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## Developing a Collaborative Learning Facility to Support Advanced Information Systems Courses: The LMU Experience

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# Developing a Collaborative Learning Facility to Support Advanced Information Systems Courses: The LMU Experience

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## Abstract

This paper describes the development of a facility designed and implemented to support collaborative learning and advanced electives in Information Systems. The complete process from the development of a successful grant proposal to the final implementation and operation of the facility is discussed. The paper also describes the logistics of the implementation and lessons learned from this project.

**Keywords:** cooperative/collaborative learning, team-oriented problem solving, project development teams

## 1. INTRODUCTION

This paper describes the development of the Advanced Information Technology Laboratory (AITLAB), a facility designed and implemented to support collaborative learning and advanced electives in Information Systems at Loyola Marymount University's College of Business Administration. We describe the entire process from the development of a successful grant proposal to the Division of Undergraduate Education (DUE) of the National Science Foundation (NSF), to the final implementation and operations of the AITLAB. The set up of the AITLAB and its role in supporting both student learning and initiating research programs are illustrated. Further, we describe the logistics of the implementation and lessons learned from this project.

## 2. BACKGROUND

Loyola Marymount University is a private Catholic (Jesuit) university offering undergraduate, professional, and graduate degree programs in various disciplines, and has an enrollment of over 6,100 students with di-

verse ethnicity. Loyola Marymount University is located in Los Angeles, California.

The College of Business Administration, accredited by the American Assembly of Collegiate Schools of Business (AACSB), is located on the Westchester campus of Loyola Marymount University. It is housed in the Conrad N. Hilton Center for Business that opened in August 1995. The college has four departments: Accounting, Finance and Computer Information Systems, Management, and Marketing and Business Law. It offers the Bachelor of Business Administration, Bachelor of Science in Accounting, and Master of Business Administration degrees. The College has over 1000 undergraduate and 400 MBA students enrolled currently. In accord with its strategic plan, the College of Business Administration revised the curricula for all degree programs as part of its ongoing evaluation and improvement process. The upgraded curricula required that the students have significant hands-on experience with the latest in information technology tools. Feedback from local businesses and an understanding of the future needs of the College's graduates also

indicated such a necessity. A review of the literature on computing curriculum development uniformly asserted that a well-equipped computing laboratory was an essential factor for a satisfactory education of the students in a computing discipline (Beidler et al., 1985; Computing Curricula, 1991; Denning et al., 1989; and McLeod Jr., 1985). Thus, the need for a computing laboratory equipped with the state-of-the-art hardware and software was determined to be of utmost importance to the success of the Computer Information Systems program at Loyola Marymount University.

This program offers business students a concentration in information systems and requires a minimum of three elective upper-division courses in Computer Information Systems (CIS). The upgraded business curriculum also includes non-credit workshops and two core courses in the CIS program. Table 1 shows the planned sequence of courses in the new CIS curriculum along with the core courses in the curriculum. The collective objective of the elective courses is to provide students in the CIS program with the technical foundation, which would prepare them for professional careers as well as for graduate studies in the field of information systems.

At the time of the planning for the Advanced Information Technology Laboratory, the faculty in the CIS program were revising all the courses in the program to increase the hands-on laboratory component significantly so that graduates would have the requisite experience with the latest in information technology tools. The improvement plan included integration of newly developed and upgraded laboratory projects as well as "hands-on" instruction in the existing elective courses. In addition, faculty planned to introduce a new course, Software Development, in order to meet the growing needs of students in the CIS program for instruction and hands-on experience in software development and project management. Szajna (1994) asserts that the concept of software development is an important issue for the practitioners in the area of information systems.

The upgraded projects and the proposed new course could not be implemented without adequate technological support. The College lacked the equipment to effectively support the hands-on component of the elective

courses in the revised CIS curriculum. The existing facility of the College at the time of the proposal was not able to accommodate effectively the needs of the elective courses, either for instructional purposes or for laboratory use. In particular, the need for special purpose software required for effective teaching of the upper division undergraduate elective courses in the revised CIS curriculum was not available on campus. Students in the elective courses, therefore, needed a computer laboratory that could be dedicated for teaching the elective courses through hands-on demonstration of the concepts being taught as well as for successful completion of their projects.

### 3. THE DEVELOPMENT PLAN

The main objective of the development plan was the creation of the Advanced Information Technology Laboratory (AITLAB) intended to support the following:

1. Introducing team-based laboratory projects that would enhance the existing elective courses in the IS area. These team-projects would be supported by the use of groupware structured to enhance team-building skills. Existing projects would be revised to include a significant hands-on component.
2. Developing a new course titled "Software Development."

The new projects in the Information Systems Analysis and Design, and the Management Support Systems courses would require the use of groupware and advanced application development tools such as Computer Aided Software Engineering (CASE) tools and an object-oriented knowledge-based shell. The projects would be organized around teams to give the students opportunities to learn and "practice problem-solving as a team" (Rettig, 1990; Rettig and Simons, 1993). Real life IS projects are inherently team-oriented and involve acquisition and sharing of problem-domain knowledge among the team members, collaboration and coordination with individual members, and consensus decision-making. We decided to use Constantine's (1993) "Structured Open Teams" concept for organizing and managing software projects to build team skills in the CIS elective courses. In particular, we expected self-selecting

groups of 3 or 4 students in each group project where each member would be assigned a specific role as project leader, archivist, and user/critic on a rotating basis in each phase of the project. For each group project, the instructor would play the role of the project manager and consultant to the team, and as a mediator for conflict resolution. In addition, one of the instructor's responsibilities would be to encourage and foster group decision-making as well as individual ownership of the group's work.

The projects in ISQM 472, Information Systems Analysis and Design and ISQM 474, Management Support Systems are described in detail below. Similar changes were developed in the Database Management Systems and the Data Communications and Networks courses.

a) Information Systems Analysis and Design (ISQM 472): Information Systems Analysis and Design deals with fundamental concepts and issues related to an understanding of the information requirements of enterprises for application systems development. The main objective of the course is to teach students group problem-solving methods for understanding a user's description of a systems problem, providing an analysis of that problem and communicating the facts in terms understandable to the user for his/her validation and, subsequently, implementing the design derived from the analysis and specification document. The course components, which would integrate the hands-on experience of the new laboratory projects for achieving the above objective, are as follows:

1. Introduction to the concepts of structured systems analysis and design with a theoretical understanding of the business process analysis.
2. Introduction to the tools of structured analysis. Concepts of business process specifications, data flow diagrams, entity-relationship (E-R) diagrams and structured charts. The hands-on component would include introduction to a CASE tool; specifically the modules of business process flow and data flow diagrams.
3. Introduction to the principles of systems design. Emphasis would be placed on the concepts of group problem-solving in the

logical design of information systems solutions. Students would be required to organize themselves into groups of three or four with each team member assigned a specific role on a rotating basis.

4. Concepts of detailed/physical design. Introduction to the design facilities of the CASE tool and using it for detailed design such as, data modeling, input and output design, interface development, and design of the control mechanism.
5. Development of a prototype of a part of the design by using the software tools and testing them for performance measures.

The existing mode of delivery of the course at the time of the proposal did not provide students with the necessary practical experience of group problem-solving skills essential in IS projects because of inadequate and inappropriate hardware and software resources. The group problem-solving approach employed in the above projects would help students gain a better appreciation of the significance of the team in project work as well as experience with an industry level design and development tool.

b) Management Support Systems (ISQM 474): The goal of the Management Support Systems course is to teach students how to develop systems that support managerial decision making. The primary objectives are to help students understand the process of identifying a manager's decision support needs, learn how to develop a prototype system usable by the decision maker, and learn how to evaluate the usability and effectiveness of such a system. In addition, students must develop and enhance the above skills in a team context.

In developing systems to support managerial decision making, the system developer and the intended user are both part of the development team. Inputs, evaluation and feedback are needed from both sides of the team to make the development process a success. In this course, the students learn to understand and appreciate both perspectives by role-playing the developer and the decision maker/user in different aspects of the term project.

As planned, the project required students to model the decision making process of an individual using quantitative and qualitative modeling with spreadsheets and object-oriented development environments. The students would form groups of three members each. Each student in a group would role-play a user/decision maker, a decision support system (DSS) developer, and a team critic. As the decision maker, the student would present to his/her "developer" partner a decision-making situation requiring a DSS. As the developer, each student would analyze the decision making situation, design and develop a prototype DSS that meets the decision maker's needs. As the critic, the student would observe the interaction between the other two members and provide feedback. The course components would be altered to implement the above processes using the appropriate industry standard software.

The projects and the assignments in both these courses were to enhance student learning by making the learning process more active and practical. The students would learn how to develop team problem-solving skills through a structured process. Experience has shown that this approach of hands-on, active learning is significantly better for students' comprehension of the subject matter than other passive forms of learning. The projects and assignments would require the intensive use of an advanced application development environment. All the projects in both courses would require class presentations of the results by students to emphasize collaborative learning and the students' oral communication skills. The proposed laboratory with its dual role as an instructional facility as well as a laboratory would enable such presentations to be carried out effectively.

#### 4. IMPLEMENTATION OF THE AITLAB

The project proposal was accepted by the National Science Foundation and a grant for an amount of \$55,780 with a matching contribution from the University, thus making a total of \$111,560, was awarded for the project (award number NSF-DUE-9651096). The proposed budget with the equipment list is shown in Appendix A.

We started the implementation process shortly after the award announcement in June 1996. The AITLAB was first used for classes in August of 1997. In the remainder of this section, we discuss the implementation and operations issues that we faced as we developed the laboratory facility. Our experience and lessons learned will be valuable for faculty who are planning to develop a facility similar to the AITLAB and are in the process of preparing proposals for such projects.

#### 4.1 Physical Location: Criteria for Selection.

The Advanced Information Technology Instructional Laboratory was envisioned to be a facility intended to provide advanced electives in the College of Business Administration with a state-of-the-art hardware with special purpose software for class and project work for supporting collaborative team work. In order to satisfy this objective the following requirements were to be satisfied.

1. The facility should handle a minimum of three electives per semester with the potential to accommodate more electives in the future.
2. In addition to the class periods for the electives, the facility must be available to support student collaborative work on team projects.
3. The following infrastructure supports were necessary to carry out a feasible implementation of the proposal
  - The AITLAB must be large enough to accommodate, in the initial phase, fifteen desktop computers, a server, printer, the instructor's workstation and a projection facility.
  - The facility should also allow for future growth to at least 25 workstations in anticipation of future expansion requirements.
  - Sufficient power for the equipment was required.
  - The instructional laboratory would have its own local area network that needed to be connected to the

campus network, which would provide connectivity to the Internet and other external resources. Proper wiring for this connection was, therefore required in the room.

- The room should have a white board (instead of a black board) to prevent damage to the computing equipment from chalk dust.
- A projection screen mounted in a suitable location was required as was the mounting capability for a ceiling/wall-mounted computer projector.
- A lockable cabinet was needed to house and secure the server and the software media.
- To facilitate unobstructed student use and expansion, the instructional laboratory must have suitable furniture that must be secured in place to meet the state building codes.
- To secure all the equipment, and facilitate access to authorized users, the room must be secured with access control locks for each door.
- Staff hours should be allocated for supervision of the facility during open laboratory hours.

Appendix B provides a schematic of the layout of the laboratory.

#### 4.2 Vendor Selection

The objectives in selecting a vendor for the **software** needed were based on the following criteria:

- Availability of educational pricing and compatibility with campus licensing. This issue is particularly important due to the expensive nature of the software packages. Adding to an existing license on campus can save a significant amount of resources.
- Software had to support teamwork and be compatible with standard operating platforms such as Windows 95 or NT.

The software packages should be able to operate in a network environment and take advantage of the client server architecture and should be robust in a multi-user environment.

- The packages should provide easy integration with standard office suites (such as Microsoft Office 97) for documentation and presentation purposes.
- Pricing and frequency of upgrades and ease of use including installation, user training, and maintenance should be considered.

The vendor selection for **hardware** was based on the following criteria

- We wanted machines with the best price-performance ratio from the best vendor. It was decided that only brand-name machines would be considered to ensure reliability.
- The performance standard had to support all the software and the network requirements.
- Warranty and after sales support available from the vendor. A history of adequate support and other references should be obtained before writing the final contract.
- Campus standard imposed by the IS department should be followed. It is important because deviation from such standards would mean reduced support from the IS department thus shifting the burden of maintenance to the faculty team on the project.

#### 4.3 Acquisition, Development, and Testing

##### Hardware Installed

The primary hardware currently in use in the AITLAB consists of fifteen student workstations (HP Vectra VA) and one instructor HP workstation all running Windows NT. These are networked using an Intel hub to share a network printer and to access the AITLAB server. The server (HP NetServer LD Pro), that runs Windows NT as well, is used to share storage space for team project work and to share applications. All the computers

in the lab are connected to a high speed HP5-SI-MX laser printer installed in the laboratory itself. The AITLAB has a Proxima data projector (allows connections to 2 computers and 1 video source) that is used for class demonstrations and presentations. The instructor's station is connected to this projector. The AITLAB network is connected to the campus network allowing access to the Internet. In addition to the above, we also have three HP workstations installed in the offices of the faculty in the project team. One Toshiba CDT 320 laptop computer was purchased later to be used for presentation in larger classrooms as well as for presentation at faculty seminars and conferences.

#### Software Installed

Application software installed in the AITLAB to support the IS elective courses were

- Systems Architect (CASE Tool) by Popkins Software
- Level-5 Object (Rule Based DSS Development Tool) by Rule Machines Corporation
- Clicknet (Network Diagramming and Documentation Tool) by Clicknet Corporation
- Autonet (Network Analysis Tool) by NDA Corporation
- Oracle 8 (Database Development Tool) by Oracle Corporation
- MS-Visual Studio (Software Development Tool) by Microsoft Corporation
- MS-Exchange Server (Groupware Environment) by Microsoft Corporation

General use software installed in the AITLAB were

- MS-Office 97 suite by Microsoft Corporation
- Netscape Communicator Suite (Web Browsing and Editing Tool) by Netscape Corporation

All the software ran under the Windows NT platform.

#### **4.3 Maintenance and Upgrades**

It is important to mention the maintenance issues that we experienced so that other faculty getting into such ventures have a complete understanding of the work required after the grant is awarded. In retrospect, we found writing the grant proposal and getting the money relatively easier when compared to the various issues that we faced after the funding was received. What we learned from our experience was that maintenance of the facility is a very important issue and must be considered explicitly at the time of developing the proposal.

Once the laboratory was in place and was in use for a year, we began to encounter several maintenance issues. It was surprising to find that despite prior thought, many of the issues were not understood till we experienced them ourselves. These issues can be broken down to the following categories:

- **Administration and maintenance of the student accounts from one semester to the next:** One of the challenges that we faced was providing the students access to the required resources for doing their work while at the same time maintaining the security of the desktop and network configuration (to prevent unauthorized activity). The Windows NT environment provided security by allowing us to create users with different levels of access to the resources. However, we soon realized that the administration associated with account creation, updating and maintenance was getting to be too much for the instructors. This was especially true because we had several classes using the laboratory each semester and each class needed its own specific settings for the users. In our original discussion with the administration of the university, we did not ask for resources to take care of such activities. On receiving resources at a later point, we hired student workers to manage the above activities but that too ran into the problem of high turnover and repeated training needs.

- **Resetting the machines and software set ups to get the laboratory ready at the beginning of each semester:** The pedagogical intent of the laboratory prevented us from limiting the functionality of the desktop. Each student was given the flexibility to change different settings on the machines, download software and experiment with them within the context of the class assignments. Such flexibility, however, made it necessary to reset all of the machines at least once in the beginning of each semester. We discussed the idea of restricting the desktop to prevent the students from making any changes, but that would have defeated the purpose of the laboratory. Clearly, such routine maintenance work also requires extra resources that should be accounted for while developing the grant.
- **Installation of new software as well as upgrades of the previous versions:** To enable students to work with the latest version of the software, regular upgrades were required. Some of the upgrades to software, such as, Oracle and Systems Architect, were expensive even with educational discounts. The university provided the funds for the purchase of the upgrades. However, the time required to install them properly and fix incompatibilities with other software was substantial and should be accounted for in the budgeting process of the laboratory.
- **Repair, replacement, and upgrade of hardware resources:** The intensive use of the laboratory, especially as enrollment increased in our classes, led to occasional breakdown of the hardware components. It was also necessary after four semesters to upgrade the memory and hard drives to accommodate the demands of the newer software. The cost and labor of such replacement also are to be factored in the ongoing operating budget of the laboratory.
- **Periodic troubleshooting during the semester:** With the variety of the class assignments and the number of students, we frequently ran into problems during the course of the semester. A lot

of the problems were due to the students and instructors changing settings on the desktop to suit their course needs. A trained laboratory assistant is necessary to monitor such problems and fix them in a timely fashion. However, such a position is often a policy decision and thus has to be understood by the administration. As mentioned above, hiring students to do this work is problematic because of their lack of knowledge and high turnover.

We addressed several of the above issues by hiring an outside consultant to do the above work, specially the installation, upgrade, and troubleshooting of both hardware and software. The consultant was brought in during the summer break to do the work with a limited budget provided by the administration. While the consultant was able to work within the budget limits, the firm did not have the specific knowledge and experience to deal with the variety of software needed in our context. Consequently, the set ups they performed worked for a short while but we began to encounter problems as the semester continued and the laboratory was used more intensively. The consultants were able to set up software to create a baseline installation that could be used to replicate the settings. The process worked only initially and we were not able to use the baseline installation for future duplication of the computers in the laboratory. We were unable to get the fund necessary for subsequent maintenance requirements.

One action that helped us considerably in the implementation and maintenance of the laboratory was the establishment of policies for the operations and management of the laboratory. These policies helped us deal appropriately with several situations. Appendix C contains a list of items for which policies were developed during the implementation of the laboratory.

## 5. BENEFITS

The AITLAB has enabled the faculty of the CIS department, for the first time, to teach students courses such as Systems Analysis and Design, Database Systems, Management Support Systems, and, Data Communications and Networks using current commercial grade software. In the case of Sys-

tems Analysis and Design, and Database Systems, we are able to incorporate team approach to students' project work. We have made it more convenient for students to collaborate with other members of their group, and to keep up-to-date documentation of the different phases of the project work from requirements gathering to the completed project.

The major benefit provided by the AITLAB was the substantial changes that we were able to make to our courses. We were able to add significant hands-on components in each of the Information Systems electives. Further, through the laboratory, our students had a facility with the right level of technology needed for the elective classes. The facility was also available to the students as an open laboratory and this enabled them to gain valuable experience working with industry standard software. All of these changes to the way we taught our elective classes substantially improved the quality of the classes.

The improvement in quality of the classes comes in part through the variety of software for use in the courses, and the requisite hardware to run them. It is, therefore, appropriate to discuss the software and their applications in detail.

System Architect and Oracle 8 are commercial software for Computer Aided Software Engineering (CASE) work and relational database respectively, and both are widely in use in industries. Consequently, our students' exposure to these technologies provides them with valuable experience in an educational environment that can be readily transferred to the real world after their graduation.

Prior to the creation of the AITLAB, students had no direct experience with any CASE tools in the Systems Analysis and Design course. All course work, including projects, were done using other graphical software without the capability of capturing the data into a repository for use by other analysts or designers. In the database systems course, first Paradox and later Access were used in the past, neither of which had the capabilities of a full-fledged database management system product like Oracle 8 with the access control and other security features.

Level 5 Object is an object oriented application development system that incorporates an inference engine. It allows creation of decision support systems with expert system components built into them. The software used for the Management Support Systems class prior to this project was VP-Expert. This DOS based program was useful in teaching the basic concepts of rule-oriented decision support systems but was ineffective in helping students learn how such systems work in real-life business contexts. Level-5 Object uses the Windows interface and thus allows easier integration with other business applications. Level-5 Object adds to the capability for the students not only to learn the basic concepts of expert systems but apply it to create practical business applications. The Windows based interface allows the students to also experiment with the effect of interface design on the usability and quality of the systems they develop for their projects. In the semester that the Management Support Systems class was offered, the students worked on some fairly challenging projects based on real-life problems and were able to develop significant prototypes of systems that could actually be implemented in the business context. During the course of the project, the vendors of Level-5 Object released a new version called Visual Rule Studio that contains the Level-5 inference engine but runs as an extension to Visual Basic. This provided additional flexibility in accessing and manipulating data from multiple sources more easily than Level-5 Object. The course was significantly enhanced with this new release of the software.

Understanding the performance of a network is an essential part of learning in the Data Communications and Networks course. This requires software for simulating and analyzing computer networks so that the students can understand the principles of designing a network before actual implementation. Autonet is a commercial grade network analysis software tool that was used for this purpose. The Autonet software has allowed the students to simulate and analyze the performance of a communications network before actually building it. It has also served as an excellent tool for conveying to the students the principles of sound design, identification of bottlenecks and sources of performance degradation in a network. Such an experience is invaluable to students

in preparing them for real-life network development projects. In addition, Clicknet has been implemented in the AITLAB to further enhance the students' learning in network diagramming and auditing. It allows easy but sophisticated documentation of computer networks. This is necessary to maintain and manage complex networks. By learning to use such software, students learn not only network analysis and design skills but also the issues involved in managing data communication networks. Alternatively, one can use MS-Visio for the same purpose.

A new course that was offered with the use of the laboratory is Electronic Commerce (EC). The AITLAB and especially the server provided the flexibility needed to offer such a class. Electronic Commerce and Electronic Business are concepts that are rapidly changing the way business and other organizations try to carry out their operations. Because we have the infrastructure of the server, the students have the ability to learn issues involved in setting up and using an EC server and planning the information systems needed to implement an E-business strategy. Without the AITLAB it would not have been possible to teach such a course in a practical manner.

The AITLAB has also helped in the development of another new course on Software Development, which was offered for the first time in the spring semester of the 2000-2001 academic year. The course introduces the students to basic concepts in software development, including data structures and algorithms, program design and control structures, program testing and validation, and systems design and implementation. Applications of these concepts in procedural and object-oriented programming languages are discussed using the Java Development Kit (JDK). In addition, software engineering principles and concepts on team-approach, management of projects, and software development tools and environments are being covered. Students, working in teams, are expected to apply these ideas in the development of real-life software projects during the semester.

The primary way in which the AITLAB enhances the pedagogical process is by significantly increasing the team-skills development and hands-on experience for students

concentrating in CIS. This has been achieved with the Structured Open Teams approach implemented in the elective classes. The Laboratory substantially has enhanced the quality of instruction students receive in the elective courses, through both in-class and hands-on demonstration. Faculty members are now able to demonstrate concepts and principles during the course of the lectures as well as demonstrate use of specialized software. We estimate that the use of in-class demonstrations have increased at least four-fold as a direct consequence of the laboratory facilities. The new Laboratory therefore, has provided students with ample opportunities to acquire and develop the requisite knowledge and skills in teamwork and the latest information technology resources both of which are essential in the business world. We graduated in Spring 1998 the first batch of students — 10 to 12, who had direct use of the AITLAB during the Fall 1997 and Spring 1998 semesters. Since then the numbers have increased dramatically, in the 2000-2001 academic year, there are total of 50 students, enrolled in the three advanced electives, using the facility.

In addition, we plan to use the Laboratory for instructional development in the CIS program. We also anticipate expanding the Laboratory resources to encompass development and use of multimedia technology to support classroom instruction in other courses in the college.

## 6. LESSONS LEARNED

The experience gained in implementing the AITLAB is indeed transferable to other colleagues in similar academic settings such as Loyola Marymount University (LMU). Those attempting a similar project can learn from the difficulties we experienced during the implementation and operations phases of this project. For instance, the fifteen student workstations have already proved inadequate for some classes causing students to be paired during class time for some courses. This has also required multiple laboratory sessions in courses where the hands-on component is critical to student learning. The extra burden of multiple laboratory sessions on both students and faculty was not anticipated. We also underestimated the resources required to have the AITLAB opened for extended hours for individual students' use, in

particular, over weekends. In addition, the lack of technical support and funds to pay for consulting help (a constraint of the NSF award) during some of the critical phases of the implementation contributed to some delays in the project. Finally, finding an acceptable physical facility was a major factor in delaying the progress of the AITLAB for the better part of a year while the University was undertaking several classroom renovation projects. Still, the completion of the AITLAB has made the whole experience worthwhile for all involved in the project, especially the students in the Computer Information Systems program at LMU.

The difficulties experienced in the initial phase of the project, in particular, with respect to getting the space for the AITLAB and preparing the room can be avoided. We suggest this issue be tackled ahead of time by getting the appropriate administration approval prior to the proposal submission for the facility that would be used if the grant proposal is successful. Our failure to anticipate such a factor cost us valuable time before we finally got permission to use the current facility. Another suggestion is to plan, prior to submitting the proposal, for the technical support, operating support, and maintenance needs of the laboratory. We also strongly suggest getting an institutional commitment for these items prior to submission of a grant proposal. A meeting with the head of the campus information technology or systems services department is also highly recommended so that proper support can be obtained. Nevertheless, we are convinced that the experience of creating the AITLAB is definitely replicable at other institutions of similar size as LMU and is well worth the effort.

## 7. LOOKING FORWARD

The AITLAB is a much-needed technical facility that has helped in attracting and retaining more capable students in the CIS area of the College. Without the AITLAB our students would still be grossly unaware of various widely used commercial software thus making their education somewhat incomplete and deficient in many respects. With the implementation of the AITLAB, we are able to provide our students with the requisite education in this rapidly changing field and adequately prepare them for more

productive professional careers when they graduate. We have already realized significant benefits of the AITLAB and expect to make further changes soon to keep up with emergent technological trends due to rapid advances in IT. For example, the Systems Analysis and Design course has been replaced by an Object Analysis and Design course using UML in the Fall 2001 semester.

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## Appendix A: The list of hardware and software requested in the grant proposal

### ILI-IP DETAILED BUDGET (EQUIPMENT LIST) FORMAT (Page 1)

Item (Descriptive name, probable brand and model)	How Many	Unit Price (List)	Unit Price (Dis- counted)	Total Cost (Dis- counted)	Totals
<b>1. Computing Equipment</b>					
<b>Hardware:</b>					
<i>Student Workstations:</i>					
HP Vectra XU P5/133 16 Mb RAM , 1 Gb HD, 15" SVGA monitor (including video card), 4x CD-ROM, Network ready and packaged with MS-DOS 6.22, Windows 3.1/95, MS-Office Professional 4.3/95	15	\$4,283	\$3,640	\$54,600	
<i>Instructor/Demonstration Workstation:</i>					
HP Vectra XU P5/133 32 Mb RAM , 1 Gb HD, 17" SVGA monitor (including video card), 4x CD-ROM, Network ready and packaged with MS-DOS 6.22, Windows 3.1/95, MS-Office Professional 4.3/95	3	5,278	4,486	13,458	
<i>Network Server:</i>					
HP Netserver - DX4-100 64 Mb RAM, 3 Gb HD, 15" SVGA monitor	1	12,366	10,511	10,511	
LCD Data Display: Boxlight Colorshow 2000+	1	4,499	4,499	4,499	
HP 4M+ Laser Printer + Network Card	1	2,115	2,115	2,115	
HP 5si Laser Printer	1	2,825	2,825	2,825	
Network Cabling		1,000	1,000	1,000	
<b>Subtotal (Hardware)</b>				<b>\$89,008</b>	<b>\$89,008</b>

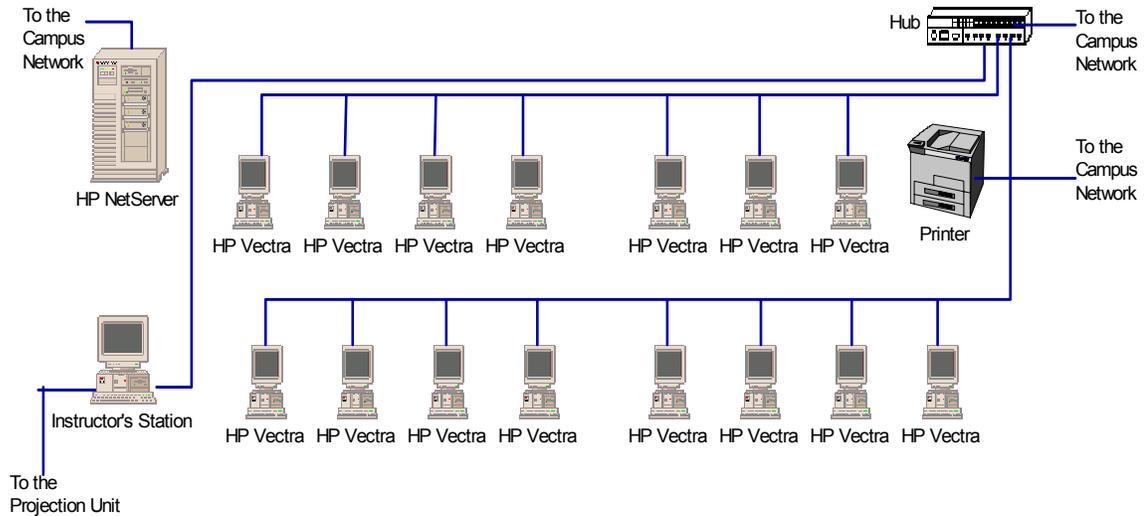
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## Appendix A (Cont'd)

### ILI-IP DETAILED BUDGET (EQUIPMENT LIST) FORMAT (Page 2)

Item (Descriptive name, probable brand and model)	How Many	Unit Price (List)	Unit Price (Dis- counted)	Total Cost (Dis- counted)	Totals
(..Continued from previous page)					<b>\$89,008</b>
<b>Software:</b>					
Windows NT 3.1 Server	1	\$388	\$388	\$388	
1 - 20 NT Clients	20	8	8	160	
Lotus Notes:					
NT Server Version 3.3	1	407	175	175	
NT Client Version 3.2	20	407	72	1436	
Lotus SmartSuite 4.0/96	20	249	149	2,980	
Level 5 - Object					
1 - 16 user license	1	1,500	1,500	1,500	
Visible Analysts Workbench					
Server + 3 nodes	1	9,320	1,179	1,179	
Additional nodes	15	1,795	259	3885	
<b>Subtotal (Software)</b>				<b>\$11,703</b>	<b>\$11,703</b>
<b>Total Equipment Costs</b>					<b><u>\$100,711</u></b>
<b>2. Shipping Costs:</b>					
HP Vectra XU P5/133	18	100	100	1,800	
HP Netserver - DX4-100	1	100	100	100	
HP 4+ Laser Printer	1	100	100	100	
HP 4si Laser Printer	1	100	100	100	
Boxlight Colorshow 2000+	1	25	25	25	
Windows NT Server + Client	1	25	25	25	
LOTUS-NOTES Server + Client	1	25	25	25	
LOTUS-SmartSuite Server + Client	1	25	25	25	
Visible Analysts Workbench	1	25	25	25	
Level 5 - Object 16 user license	1	25	25	25	
<b>Subtotal (Shipping)</b>				<b>\$2,250</b>	<b>\$2,250</b>
<b>3. Required Taxes</b>					<b>\$8,598</b>
(CA Sales Tax 8.25%)					
<b>Total Project Cost</b>					<b><u>\$111,559</u></b>
Non-NSF contribution (including any overmatch):					<b>\$55,780</b>
<b>NSF Request</b>					<b>\$55,779</b>

### Appendix B. The schematic of the AITLAB



Note that the connection to the printer and the server is made through the campus network. Those units are directly plugged into the wall jack connected to the campus telecommunication equipment.

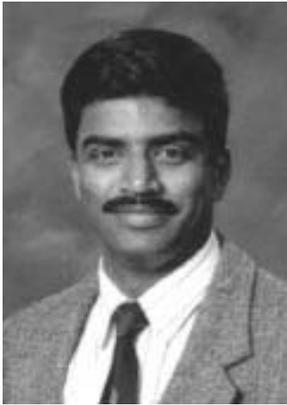
## Appendix C: AITLab Policy and Procedure Items

1. Lab Assistant
  - Job Description
  - Estimate hours needed
  - Request work study position
2. Create Annual Budget
  - Workstudy hours
  - Supplies
  - Projector Lamp replacements
  - Toner Cartridge
  - Allowance for repairs/replacements
  - Software upgrades/replacements
  - New Software requirements
  - Allowance for theft/damage
3. Policies and Procedures
  - Hours of Operation
  - Types of use
    - Undergraduate Classes
    - MBA Classes
    - International MBA Classes
    - Executive Education Classes
    - Other CBA Workshops and Classes
    - Other non-CBA [LMU] Workshops and Classes
  - Charges for Use [How do we recoup operating costs?]
  - Data Storage Policies
    - Space Allocation for Students in Classes
    - Space Allocation for IS majors not in Classes
    - Space Allocation for non-IS majors
    - Space Allocation for CBA faculty
    - Space Allocation for non-CBA faculty
  - Printing Policy
    - Printing for Classes
    - Printing for IS majors not in Classes
    - Printing for non-IS majors
  - Games and Offensive Material
    - Restrictions of Lab use
    - Sanctions for misuse of Lab facilities
  - Software Purchase and Maintenance Policy
    - Software for regular CBA classes (Undergraduate, MBA)
    - Software for International MBA Classes
    - Software for Executive Education classes/workshops
    - Other instructional software
    - Installing software on server
    - Installing software on Instructor client machine
    - Installing software on Student client machines

**Table 1. Course Sequence in the Computer Information Systems Program**

Freshman Year	Sophomore Year	Junior Year Fall	Junior Year Spring - Senior Year Spring
Non-credit <u>Workshops:</u>  Spreadsheets  Databases  Presentation Graphics	<u>ISQM 275:</u>  Business Problem Solving with In- formation Technol- ogy	<u>ISQM 370 :</u>  Introduction to Management Information Sys- tems	<u>ISQM 471:</u> Database Management Systems <u>ISQM 472:</u> Systems Analysis and Design <u>ISQM 473:</u> Data Communications and Networks <u>ISQM 474:</u> Management Support Systems  <u>ISQM 4XX:</u> Software Development

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