installed that would link that building to the campus backbone. Without this connection, site licenses would become an issue for many of the software programs in use. Second, the building was off-campus which would make inter-departmental participation and student access more difficult. Due to limited available facilities on

campus, a large existing traditional classroom was the only option which meant that the redesign would need to accommodate both the Virtual Enterprise and a traditional class.

Administration's requirement to have the facility serve regular classes meant the redesign and layout would need to accommodate at least twenty students in a non-Virtual Enterprise usage. The number of students is driven by the college's contract with faculty that a minimum enrollment of twenty students is needed to avoid class cancellation.

Another consideration was that a typical office environment might have workspaces that have employees with their backs towards a part of the office. However, the design had to minimize workspaces where a student would have their back to the front of the classroom. Another workspace issue was the anticipated wiring of the network and other electrical items. The existing floor was carpet over concrete; limiting the wiring to either wall-runs or ceiling-drops. The design had to minimize any wiring along the floor. In addition, there were several ADA requirements that needed to be met.

The various faculty stakeholder requirements led to several system requirements. The most prominent of these requirements was the desire to have a very fluid, open, and mobile work environment. The obvious solution was to implement a wireless network environment. However, the director of the college's Technology Support Services (TSS) department stated that the department would not install nor support a wireless solution. The college lacks the infrastructure to ensure security and authentication of wireless users at this time. The possibility of creating a Local Area Network (LAN) isolated from the campus backbone was considered and rejected for two reasons. First, the isolated LAN would need to have its own internet connection. This connection would require an added expense not covered by the college. Secondly, being isolated from the campus backbone

would mean that some software would not be eligible for installation under existing software license agreements and would need to be purchased separately. These two cost factors alone forced the decision to go with a wired network solution. The college has plans to upgrade their network infrastructure to allow wireless connections in the future. At that time, a simple and relatively inexpensive installation of wireless Network Interface Cards will add connectivity to the mobile laptop computers.

The decision to involve other departments in the program led to the concept of a virtual business comprised of five departments (Accounting, Marketing, Management, Sales, IT) with four individuals in each department. This organizational structure supported the need for at least twenty computer stations.

The decision of whether the computer stations would be laptops or desktops was based upon an analysis of the various strengths and weaknesses of both types. The business instructor's vision for an open, fluid, and mobile environment led to the consideration of using only laptops for all the stations. However, durability, reliability, safety, maintenance, and ergonomic issues were identified. As John Stenzel (1996), coordinator for the UC Davis Computer and Composition Program, points out in his report, "the keyboards are small and cramped, often ill-equipped to take the pounding they receive in lab use". This observation was echoed by the college lab managers, technicians, and Technical Support Staff (TSS) staff. An article by Una Daly (2005) for T.H.E. Journal, a magazine focused on education technology, points out the safety, maintenance, and durability issues unique to laptops. She writes, "Security can also be an issue with laptop computers; their size makes it easy to slip one out of the classroom undetected." She also identifies maintenance issues that are exacerbated by battery

recharging and replacement. Lastly, she points out an inherent durability issue with laptops stating “the increased handling of portable computers contributes to more physical damage than to desktop computers.”

Ergonomic issues associated with laptops are important and should be considered for this application. This issue is made more pronounced by this particular program as the duration of class is anticipated to be six hours a day, twice a week. This author suffered through a painful physical condition that required surgery to correct as a result of using a laptop exclusively during a consulting job over several months. The use of separate full-sized keyboards was ruled out though, since the desk top workspace was limited and not all work surfaces could accommodate an underside-mounted keyboard tray.

Despite these weaknesses, the advantages associated with the anticipated wireless technologies led to a decision to incorporate one or two laptops in every department. Laptops would also be a better fit for the smaller work surfaces that could not accommodate an underside mounted keyboard. The laptops could be stored away when not in use. The desktop computers had weaknesses with size and mobility. The size issue could be minimized by using a floor-standing tower configuration and a keyboard tray that fit under the desk along with a desktop Liquid Crystal Display (LCD) monitor. The mobility issue would be minimized by the fact that each department would have a laptop or two and if a department needed to collaborate with another department, one of their laptops could be unplugged and used elsewhere in the room. Ultimately, the final solution was to use a combination of tower-configured personal computers and laptops.



An additional laptop was required for the instructor to enable presentations to the community and off-campus access to files. However, due to durability, expandability, and maintenance constraints associated with laptops, a tower-configured personal computer was chosen for the instructor's in-class workstation.

An analysis of the hardware specifications driven by the anticipated software to be used was also done. The digital media related software introduced the most demands. In order to minimize costs, only the instructor's laptop and classroom tower and the marketing and graphics departments would conform to the demands of the digital media software. All other laptops and towers were configured to accommodate Microsoft's office suite and the upcoming Vista operating system.

The last decision concerning the personal computers was whether the Apple or personal computer (PC) platform would be used. This decision was made easier because the TSS staff at the college does not support Apple hardware. The digital media instructors at the college were asked for their input and neither expressed a concern about not adopting Apple computers for graphic-related work. Although Apple computers enjoy a positive reputation especially in the graphic arts disciplines, the instructors have based their courses around software that supports the PC and felt that since students entering the entrepreneurial program would be coming from courses offered in the digital media program, their experience would be maximized through the use of PCs. Some consideration was given to the newly introduced dual-boot configured Apple computers. The decision to employ these new Intel-based Apple computers along with a dual-boot configuration was discarded due to the immaturity of this technology and the anticipated solutions that have been reported (Hesseldahl, 2006; Louderback, 2006).

The network will include two servers. The decision to purchase separate servers rather than utilize existing servers that service the general computer lab was made based upon the IT instructor's requirement that the students are to experience system crashes and other failures that will require access to administrator privileges on the servers. Using separate servers and isolating the network as its own domain will prevent interruption of the general computer lab operations. One server will handle internal infrastructure duties such as domain controller, DHCP, DNS, WINS, and file and print sharing. The other server will handle E-mail and Web server duties required to satisfy the business instructor's needs. Video files produced by the graphics department require sufficient bandwidth from the network to support the Gigabyte size files.

The requirements for the video-conferencing system were driven by three main factors. First, the system must be capable of delivering an image of the people as well as any content from a computer simultaneously in the conference room. Secondly, the system should be of professional quality to support the community usage anticipated. Thirdly, the camera must be capable of capturing the participants seated in the under-sized room. Both ISDN and Internet Protocol (IP) systems were considered. Due to the extra cost of the ISDN service, the IP-based system was chosen.

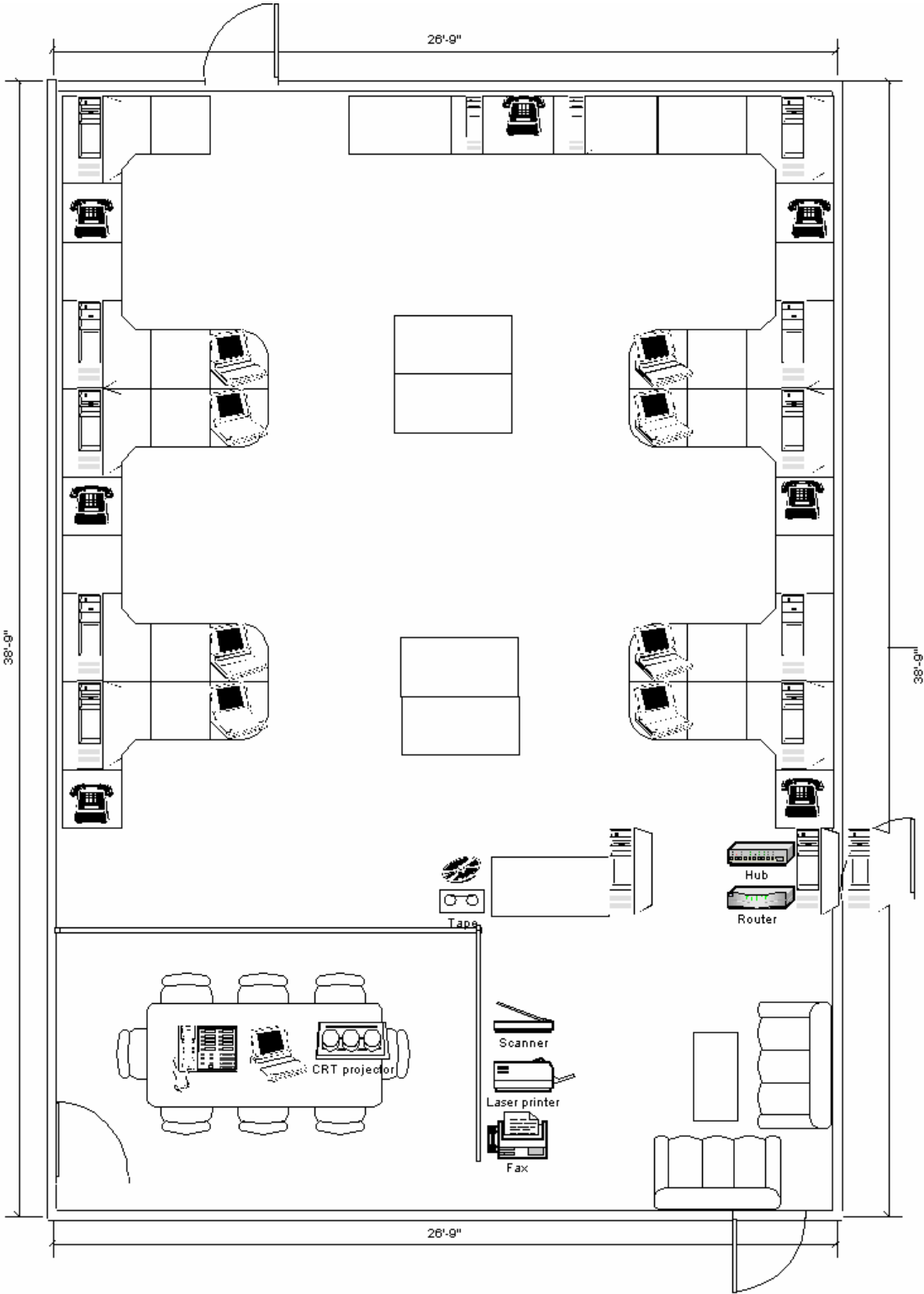
The Virtual Enterprise model relies upon the Internet to enhance the virtual business simulation experience. Many Internet-based services are provided by the City University New York Virtual Enterprise hub such as virtual banking, video conferencing with multiple sites, and web site hosting. An Internet connection is a valuable asset for students in the program. In addition, several requirements and decisions were based upon an Internet connection. The college provides an Internet connection to all facilities on

campus. Lastly, the system has to provide typical office capabilities such as faxing, copying, and telephone communication.

### Design Specifications

The facility chosen was a classroom that traditionally held up to fifty students. This room after remodeling for the Entrepreneurial program will be able to accommodate twenty students at workstations and thirty two students total. *Figure 1* shows the room layout.

Figure 1. Classroom layout.



The following ADA requirements were incorporated into the design (College of the Redwoods Board of Trustees, 2001).

- 28” clearance from floor to underside of desktop for all desks
- 36” aisle width access
- One desk equipped with a power-assist feature to change its height
- One station with a 21” CRT or 19” LCD monitors
- One station with CCTV capabilities and an enhanced vision 19” LCD display
- One station with a scanner and associated optical character recognition software
- One station with text-to-voice delivery software
- Three stations with sound cards and voice recognition assistive software
- Three stations with screen reader software
- Three stations with a wheelchair footprint of 30” wide by 48” deep (19” of the 48” may be knee space under the work station)
- Two stations with 19” CRT or 17” LCD monitors

Table 1 highlights the major computer specifications.

**Table 1. Computer Specifications.**

Qty	Items
24	Computers
13	Desktops (supplied from Tangent)
8	office equipped towers
	P4 3.0GHz 630
	GeForce 6200 16xPCIe 128MB
	1 GB RAM DDR2 PC2-4300
	120 GB SATA 8MB HD 7200
	52X CDRW/ 16x DVD
	17" LCD
5	digital media equipped towers
	P4 3.4 GHz 650
	GeForce 6200 16xPCIe 256MB
	2 GB RAM DDR2 PC2-4300
	120 GB SATA 8MB HD 7200
	16x DVD +-RW
	19" LCD
	1394 firewire
	SBS250 speakers 2 piece
	Creative SB Audigy SE PCI
10	laptops
5	office equipped laptops
	Dell Latitude D820 Core Duo T2300 1.67 GHz
	Nvidia Quadro NVS 110M TC 256MB
	1.0 GB RAM, 1 DIMM
	80 GB HD 7200
	24X CDRW/DVD
	15.4 WXGA
	Docking port replicator
	Notebook stand
	PCMCIA sound card (1 for conference room)
5	digital media equipped laptops
	Dell Latitude D820 Core Duo T2500 2 GHz
	Nvidia Quadro NVS 110M TC 256MB
	2GB RAM
	100 GB HD 7200
	8x DVD +-RW
	Docking port replicator w/lcd stand

	1394a
	15.4 WXGA
	19" LCD (4 with, 1 without)
	optical mouse
	speakers
1	Tower for video designers
	Intel Dual core 3.2 GHz
	4 GB RAM
2	250GB SATA Raid 0
2	80GB SATA
	nVidia GeForce 6200 128MB
2	16x DVD +RW DL
	19" LCD
	sound card
	headphones
	speakers

*Table 2* identifies the anticipated software needs.

**Table 2. Software Requirements.**

Qty	Software
1	Window's server and Exchange license
1	Norton Ghost
1	NetOp School workstation control for Instructor
24	Quickbooks Premiere Edition 2006
1	GoToMeeting License
24	MS Office 2003 Professional
2	MS Visual Studio 2005
1	MS Exchange Server
	Digital media software
10	Adobe Photoshop CS2
10	Adobe InDesign CS2
10	Adobe Illustrator CS2
10	Adobe Dreamweaver 8
10	Adobe Flash 8
10	Adobe Premiere Pro 2.0

The digital media-equipped computers were configured to accommodate the most demanding software product anticipated to be used. Adobe Premiere Pro 2.0 demanded the most from the hardware specifications. *Table 3* lists the specifications are for Adobe Premiere Pro CS2 as reported on Adobe's web site.

**Table 3. Hardware Specifications for Adobe Premiere Pro CS2.****Adobe Premiere Pro 2.0**

P4 1.4 - 3.4 (HDV) CPU  
 512MB - 2GB (HDV) RAM  
 4GB dedicated 7200 rpm RAID 0 Hard  
 Drive  
 1280x1024 32 bit Graphics Card

*Table 4* lists the specifications associated with a “Premium Ready” computer that supports Microsoft’s next generation operating system called Vista. (Gruener, 2006; Harris, 2005).

**Table 4. Hardware Specifications for “Premium Ready” Computer.**

MS Vista

P4 3.0GHz CPU with i945 chipset  
 1GB (32bit version) RAM  
 SATA2, 8MB cache, Native Command  
 Queueing Hard Drive  
 Windows Vista Display Driver Model  
 (WDDM), DirectX9, PCIE x16, 128MB  
 Graphics Card

*Table 5* identifies the specifications for the major network components.



**Table 5. Network Hardware Specifications.**

<b>Qty</b>	<b>Items</b>
2	Servers Dell PowerEdge 2850 3GHz 1GB RAM 2x73GB HDD 2x146GB HDD DAT 72 TBU 1500VA UPS
	Network support equipment
1	router Cisco 2811
1	switch HP Pro Curve 2848
2	transceiver 10/100/1000TX to 1000X
1	48 port Cat-5e patch panel

*Table 6* identifies the specifications for the video conferencing equipment.

**Table 6. Video Conferencing Equipment List.**

<b>Qty</b>	<b>Items</b>
	<b>Video Conference equipment</b>
1	Polycom VSX 7400, People + Content
1	Room camera Polycom PowerCam
2	50" Plasma Screens NEC 50XM5

Finally, the college's network is supported by a T3 connection provided by The Corporation for Education Network Initiatives in California (CENIC). The T3 circuit has a DS3 data rate of 45Mbps. The college dedicates 10Mbps for shared Internet usage by the entire campus. The remaining bandwidth is used to support the college's video communication needs. The Virtual Enterprise network will be connected to the college's network backbone for Internet access and for access to other network resources. The college provides security measures as part of its network services.

The complete equipment list is included in Appendix E. The furniture list is included in Appendix F. The communications network diagram is included in Appendix G.

### Summary

The design specifications were a result of input from stakeholders and principal Virtual Enterprise concepts. Due to the decision to attempt an interdisciplinary approach, there were a number of stakeholders involved with the project and their input was varied. Through meetings and ad hoc surveys, the stakeholders provided their system requirements. Conflicting interests about facility location, technology options, and college regulations were identified and addressed. The resulting design is a product of best practices, compromise, balance, and constraints.

## Chapter Four: Project History

### Background

The author first became aware of the Virtual Enterprise program at a Spring 2005 Information Sciences Department faculty retreat. The business instructor had just come back from a conference and was excited about bringing the program to the college. The idea of integrating a simulated business environment with traditional academic goals was intriguing. However, many pressing agenda items needed immediate attention, so the idea was pondered for awhile. The business instructor and the author discussed the program many more times that semester. From these discussions, it became clear that a significant IT component would be associated with the implementation of the program. The author assisted with the preparation of a preliminary proposal delivered to senior administration members at the end of the semester.

The proposal was met with general enthusiasm and support. The business instructor approached the author and expressed his need for support and counseling regarding the project's IT component. Over the summer of 2005, the author considered the way professional project requirements for his master's degree could be satisfied through his Virtual Enterprise program work. At the end of the summer, the author offered to support the IT component of the project. The business instructor accepted, and initial project strategies were enthusiastically discussed. In the beginning of the fall semester, a meeting was set up with senior administration to discuss funding and facility issues. At that meeting, the president announced that a private donor was interested in

supporting the program. A major hurdle had been overcome, and it was time to develop a plan.

### Project Progression

The project started with setting a target date for the academic launch of the proposed course. Offering the new course would require two major milestones to be met. The first milestone was the design of the infrastructure needed to support the program. The second milestone, considered separate from this project, was the development and approval of the new curriculum.

Major tasks and deadlines were defined. Other community college programs in the western region of the United States were reviewed for applicability. Lead faculty members from several colleges were contacted and discussions ensued regarding facility, equipment, and curricular issues. Local faculty, staff, and community members were solicited for their input on these same issues. Various technologies were investigated as possibilities for the infrastructure design. Feedback regarding equipment and experiences were collected. Project scope was defined, and many issues were identified. A suitable facility was found, and a furniture vendor was selected.

The project plan took shape as meetings with college maintenance and facilities staff helped to determine activities related to the room remodel and equipment needs. The various IT resources were reviewed and analyzed in detail. The results led to a list of equipment needs. Estimated equipment costs were determined and an updated cost proposal was prepared. The initial plan was to design the facility and identify the computing equipment needed during the Fall 2005 and Spring 2006 semesters. Curriculum development and approval was scheduled for the Spring 2006 semester,

allowing for a Fall 2006 semester launch. Plan details, including the room layout design and the updated cost proposal, were finally presented to senior college administration.

Next, team members were identified to purchase, assemble, build, and support the required infrastructure. The project has been handed over to college staff, who will manage the program with the supervision of senior college officials. The college President's approval of the IT plan marked the culmination of efforts and the transition of the project from development to implementation.

The most significant event of the project was senior administration's approval, which led to the solicitation of a private donor to fund the project. Without this financial support, the project would have been scaled back to a format unsuitable for this professional project. The funding has also allowed for a "best practices" approach leading to a distinctive design.

Once the project was approved, the support and commitment from lead faculty in other disciplines was identified as another significant factor towards the future success of the entrepreneurship program. Identifying the appropriate facility had several setbacks and delayed many equipment decisions. Once the facility was selected and approved by senior administration, layout and equipment decisions progressed.

During the Project Plan Phase, discussions with the various college staff regarding facility and maintenance issues were being met with indifference and resistance. Fortunately, an ally in the staff was found. This ally had the respect and seniority to assemble all the major staff members needed to address the project issues. Through the ally's efforts, a project meeting was held and many issues were addressed that cleared the way for the facility remodel and equipment purchase approval.

At one point, ironically, ADA requirements threatened to negatively impact the students work environment. The floor to desktop underside clearance was stated as including the lowest protrusion under the desk, meaning the keyboard tray. This requirement would force the elimination of all underside keyboard trays leading to all keyboards being placed on the desk thus reducing the usable desk space by the student. Another lab on campus identified as ADA compliant was found to have similar keyboard trays and the requirement was relaxed for the remodel. The compromise was that any student using a wheelchair could request to have the keyboard tray removed for more clearance.

### *Analysis and Findings*

During the investigation of other colleges using the Virtual Enterprise model, very few colleges were found to have successful programs. Reedley Community College was the only college in California that had attempted this program, and was forced to cancel classes during the spring semester of 2006 due to low enrollments. Community colleges from other states had varying degrees of success, with most suffering from low enrollments. In every case, the program had been based in a single academic department. From this information, the decision was made to solicit a commitment from several departments to participate and support the program.

A multidisciplinary approach has several potential benefits. Students in a particular virtual department will receive support and instruction from an expert in that field. Having several faculty members involved with the program should increase creative input. The faculty as a group will be a better advocate than a sole instructor. As a community college, one of the main goals is to provide vocational education and

training. Students in disciplines other than business can also benefit from a simulated office experience. Students in networking, digital media, accounting, and other fields can gain knowledge and experience from this program that will help them in their career paths. The Virtual Enterprise program should help potential entrepreneurs learn how small businesses operate, and provide them with practical experience, which a big asset. Lastly, the support of several disciplines will increase the number of students interested in the program and hopefully keep enrollments higher.

The information technology equipment identified was not a result of “best practices” entirely. Instead, several factors had an influence on the technologies and equipment selected. The facility, and more generally the existing infrastructure on campus influenced the equipment chosen. Software site licenses requiring access to the campus network backbone eliminated the possibility of an isolated LAN using wireless technology. Since the facility would not be dedicated to Virtual Enterprise program participants, additional equipment setup and security issues needed to be addressed. For example, external keyboards for laptops were not selected due to the increased security risk and maintenance effort. The other major influence was the college’s information technology support staff. Their policy of not supporting wireless or Apple computers contributed to the selection of wired Ethernet and Intel-based personal computers. The end result was not inferior though, since wireless Ethernet or Apple computers are not necessarily considered ideal. Instead, the decision was made to satisfy project requirements with technologies and equipment that the college staff is knowledgeable about, and that they will troubleshoot and maintain.

Overall, the project met the intended goals of selecting a suitable facility, designing an office environment that could also serve a traditional course offering, and identifying the information technology equipment needed to satisfy the requirements of the stakeholders. The resulting room and technical infrastructure design has been met with praise from faculty, staff, and administration.

### Changes to the Plan

The original plan to have the facility and curriculum ready for a Fall 2006 semester launch was pushed out to a Spring 2007 semester launch. The primary factors that contributed to the slip were the difficulty in identifying a suitable facility, finalizing a room design, and obtaining facilities and maintenance staff support in a timely manner.

### What Went Right and What Went Wrong

The project benefited from four major successes. A suitable facility was found that satisfied all stakeholder requirements. Support from faculty in other departments added legitimacy and strength to the new program. An ally was found amongst the college staff that led the way to support from facilities and maintenance staff. Lastly, equipment and technologies existed that satisfied requirements and was supported by the college staff.

The project suffered from a combination of politics, limited facilities, underestimated room layout design time needs, and untimely cooperation from staff. The first choice for a suitable facility was the existing career center. A political reaction ensued with several senior staff arguing against the move. Interestingly, that same facility was released to the humanities department for one of their programs barely three



months later. Suitable alternative facility choices were limited by funds to build new facilities and by limited existing non-teaching facilities. The design of the room layout took considerably more time than was originally allocated. In addition, the lack of experienced educational furniture vendors in the area contributed to the length of time spent on this task. The lack of cooperation initially by facilities and maintenance staff led to several weeks slipping by without their input and commitment to support the remodel.

### *Project Variables and Their Impact*

The unforeseen element in this project was the role that politics would play. The selection of the career center as the first choice for a suitable facility was an obvious choice. It was not a teaching facility and therefore would not interfere with the scheduling of future classes and it had a location that was nearby the faculty and IT staff that would be involved with supporting the program. Although there were other facilities that were suitable for the career center, the director solicited support from senior administrative staff to object to the move. The politics of this objection were not clear until just a couple of months later when the center was relinquished to the humanities department for one of their projects. Even though the inability to secure the career center facility did not stop the project, it did add to the complexity of selecting an alternative facility, which ended up delaying the final selection.

Politics also played to the project's favor. The inability to get facilities and maintenance staff to return calls and participate in analysis meetings contributed to further delays. These delays would have continued if one of the staff members had not intervened and personally contacted the appropriate staff and management. This staff member was able to get the other staff members to attend a meeting. It was not until after

the meeting that I learned how much respect the other staff had for this individual and how fortunate we were to get his assistance.

The college staff also contributed to project changes in another way. The IT staff's non-support of wireless technologies led to the adoption of a wired network. This restricted the fluid and mobile design the business instructor wanted. It is not a given that a wireless solution would have been implemented even if the IT staff supported wireless networks. Further research and analysis would have been performed to determine the pros and cons of implementing wireless. Despite this limitation, several laptops were identified as part of the configuration and these devices would be able to take advantage of any future adoption of wireless technologies by the college.

The only other variable that influenced the project's schedule was the demands from teaching and administrative duties. Unlike conventional professional projects that are executed as part of one's full time job, this project had to be managed secondarily to the primary and full time requirements of teaching and the associated administrative duties that present themselves during the course of a semester. Several events occurred that delayed progress on the project. These events included new curriculum development, modifications to existing curriculum, and new faculty position requests.

### Summary

The initial plan to launch the first Virtual Enterprise course during the Fall 2006 semester was changed to the Spring 2007 semester due to the effort required to identify a suitable facility, solicit input from the college staff, and resolve issues that arose. Conflicting interests and politics made the selection of a facility a lengthy and difficult task. College staff's reluctance to cooperate also led to delays that were eventually

overcome by gaining the support of a key staff member. A significant amount of time was also spent of resolving issues such as those precipitated by the college's ADA requirements.

Two key findings emerged during analysis. The first was the discovery of very few successful community college programs in the western region of the U.S. This led to the decision of using a multi-discipline approach for the Virtual Enterprise program. This is a unique approach not discovered in any other college that was analyzed offering a Virtual Enterprise program. It is hoped that this approach will add longevity, stability, and interest to the program. The second key finding was the college's lack of support of certain technologies. The decision to stay with technology that was supported was influenced by cost, staff expertise, and feedback from discussions with faculty and technical support staff at colleges with Virtual Enterprise programs.

Despite politics, conflicting interests, technology constraints, and part-time project management issues, the project still met expectations and received approval from senior administration officials to continue into the implementation phase.

## Chapter Five: Lessons Learned

### The Project Experience

There were several lessons to learn from this project. Involve key stakeholders early in the process. Check with the IT Department for approved computer equipment. Document all project communications in a journal. Investigate the legitimacy of any unreasonable requirements. Finally, make sure that enough time can be allocated to manage the project effectively if it is an additional workload.

Although all the key stakeholders had been properly identified, an assumption that there would be cooperation by all during the requirements analysis was incorrect. Assuming cooperation led to the decision to consult with staff later in the requirements analysis phase. Their lack of cooperation had a bigger impact on schedule delays because of their scheduled later involvement. The college staff is not used to projects being driven by faculty and is more receptive to taking direction from senior staff.

Even though a technology exists, it may not be supported by the college. The business instructor's original desire to have a fully mobile work environment led to some effort analyzing wireless technologies. Later, during an unscheduled hallway chat with the Technology Support Services director, it was learned that wireless technologies were not supported by his staff due to infrastructure and security issues.

Using a journal to document action items, meetings, critical decisions made, and just about anything to do with the project, was a tremendous asset. However, there were a couple of occasions dealing with vendors where decisions were made over the phone and not carried out later. Fortunately, none of those omissions was irreversible, and none

of them affected the outcome. It can not be overstated how important it is to document all forms of conversations.

If a requirement seems unreasonable it may be, and deserves a further review. A significant amount of effort was spent on identifying what and how ADA requirements affected the project. One particular staff-imposed requirement was so counter intuitive that a further investigation was done. The requirement was found to be inconsistently applied and ultimately retracted.

Managing a project part time is difficult. As a full time teaching faculty member, the majority of the effort that went into this project occurred during evenings, Fridays, and weekends. The project was in a constant state of start and stop, which is not an efficient way to manage a project. Most meetings were restricted to Fridays, which increased the length of the project. A tendency to have informal hallway meetings between classes made it much more difficult to document results and to follow through with actions.

#### *What Could Have Been Done Differently*

In hindsight, three situations could have been handled better. As a result of the complications occurring from the non-cooperation of staff, the importance of consulting all the key stakeholders early in the project became clear. A kick-off meeting with senior staff direction could have proved beneficial in getting cooperation early before serious analysis commenced. Next, the project would have taken far less time and been a more reasonable task to manage if either it could have been executed during a teaching break or a reduction in the teaching load had been approved. Lastly, after submitting the final materials list, the way recurring costs would be handled became a concern. Although it

was discussed during the final presentation to senior administration, a commitment from them to address these costs was not offered. This leaves the various departments and divisions to address these costs as part of their budgets. A more appropriate approach would be to include these costs in any materials list submitted even if they are not required.

### Meeting Initial Project Expectations

The project met the initial expectations of finding a suitable facility, designing the facility's layout, and selecting the information technology equipment needed to support the program. The facility chosen was an acceptable compromise between the desired career center and the existing available classrooms. The layout satisfied the needs of the stakeholders to be open, flexible, and with a distinctive office appearance. The layout also satisfied the request to create an environment that fosters group work by arranging the workstations in clusters. The technology and equipment needed to provide networked office computing was selected. Some of the choices made were not necessarily from best practices of other institutions due to constraints from within the college. However, the choices made do provide a balance between durability, flexibility, and expandability and will serve the program well into the future. Not only has the project met the expectations of the principals, it has received positive feedback from other faculty, staff, and administration.

### The Next Step

The project is now being managed by facilities and maintenance staff supervised by senior administration. It is anticipated that equipment and furniture will be purchased

during the Fall 2006 semester. Room remodeling and equipment installation is anticipated to occur over the winter break between December 2006 and February 2007.

### Conclusions

Development of the IT implementation plan has led the community college faculty closer to realizing their vision for a Virtual Enterprise program that helps rural students gain business knowledge and practical experience using current technologies. This foundation should provide students with the tools needed to establish their own businesses, and increase their chance for success. The plan defined the resources required for a Virtual Enterprise program, and helped provide the college with a more concrete and complete picture for launching the program.

The plan met initial expectations. The knowledge gained through investigations and communications with other community colleges that have Virtual Enterprise programs aided the research for the project, since little information was otherwise available. After initial research, the analysis and design focused on working within the college's IT constraints. Further analysis of wireless technologies is recommended for college situations that are not limited to wired solutions. Coordination and planning as the project progressed resulted in a plan that everyone liked, and in getting financial support from an anonymous donor along with other community funds for the pilot program. The system balances dependability and ease of maintenance with potential mobility and expandability. The college President's approval of the plan marked the culmination of efforts and the transition of the project from development to launch. Administration has taken control of the project, and the first Virtual Enterprise course has been scheduled for the Spring 2007 semester.

While meeting the requirements for the many stakeholders proved challenging, and the diverse interests increased the time required to coordinate efforts, using an approach that involved multiple disciplines resulted in a more solid design with broad appeal. Launching the pilot Virtual Enterprise program with a strong foundation using this approach, which is apparently unique, increases the likelihood for program longevity. For example, the college president just announced that she has accepted a new job, yet implementation continues. In addition, the approach may make significant impacts in the recruitment, retention, and educational experience of students. The college will measure the long-term success of the project by student enrollment figures and continued community funding and support.

### Summary

The launch of the innovative Virtual Enterprise program, after much hard work, shows how the enthusiasm and dedication of a few individuals has the potential to benefit many people and be a both a positive influence and an instrument of change within a community. Lessons learned during development of the IT plan will be applied to other college projects in the future, such as the importance of documentation during project activities. Other organizations that want to launch similar programs may find insight from this experience helpful. The effort required a mix of project management and technical analysis skills. The faculty involved broadened their ability to guide others towards a common goal, as well as set an example for their students by showing the way that knowledge and critical thinking skills learned at school can be applied to real-life situations for practical benefit.



Helping the college as a project leader for this program has been rewarding. Those involved feel that they are making a difference in the community. Proud of its rural heritage, the community struggles to maintain the “Lost Coast” lifestyle appreciated by its citizens and thus embraces ideas like the Virtual Enterprise program that encourage local economic growth. As individual opportunity is increased through education, more entrepreneurs may be encouraged to stay in the local area, and in turn, help the community flourish. The community college tries fresh teaching approaches to try to bridge the digital divide, and to lead the way to greater prosperity in an increasingly technological world.

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This site provides a history and information about the Virtual Enterprise program at City University of New York and overseas. The City University of New York is a champion of Virtual Enterprise for the United States and abroad. Key faculty and staff members at City University of New York, Kingsborough College provided information regarding their experiences and recommendations.

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<http://www.upenn.edu/computing/arch/standards/desktop-05-06.html#as>

The University of Pennsylvania Information Systems and Computing department provides an annual recommendation of desktop and laptop personal computer specifications. Their recommendations reflect institutional and industry trends. These recommendations provided a good cross-check of requirements for students in an academic setting.

## **Appendix A - Project Overview Statement**

**Project Name:**

Development of an Information Technology Plan for a Virtual Enterprise Program at a Community College

**Problem/Opportunity:**

The college is located in a rural area that does not have large manufacturing or service-based businesses generating jobs. Consequently, many jobs are created by entrepreneurial endeavors. Traditional small start-ups are risky and a lack of practical knowledge and experience can limit their success. College of the Redwoods' business curriculum has an opportunity to introduce an innovative program to encourage and enable students from all disciplines to consider entrepreneurial endeavors, and to help bridge the gap created by the huge digital divide.

**Goal:**

To encourage entrepreneurial endeavors in the community, the goal of this project is to develop a plan that details the technical and classroom resources necessary to implement a Virtual Enterprise program at the community college.

**Objectives:**

There are three objectives for this project. The first objective is to identify a facility suitable for a Virtual Enterprise class. The second objective is to design a room

layout that establishes the desired business environment. The third objective is to identify the information technology and office equipment needed to support Virtual Enterprise course offerings.

#### Success Criteria:

The success of the project will be determined by three criteria. A facility layout that satisfies the requirements of the stakeholders represents one criterion. A list of equipment and furniture needed to support the Virtual Enterprise program is another criterion. Administration's approval of the facility, the facility's design, and the equipment and furniture lists is the last criterion.

#### Assumptions, Risks, Obstacles:

- A College of the Redwoods' facility can be built or exists that will satisfy the objectives.
- Equipment, furniture, and facility construction costs will exceed funding
- Politics and cooperation from staff and administration
- Support from other faculty in the division
- operational requirements can be met

## **Appendix B – Work Breakdown Structure**

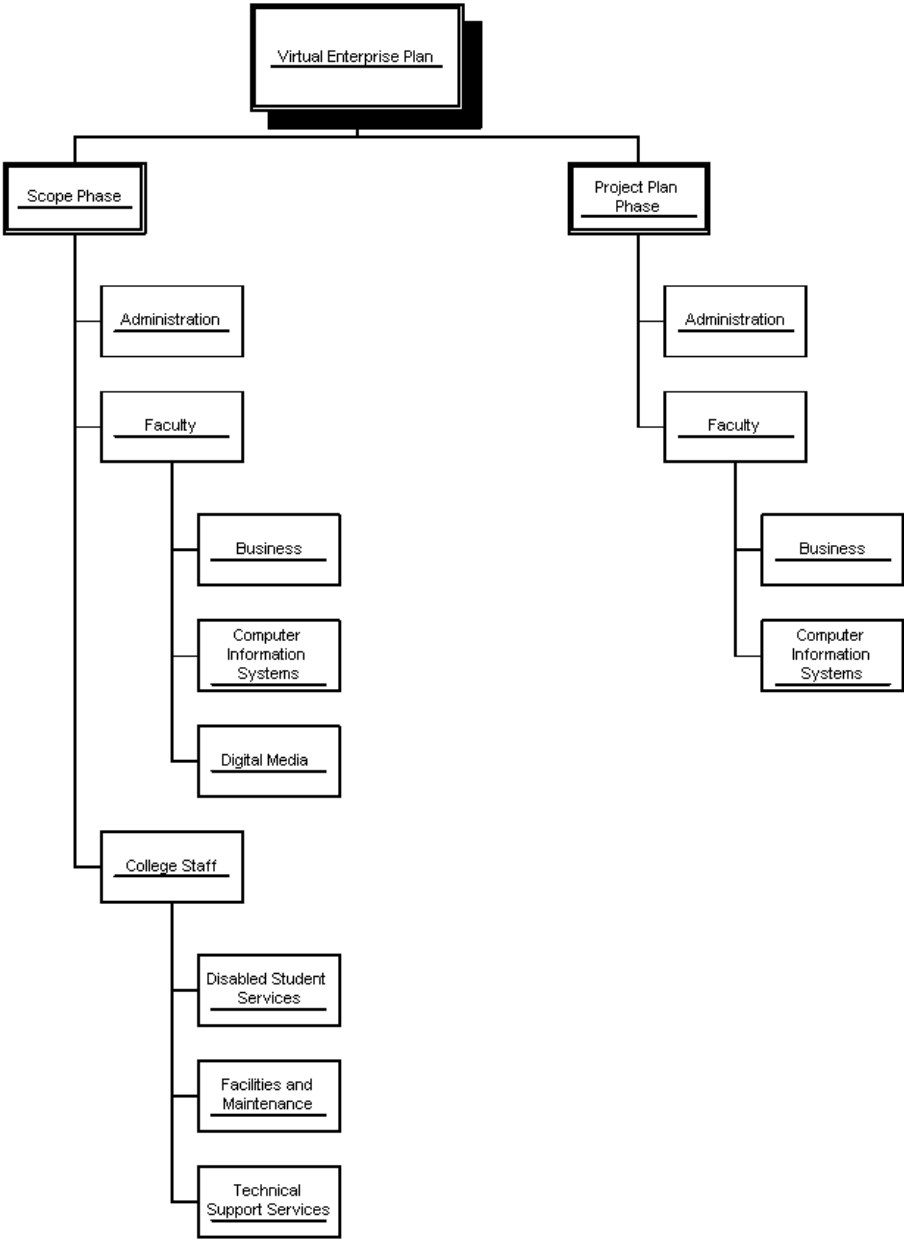
1. Determine stakeholder requirements
  - 1.1. Consult with business instructor
  - 1.2. Consult with administration
  - 1.3. Consult with other faculty
  - 1.4. Consult with staff
  - 1.5. Consult with community members
2. Identify a suitable facility
  - 2.1. Identify eligible existing facilities
  - 2.2. Analyze on-campus and off-campus benefits and weaknesses
  - 2.3. Determine facility constraints associated with stakeholder requirements
  - 2.4. Notify Senior Administration of chosen facility and get approval
3. Design a room layout that establishes a business environment
  - 3.1. Determine room design requirements
  - 3.2. Select furniture vendor
  - 3.3. Select furniture
  - 3.4. Create facility layout diagram
  - 3.5. Create furniture materials list
4. Identify the information technology equipment needed to support the program
  - 4.1. Identify existing Virtual Enterprise program systems
  - 4.2. Research best practices from existing programs
  - 4.3. Consult with department content experts for needs



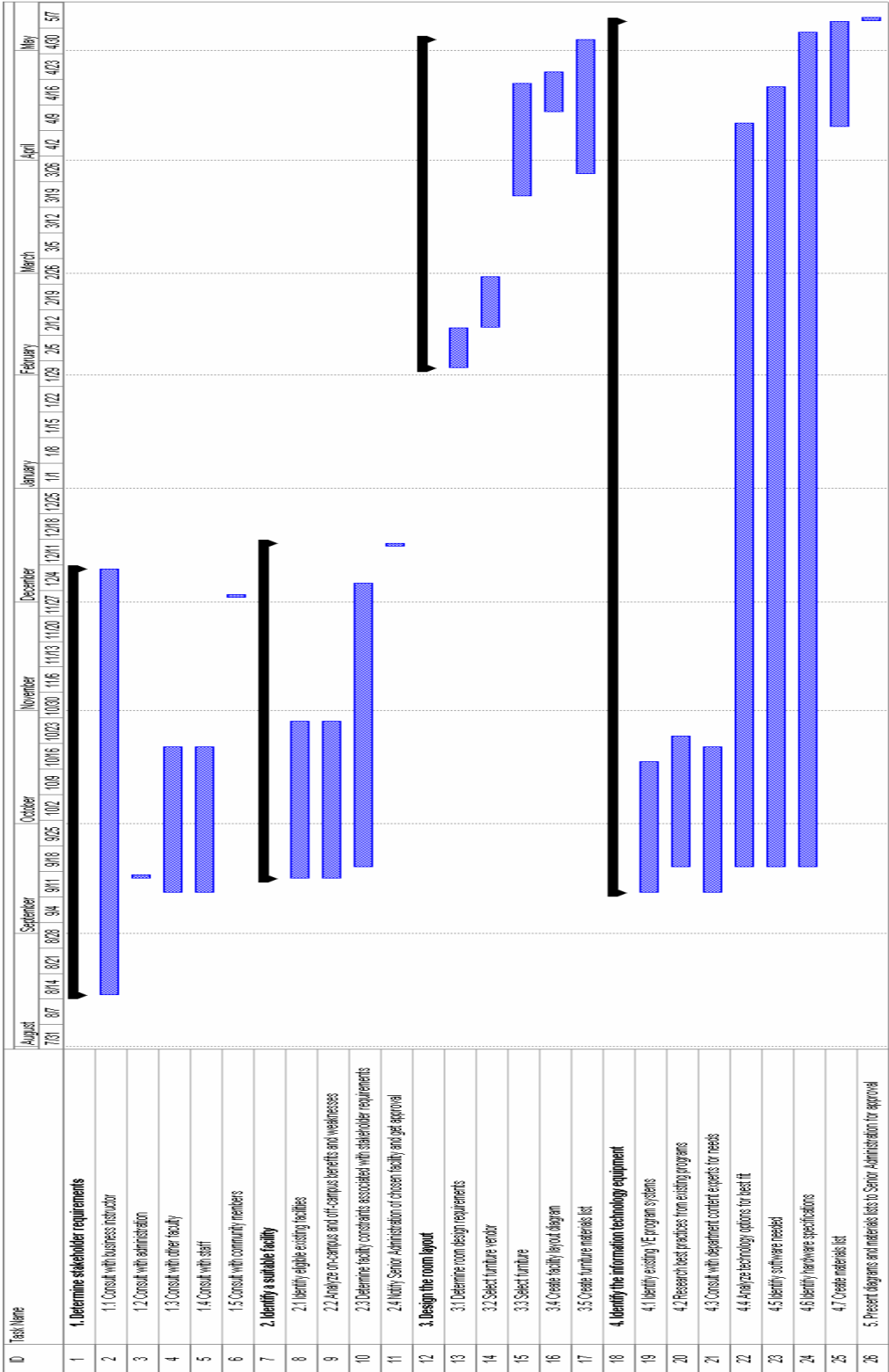
- 4.4. Analyze technology options for best fit
  - 4.5. Identify software needed
  - 4.6. Identify hardware specifications
  - 4.7. Create materials list
5. Present diagrams and materials lists to Senior Administration for approval

# Appendix C – Resource Breakdown Structure

## Resource Breakdown Structure



## Appendix D – Project Timeline



## Appendix E – Complete Information Technology Equipment List

Qty	Items
24	Computers
13	desktops
8	office-equipped towers
	P4 3.0GHz 630
	GeForce 6200 16xPCIe 128MB
	1 GB RAM DDR2 PC2-4300
	120 GB SATA 8MB HD 7200
	52X CDRW/ 16x DVD
	17" LCD
5	DM-equipped towers
	P4 3.4 GHz 650
	GeForce 6200 16xPCIe 256MB
	2 GB RAM DDR2 PC2-4300
	120 GB SATA 8MB HD 7200
	16x DVD +-RW
	19" LCD
	1394 firewire
	SBS250 speakers 2 piece
	Creative SB Audigy SE PCI
10	laptops
5	office-equipped laptops
	Dell Latitude D820 Core Duo T2300 1.67 GHz
	Nvidia Quadro NVS 110M TC 256MB
	1.0 GB RAM, 1 DIMM
	80 GB HD 7200
	24X CDRW/DVD
	15.4 WXGA
	Docking port replicator
	Notebook stand
	PCMCIA sound card (1 for conference room)
5	DM-equipped laptops
	Dell Latitude D820 Core Duo T2500 2 GHz
	Nvidia Quadro NVS 110M TC 256MB
	2GB RAM
	100 GB HD 7200
	8x DVD +-RW
	Docking port replicator w/lcd stand
	1394a
	15.4 WXGA
	19" LCD (4 with, 1 without)

optical mouse  
speakers

- 1 Tower for video designers
  - Intel Dual core 3.2 GHz
  - 4 GB RAM
- 2 250GB SATA Raid 0
- 2 80GB SATA
- 2 nVidia GeForce 6200 128MB
- 2 16x DVD +RW DL
- 19" LCD
- sound card
- headphones
- speakers
- S/W \*

- 2 Servers
  - Dell PowerEdge 2850
  - 3GHz
  - 1GB RAM
  - 2x73GB HDD
  - 2x146GB HDD
  - DAT 72 TBU
  - 1500VA UPS

#### Software

- 1 Window's server and Exchange license
- 1 Norton Ghost
- 1 NetOp School workstation control for Instructor
- 24 Office related
- 24 Quickbooks Premiere Edition 2006
- 1 GoToMeeting
- 24 MS Office 2003
- 2 MS Visual Studio 2005
- 1 MS Exchange Server
- 1 MS Outlook

#### DM software

- 10 Adobe Photoshop CS2
- 10 Adobe InDesign CS2
- 10 Adobe Illustrator CS2
- 10 Adobe Dreamweaver 8
- 10 Adobe Flash 8
- 10 Adobe Premiere 2.0

#### Network support equipment

- 1 router Cisco 2811
- 1 switch HP Pro Curve 2848
- 2 Transceiver 1000FX to 1000TX
- 1 equipment rack with sides and doors

- 1 fan unit for rack
- 1 48 port Cat-5e patch panel

#### Computer support equipment

- 1 SVGA manual 2 port switch
- 2 laptop carrying case
- 3 s video to ntsc cables for laptops
- 1 web camera
- 1 web camera
- 3 250MB zip disks, 8 pack
- 3 Plantronics microphone Audio 50
- 8 graphics tablets Wacom Graphire 4 6x8
- 6 usb flash drives
- 4 200 GB external hard drives
- 1 9 cell spare battery for instructor
- 2 USB remote mouse Atek
- 1 Portable LCD projector
- 8 headphones

#### Classroom equipment

- 1 CCTV- 19" LCD Enhanced Vision Merlin
- 1 Document camera Samsung UF-80ST
- 1 Card swipe system

#### Office equipment

- see Pacific Paper list
- 1 scanner HP scanjet 8200

#### Video Conference equipment

- 1 Polycom VSX 7400, People + Content
- 1 Room camera Polycom PowerCam
- 2 50" Plasma Screens NEC 50XM5

#### Furniture

- 1 Instructor desk, Smartdesk IDT 603030-CK9

#### Misc

- Domain name registration
- 1 Contemporary Research S-video cc decoder VSCC
- 1 BNC male to RCA male 3-foot cable (part #B-P3)
- 2 adapter male BNC to female RCA (part #B-PF)
- 1 Tecnec H50C-C3 Lock system (combination lock)
- 1 Digital Camera, Canon S3 IS
- 1 Canon PSC-75 Soft Case
- 1 Canon CBK4 - 300 - AA Battery Charger & Kit
- 1 Sandisk SDSDH-1024-901 - 1 GB Ultra II Secure Digital Memory Card

## Appendix F - Furniture and Equipment List

Item Nbr.	Mfr Cde	Manufacturer Part Number	Description of Item	UOM	Qty Reqd
1	---	HON.....	PRMC02HX2SOLOCURRANTC	Ea	1
2	---	HON.....	PRMCO1HX2SOLOCURRANTC	Ea	4
3	---	OFFICE SRCE.	2175 BLACK.....	Ea	8
4	---	MAXON.....	ECIE.....	Ea	4
5	---	MAXON.....	WC36E.....	Ea	1
6	---	MAXON.....	LL3636E TACKABLE.....	Ea	8
7	---	ELITE.....	PV520 CHERRY TABLE...	Ea	1
8	---	ABCO.....	H8BLK/BLK/CHERRY....	Ea	1
9	---	HON.....	673LP.....	Ea	1
10	---	HON.....	SC1872P.....	Ea	1
11	---	WORKRITE....	SP367224CUSTOM.....	Ea	1
12	---	MAXON.....	MTH4824T.....	Ea	4
13	---	MAXON.....	MTR4824T.....	Ea	4
14	---	MAXON.....	DSCSTB2436HMHE.....	Ea	9
15	---	MAXON.....	DSRSTB2424HMEP.....	Ea	10
16	---	MAXON,.....	DSRSTB2436HMEP.....	Ea	1
17	---	MAXON,.....	DSRSTB2436HMCL.....	Ea	7
18	---	MAXON,.....	DSRDTB2436HMMS.....	Ea	1
19	---	MAXON,.....	DSRDTB2442HMEP.....	Ea	2
20	---	HON,.....	MSP70.....	Ea	2
21	---	HON,.....	MSAT.....	Ea	2
22	---	HON,.....	MST60.....	Ea	1
23	---	MAXON,,.....	DSRHM60E.....	Ea	9
24	---	MAXON,,.....	DSHTB60.....	Ea	9
25	---	MAXON,,.....	USL30.....	Ea	9
26	---	WORKRITE....	3170-22TG.....	Ea	10
27	---	WORKRITE....	2180S-25J.....	Ea	10
28					
29			FINISH SELECTIONS FOR ABOVE FURNITURE:		
30			FABRIC: 2823-010 HOPSCOTCH CHESS		
31			PAINT AND T-MOLD ING: BLACK		
32			LAMINATE: 7054-60 WILD CHERRY		
33					
34	APG	22550.....	COOLER,WATER,W/COLDBO	Ea	1
35	HEW	Q3950A.....	PRINTER,LJ2840,AIO CO	Ea	1
36	HEW	Q3960A.....	TONER,F/ CLJ 2550,BK.	Ea	3
37	HEW	Q3961A.....	TONER,F/ CLJ 2550 HY,	Ea	2
38	HEW	Q3963A.....	TONER,F/ CLJ 2550 HY,	Ea	2
39	HEW	Q3962A.....	TONER,F/ CLJ 2550 HY,	Ea	2
40	HEW	Q3964A.....	DRUM,F/ CLJ 2550,BK..	Ea	1
41	SPR	06120.....	PAPER,COPY,8.5X11,WE,	Ct/Cs	6
42	SAN	80078.....	MARKER,CHISEL,DRYERAS	Ea	20
43	SAN	80001.....	MARKER,EXPO 2,CHISEL,	Ea	75
44	ITA	30027.....	PEN,BALLPOINT,STICK,M	Bx	25
45	SPR	SP111-1/3...	FLDR,FILE,LTR,1/3,MLA	Bx	6
46	SPR	SP52-1/3....	FLDR,HANG,LTR,1/3,GN.	Bx	10

47	SPR	19783.....	NOTES,ADHESIVE,3"X3"-	Ea	144
48	MMM	566.....	PAD,4 SLFSTCK 20X23,W	Pk/Pd	6
49	SPR	85009.....	CLIP,GEM,JUMBO,REGULA	Bx	50
50	SPR	01317.....	STAPLER,FULL STRIP,BK	Ea	15
51	SPR	HB210.....	STAPLES,CHISEL PT,STD	Bx	15
52	SPR	86000.....	REMOVER,STAPLE.....	Ea	15
53	SPR	02041.....	SCISSORS,8"-STST.....	Ea	10
54	SPR	01522.....	HIGHLIGHTER,CHISEL TP	Bx	4
55	SPR	01796.....	PUNCH,HEAVY DUTY,3-HO	Ea	1
56	SPR	60045.....	TAPE,INVISIBLE,3/4"X1	Ea	30
57	SPR	64007.....	DISPENSER,TAPE,BK....	Ea	12
58	SPR	73503.....	LAMINATOR,PRO,12",4-R	Ea	1
59	GBC	3745022.....	POUCH,LTR 3MIL LAM,10	Bx	1
60	TOM	68620.....	TAPE,CORRECTION,MONO,	Ea	12
61	AVE	05167.....	LABEL,LSR,1/2X1-3/4,W	Bx	1
62	AVE	05164.....	LABEL,LSR,SHPG,3-1/3X	Bx	1
63	AVE	05366.....	LABEL,LSR/IJ,F/FLDR,W	Bx	1
64	QUA	R1520.....	ENVELOPE,TYVK,9.5X12.	Bx	1
65	QUA	11218.....	ENVELOPE,SELFSEAL,#10	Bx	1
66	QRT	3640TE.....	EASEL,RVSB,6X4,RDS TE	Ea	1
67	PCE	KX-TS730S...	PHONE,CONFERENCE,TM..	Ea	1
68	CNM	MP27D.....	CALCULATOR,12DGT.PRIN	Ea	2
69	SPR	02160.....	WASTEBASKET,RECT,28 Q	Ea	12
70	RUB	4A18TPCYLBL	WASTEBASKET,PUSH TP,1	Ea	1
71	ELD	22341.....	SHELF,3TIER,DSK,MESH,	Ea	12
72	ELD	22171.....	ORGANIZER,DESK,MESH,B	Ea	12
73	FEL	21106.....	COPYHOLDER,DESK TOP,B	Ea	12
74	ELD	24701.....	COSTUMER,COAT TREE,EY	Ea	1
75	ATT	982.....	PHONE,982,2LN,SPKR,GP	Ea	7
76	FEL	99595.....	CORD,EXT,1OUT,3PRNG,9	Ea	4
77	KMW	62132.....	SURGE,GUARDIAN,6OUTLT	Ea	20



## Appendix G –Virtual Enterprise Network Diagram

VE Network Communications Logical Diagram

