Student Internship in Information Systems: Creating Opportunities and Solutions

ABSTRACT: A common problem in academics is the effective use of technology to support faculty use of information technology both in and out of the classroom. Administrators have tried four strategies to support technology: rely on a computer user services department, hire a technology specialist in a staff position, require one or more faculty to be responsible for the technology, or use students in a combined learning/service role. This paper describes our use of Information System students as interns. We discuss how our internship program has both solved technology problems for faculty and staff and created opportunities for students. We describe the implementation and management of the student internship program. We conclude the paper with a description of a typical project, the installation of a network throughout the college.

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INTRODUCTION

Many university administrators face the same dilemma—how to provide quality education to students in an environment of shrinking resources without increasing the workload of often overtaxed faculty and staff. A common method to resolve this quandary is the use of information technology to extend the abilities and efforts of the faculty. Faculty use technology to support teaching (e.g., grade books, test generators), communication within and between campuses (e.g., electronic mail, distance education), and research activities (e.g., library data base searches, data analysis).

While somewhat successful, the technological solution has become part of the problem. Our use of technology has become dependence. We rely on it to accomplish many of our day-to-day tasks. Unfortunately, technology is not always easy to learn or use: it must be evaluated and installed, and it requires maintenance. So, the resourcesaving solution can easily become a resource-consuming endeavor.

Administrators typically use strategies based on one or more of four approaches to bring technology to academia: (1) rely on the computer user services department, (2) hire a technology specialist in a staff position, (3) require one or more faculty to be responsible for the technology, or (4) use students in a combined learning/service role. In our institution, we have successfully implemented a program based on the fourth alternative. The remainder of this paper describes our student internship program. The next sections continue the discussion of the problem as it affects both the college and the students. Next, we introduce a solution in the form of an internship program. Then we describe the implementation and management of the student internship program. We conclude the paper with a description of a typical project, the installation of a network throughout the college.

THE PROBLEM

As Seen by the College

Like most addictions, our need for technology increases—applications expand, new applications arise, and technology continually changes. Regardless of the impetus, making technological solutions available to potential users generally follows a five-step process. The first step is awareness of a problem or opportunity. Examples are requests from users, a directive from the computer services department, and so on. Then, someone must evaluate the alternatives' effectiveness in solving the problem and their compatibility with the existing technology base. To be effective, the technology must not only solve the problem, but do so in a manner consistent with hardware and software already in place. An example is software that works on a mainframe when users only have access to personal computers. The next step is to install the technology. This includes loading software as well as the actual installation of boards, cables, or complete systems. Once a new product is installed, users must be trained to use it. Training can be as simple as a quick demonstration or as complex as written "how to" manuals. The final, and frequently overlooked, step is maintenance. Hardware and software inevitably change or fail, and someone must maintain them.

The first place to look for help with technology is the university's computer user services department which has the staff and the expertise to resolve most problems. However, like most university departments, Computer Services is already fully employed. While they may have enough staff to handle the more important problems, many smaller problems are left for the colleges to resolve. Furthermore, Computer Service's focus is typically on the more global issues facing the university.

Therefore, they may not have expertise in specific areas of interest to faculties. For example, they may be able to provide a user with access to a statistical analysis package but not assistance in the actual use of the package.

The second option is to hire someone trained in the area as a full-time member of the college staff. This alternative is a luxury in today's world of shrinking budgets and an alternative many cannot afford. Even when moneys are available, it is difficult to hire and retain a person with sufficient breadth of knowledge to work with the variety of technology used in a university environment.

Another option is to place the burden on faculty. This defeats the original purpose of using technology which was to extend, not impede, the abilities of the faculty to educate students. Those faculty members with the needed skills to resolve technology problems find some of them interesting but also very time consuming. Few faculty members wish to serve as systems analysts for the college. It is one of those collateral duties that yields little reward and consumes large quantities of time, time better used for other activities.

Another problem in using faculty as technology experts is that of retaining "corporate knowledge" in the technical areas. As faculty members change institutions, they take with them the knowledge base accumulated at the college. If no one else on the faculty or staff shares those skills, the skills are lost. Such a loss forces a relearning of those skills at the high cost of entry-level learning.

The final option, the option we chose for our college, is to package these tasks as a learning experience for Information Systems (IS) students. One of the foundations of any IS curriculum is to prepare students to become systems analysts. The development of good systems analysts requires hands-on experience. To the extent that experience can be provided in the university environment, the quality of education received by the student is enhanced.

As Seen by the Student

One frequently heard complaint about business schools is that graduates are not ready for the job market. The concern is that schools spend too much time in theory and not enough time in practice. Many schools now look for opportunities for students to test their existing knowledge and learn new skills in a professional environment.

The IS curriculum trains students in the principles and practices of the IS profession. Much class work, however, is conceptual in nature and contains principles often stated in generalities. Without concrete examples or the application of these principles, the student would be left without a real understanding of the principle and what the various applications might be.

Application of principles contributes to retention as well as understanding. Imagine learning how to drive a car by reading a text! While basic knowledge might be acquired, missing the experience denies the student the opportunity to master the skills. Without actual application, retention of the material is also poor, extending slightly beyond the classroom exit on the day of the final exam. Teachers are discouraged to find in subsequent classes that prerequisite material must be dredged up and rehashed to lay the proper foundation for new material. One needs only imagine how that feeling is amplified for a new employer.

Case studies and class projects often substitute for real applications. Case studies are not always useful tools for illustrating concepts presented in lectures. Few cases are sufficiently comprehensive to illustrate all of the necessary principles; and short cases typically are incomplete and require several assumptions, some critical to the formulation of the design. So, while such cases provide some benefit, they lack breadth in application of the learned skills.

Projects are more useful, especially with real clients, because the investigative process can be directly experienced. However, large classes and project teams deny teachers enough time to work with students individually. Also, a student on a project team generally experiences only a subset of the total project activities. A common student complaint at the end of the semester is, "I didn't know what was going on." While this failure is the fault of the project leader or the instructor, it is a problem for the student who has missed the experience. The result is that some students can graduate from a four-year institution with minimal actual contact with the problems and processes of systems analysis.

Another effect of lack of actual experience for many students is low self-confidence. Students occasionally express some fear and reservation about going into the job market because they "can't do anything." What athlete could possibly attend a tryout having only read about football? A major purpose of a college education is to learn good work habits and problem-solving skills. Additionally, students need enough direct contact with the activities common to their major field to know that they have chosen the right profession. They should, at the least, feel mildly confident that they can do the job.

Employers understand the nature and limitations of education, and most expect some initial training period before new graduates become productive. Many employers require a probationary period during which time the skill base of new graduates is evaluated. In contrast, students with actual experience are given preferential treatment and often receive higher starting salaries.

THE SOLUTION

An IS Internship Committee was formed to select students for the internship as well as to select the problems to be solved. The committee consists of the dean of the college as chairman and two of the IS faculty as members, one of whom serves as the coordinator of the program and directly supervises the activities of the interns. As such, the coordinator becomes more of a project leader than a systems analyst.

Organizationally, the committee stands between the faculty (the clients) and the students who work for them. Insulating the students protects them from making decisions regarding the priority of projects and direction of work. This structure precludes conflicts which may prejudice student relationships with future teachers. The presence of the dean also helps protect the interns and the committee members and demonstrates support for the interns and the program.

Selection for an internship is based on classroom ability and technical skills which are likely to be needed for the various projects. Both juniors and seniors are selected. Juniors initially serve more as apprentices, since they typically have not taken many technical courses. We have found that seniors have enough training to be productive analysts. Ideally, senior/junior pairs are assigned to specific projects while the juniors gain competence and confidence throughout the academic year. They are encouraged to take on increased responsibility commensurate with their increased abilities. By year end the graduating seniors will have conveyed their corporate knowledge base.

Project Selection

The internship committee screens

prospective projects. Each project is evaluated on three criteria: the scope of the project, the criticality of the solution, and availability of the needed student skills. The scope of the project refers to both the size and complexity of the problem and potential solutions. Since our work force is made up of students, we are limited by the number of hours they are available to work and termination points such as the end of a semester. Therefore, we limit projects to those which can either be completed in one semester or can be divided into semester length parts.

The second selection criterion concerns the criticality of the solution. We reject projects for which guaranteed solutions must be found immediately. Interns are students first (very good students, but students none-the-less) and employees second. The priority is their education. We ensure that they are not distracted from their studies by urgent user requests. Similarly, an internship is a training ground, and sometimes mistakes are made. We do not accept projects so critical to a user that mistakes are not tolerated.

The final selection criterion is a matching of user needs and student skills. We discourage "repair shop" projects which provide little educational experience for the interns. We prefer projects which build upon some skills the interns already have and offer them the opportunity to learn new things. The program most benefits the students when they are required to "stretch themselves" a bit. We do not wish to break them, but we do want them to learn.

Student Workload

A major concern is workloads for full-time student-interns. The initial program allowed seniors to work 20 hours/week and juniors 10 hours/week. Rarely did they actually have that much time to devote to the internship, since priority is given to normal school work. The current maximum allocation for seniors is 10 hours/week and for juniors 8 hours/week. Actual workloads are closer to 7 hours/week, but students are able to adjust when projects demand more.

Our budget is based on 36 hours per week. There is, however, great variability in the actual hours reported each week. Students report their actual hours worked for each two week pay-period. Students sometimes forget to report for one period and accumulate hours over multiple periods. Much of the variance is due to the nature of the projects: some projects have deadlines, some are more interesting than others, some turn out to be more complex than the students first estimated, and so on. A third reason for the variability is the natural interference of more important school activities. These include midterms, finals, and recruiting interviews which all tend to occur at given times during the semester. The actual activity per week ranges from 0 to 22 hours. We have found that, with a little guidance, students are pretty good at setting priorities and balancing their schedules.

Costs

An internship program incurs three types of expenses: intern wages, director wages, and equipment costs. We currently budget for four interns with rates of $6.67 per hour for senior interns and $5.50 for juniors and a total budget not to exceed $7,000 per year. This rate is competitive as it exceeds that paid most part-time student employees at our university. Average annual wage expense for the past five years is only $5,573.94. Actual costs are much less than budgeted because students are not able to sustain the maximum level of activity over the whole year. The program as envisioned may eventually include a graduate who will work as the college systems analyst replacing some or all of the director's tasks. Funding, however, has not been sufficient to support this position.

Director wages and equipment costs are more difficult to identify. The director is given a one class reduction in teaching load, but this task is packaged to include other responsibilities. We have sufficient capacity on the university mainframe and access to PC's to avoid extra hardware costs. We did purchase one additional PC which is used by the interns as a development machine. We have experienced a slight increase in costs for mainframe access, supplies, manuals, and copies. These costs are indicative of the increase in the number of projects solved, not that they were solved by student interns.

Benefits

A student intern program has obvious value to the college—we get highly motivated, well trained analysts at greatly reduced costs. Thus, we get more problems solved more rapidly. Teachers can integrate new techniques into classroom presentations. Researchers have better access to databases and analytical tools. The faculty, in general, has more time to devote to appropriate research and teaching activities. While these are certainly important considerations, the real value of such a program is the educational opportunities it affords participating students.

The students benefit in several ways. Foremost, they get real-job experience in systems analysis. They take projects from initial investigation through implementation and evaluation. They experience a wide range of problems and interact with users from widely diverse backgrounds.

They also benefit in the job search process. They have stronger resumes because they can offer employers meaningful experience. They also get better written recommendations from faculty members who have observed first-hand their performance as employees. Finally, those having financial difficulties find a source of funding their education's at a reasonable rate in a meaningful, work-related area—beats selling hamburgers!

Even students not participating in the program benefit from it. The internship program brings the IS majors greater visibility both on and off campus. We are attracting more recruiters as firms become familiar with the goals and training offered at the college. We also expect increases in recruiter visits and availability of internship opportunities to bring the IS area greater visibility on campus, attracting better students to the program.

A TYPICAL INTERNSHIP PROJECT

A good example of how internships work in our college is a project from last year. For several years the university has provided mainframe access to all faculty and staff and in some student labs. Communication with other users on campus or at other universities was done through BITNET. We also had some basic access to the university's library facility. Computer Services is creating a campus-wide backbone network, tying together several mid-size machines and two mainframes with both the BITNET and Internet networks. The network is open to anyone who wants access for a $500 one time connect charge. The same charge is assessed to single terminal and network attachments (to cover the port cost on a router.)

We became aware of the problem through requests by individual faculty for connection to "the backbone." Clearly, individual connections were cost prohibitive, but a single connection for a college network seemed like a practical solution. The dean of the college presented the problem to the IS internship committee for evaluation. The IS internship committee evaluated the proposal. They decided that, while the project was a great learning opportunity, it was simply too big and the solution too critical for student interns. Therefore, the project was subdivided into three parts—design, installation, and maintenance. The Computer Services group agreed to accept responsibility for the final phase, since it is ongoing and requires quick responses to user problems.

The first task assigned to the interns was to evaluate user needs and evaluate potential solutions. The difficulty in evaluating the various options was ensuring compatibility. In order for Computer Services to inherit the system, all hardware and software had to meet their standards. An overall design was prepared to connect 25 users in a network based on transmission control protocol/internet protocol (TCP/IP). Network interface cards for PC's were specified within the standards of Computer Services. In order to accommodate the physical length of the network and to take advantage of existing technology, the interns designed a four segment network: an existing local area network (Ethernet bus), a star topology using twisted pair, and two 500 foot Ethernet bus segments (originally a single segment that had to be split with a repeater because of length). After the design was approved, interface cards, cable, connectors, a hub, and a repeater were ordered.

The next task for the interns was to physically install the system: they ran cable, attached connectors, and installed cards. One pair of interns installed software, the other installed hardware. When the network was completed and connected to the backbone, the interns began testing. Once the initial bugs were resolved, users were brought on line with some rudimentary training. Finally, documentation was written and the system turned over to computer services for more thorough training and ongoing maintenance.

CONCLUSIONS

The only measures we have of the success of the IS internship program is anecdotal evidence from past participants and our own observations. Both faculty and student participants agree that this program has added quality to our undergraduate IS education. It has also provided an economical means for a college that is basically an undergraduate institution to fund systems analysis projects and provide technical assistance to the faculty. Students gain valuable "hands on" experience that is usually rewarded in the job market. Everyone involved with the program has benefited from it.

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