Syracuse University has embarked on a project to move all of its administrative computing applications from a mainframe to a client/server environment. Many of the challenges have come not from the technological transition, but from the changes required in the way both the Information Systems organization and its clients work. This article examines and evaluates the cultural initiatives that became necessary in the technology transition, such as restructuring the IS organization, retraining existing technical staff, training clients, and finding new ways to do business with IS clients.

Syracuse University is a private research institution located in central New York state. It has twelve schools and colleges with an enrollment of around 15,000 graduate and undergraduate students. In March 1993, the vice president for research and computing published a document that was a vision of computing at the University in the next five years. The following is an excerpt from that document:

Information technology will have an increasing influence on University life in the future. Communication, even more than computation, will be the essence of the revolution. The volume of available information will continue to increase at a staggering rate (currently doubling every four years), with effects that are both daunting and tantalizing. The challenge will be to access selectively the information we need and to use that information to develop knowledge, understanding, wisdom. A key objective will be to empower each member of our community with the appropriate technology and facilitated access to all of the information to which he/she is reasonably entitled.1

The effect of this document on our computing organization and our clients was dramatic. It led us to look for organization models, training methods, and support models that would move our staff and our clients into the future.

The Computing and Media Services organization has a staff of around 130 in four units: Information Systems, Client Services, Network Systems, and Faculty Computing and Media Services. Information Systems (IS) is a mainframe

1 Benjamin R. Ware, 93 Forward! Directions for Computing at Syracuse University, March 1993, p. 1.
shop with a programming and technical staff of thirty-five FTEs to support administrative applications. Our client base is approximately 2,600; we have a portfolio of sixty application systems and a well-satisfied customer base, and have done a good job at providing applications needed to support the administrative operations of the University. We have not been equally successful in distributing information to our schools and colleges for management and decision-making.

A client/server project team was formed to develop a detailed plan to meet the objectives stated in the computing plan:

- To migrate from primarily mainframe platforms to a primarily client/server, distributed environment.
- To make information about students, courses, and financial accounts easily accessible to stakeholders.
- To provide our users with an easy to access reporting environment with appropriate software.

One of the assumptions of our plan was that we would retrain existing staff rather than outsource the majority of the work. We have a very stable, experienced staff who know and understand our business. As we evaluated new technologies, we realized that perhaps the most difficult transition would be changing the way the programming staff and our clients work. This change would be effected at the same time the University was undergoing restructuring and budget cuts. We looked first at our own organization and staff.

### Reorganizing

Our own structure hindered the way we needed to work. The programming staff reported to three application managers who were each responsible for a specific suite of applications and clients. Resources were managed within each group with occasional transfers from one group to another. An advantage of this model was that our clients had a stable point of contact with programmers who were very familiar with their systems. Requests for system enhancements went to the appropriate application manager, who set schedules and priorities using the resources in their own group. Clearly this kind of model would not serve us well in our transition. We felt we needed to do three things:

- Establish an internal organizational structure that would be flexible and responsive to ever-changing resource needs for both the mainframe and client/server environments.
- Ensure that our legacy systems were maintained, but enhanced only when absolutely necessary.
- Change the way our clients communicated with our office to allow our staff time to retrain and move ahead with new technologies.

First, we changed the organization of the office. For maximum flexibility, all incoming work and programming resource are now managed from one point. The three groups of application programmers were consolidated to report to two application managers. Although each manager has a group of clients for whom he or she is the primary contact and coordinator, they jointly oversee project schedules and manage programming resources. Programmers refer calls from clients to one of these application managers. This moved our clients' point of contact to the managers, creating fewer interruptions for the programming staff and allowing the managers to be the overall schedulers. The change provides our clients with their first visible effect of the technology transition. For our staff, this model emphasizes teams that are organized for the life of a project.
We have three technical support groups in Computing and Media Services. Last year, we evaluated combining these groups. Although it makes sense that they should be combined at some point in the future, there is not yet enough commonality to make the change feasible.

Relationships with clients
Having settled our internal organization, we studied how we would interact with our clients during the transition. The administrative vice presidents were notified that the majority of our programming resources would be directed to client/server projects. With the exception of some systems that will not be replaced until after 1997, mainframe applications would be enhanced only to meet changing legal requirements.

We waited for the roof to cave in. At first, it didn't! Reality set in two months later, and we did receive some letters of protest. Clients who were displeased with our decisions have been encouraged to talk to our vice president. He plays a vital role in facilitating the politics and funding for this project. In addition, our project managers have been diplomatic and sympathetic but firm with our clients. We made a smooth organizational transition with the aid of their facilitation, listening, and negotiating skills. The change in the distribution of work effort is reflected in Figure 1.

A program was developed to enable University offices to have some computing expertise in their departments by subsidizing the hiring of staff with computing experience. We call these "distributed" positions: the department funds two-thirds of the person's salary and our computing organization funds one-third. Some smaller offices, where budget and workload would not necessarily support a full-time computing person, are sharing a "distributed" person. The distributed staff members work in the client office, but are also part of an informal organization coordinated by Computing & Media Services. They have monthly meetings and are included in all of our departmental mailings and events. The distributed staff coordinator sits in on annual performance reviews. In addition, Computing & Media Services will pay for half their technical training expenses.

The first wave of distributed positions was in college offices; we are now beginning to see a move into administrative offices. These people are extremely effective because they are in the client offices every day, serving as liaisons between their "home" department and Computing & Media Services. Everyone gains with this program. Our client offices have a technology person available to them all the time who can answer many of the questions that would come to our department. This program has been very popular, as indicated by Figure 2.

Issues still to be addressed
Within our organization there are still major issues we need to address.
• Changing job descriptions. Although we have changed the organization of our office and changed the way we work, our job descriptions and titles remain the same as they were in the 1970s. We realize they do not fit the way we work today and how we need to work in the future. We don't yet know exactly what our office will look like in four years, but we believe we need to evolve to another model and have the flexibility to move people where they are most effective. We continually look at organizational models and job titles at other companies and institutions.
• Employee recognition. This has been an issue for some time; now it has become a larger one. The University has no employee recognition program and neither does our department. At a time when we are asking more of people and are unable to reward them monetarily, it becomes critical to have ways to let people know they are doing a good job.
• Performance reviews. In the past, performance reviews have been done by the managers of each area. With our current work model, we...
need to look at a different way of approaching reviews, so that work done in the various project teams is taken into account and recognized.

We're making our first attempts at defining our environment at the end of this transition and looking at how our organization will need to change. The methodology we're using involves defining our goal environment, then defining milestones that will lead us to that goal. For each milestone, we are looking at the stakeholders, what technology and organizational changes will be required, and what risks are involved.

Rethinking application development/acquisition

As a result of our experience with client/server pilot projects, we realized we needed to change the way we developed systems. Members of the client/server project team made several recommendations for application development.

- **Use object-oriented analysis techniques.** All of the application development tools that we evaluated use some object-oriented principles. While we did not expect that we would necessarily use true object orientation for our first endeavors, it appeared that there were aspects of the methodology we should adopt. The transition would require our staff to understand these techniques; the application of the techniques would require changes in the way we approach systems development.

- **Use a three-tiered architecture for building our applications.** One of the productivity gains we wanted was from reusable code. From reading, and conversations with consultants and others experienced in client/server architecture, the three-tiered approach to programming makes the most sense. This architecture divides an application program into three parts: presentation, process logic, and database services. This approach allows optimal code reuse and insulates the business rules and logic from the desktop presentation.

- **Define specialists for some areas.** Given the long list of new technologies, we need to designate specialty areas where we train a small number of people to be available as a support resource to project teams. We refer to these people as mentors, to reflect their role as educators and guides.

- **Foster success.** With so many things going on in parallel we need to look for combinations of software, human resource management techniques, and organizational structures to provide the best possible environment for success.

We looked first at the role that mentors would play. We would not be able to train everyone in all of the new technologies; it was too much change in a short period of time. The mentors would be trained and skilled in a particular area. They would join a project team as needed and work with them. We identified mentors for project management, object orientation, human interface design, data modeling, database design, networking, desktop hardware, server hardware, and printing. In most cases, the mentor role is part time, and we have at least two people who are knowledgeable in each area.

Led by the object-orientation mentors, who created a system development methodology outline, the mentor groups worked together to expand the outline into a detailed document. The methodology is packaged as a project notebook, which contains:

- A sample project management chart with each task being a methodology step
- An explanation of each step in the project management chart
- Samples of deliverables
- Guidelines from mentor areas
- Expectations and procedures for each mentor area
- A list of the mentors for each area

The team leader of each new project receives a notebook. Built into the methodology are "check in" points where the project team meets with some or all of the mentors to review models and plans. These meetings ensure that communication is taking place between all of the mentors and the project teams. The methodology provides some structure to projects and gives us a common ground to discuss progress. It is not a finished product.

To encourage feedback on the methodology and project management in general, the application managers convene a weekly meeting of team leaders to talk about issues, problems, and even good things that are going on—a forum to find out what works and what doesn’t. This is a productive group and contributes to the evolution of the methodology. In our experience, the majority of the problems in implementing new applications have to do with the management of the project and not with the technology. In this environment, there are many more pieces to manage. The applications staff has to coordinate the installation of network connections, desktop equipment, and server hookups. We continue to look for ways to improve our skills in this area.

Parallel to the development of applications, we have several teams involved in searches for application packages—student systems, space and facilities management, classroom scheduling, and alumni development. When we were beginning to feel comfortable with the work done in systems development, we found chances were...
good that we would be able to purchase software for our major application systems. We have backed off our plans to delve into three-tiered program architecture, because it is not clear that we will be developing any major applications ourselves. Does this mean that all of our systems development methodology work was in vain? We don’t think so. The principles we have learned helped our reeducation and reorientation process. We are now developing a package-search methodology and find we still need to interact with mentor groups to do technical evaluations of software. We’re still learning ways to work together effectively. We’re learning to be better communicators. The days when we could develop applications in our own cubicles are over. We asked for a lot of client interaction in the past, and now we are asking for even more. Everyone has a stake in the project and in improving the process.

Retraining IS

As far as technologies were concerned, it appeared that there was very little that would remain of our former lives once this transition was complete. The list of new things to learn was daunting: operating systems, networks, CASE software, object orientation, application development tools, end-user tools, networks, databases. In the first six months of the project we brought in a new database manager, a new CASE tool, several query products, two application development tools, new server hardware, and workstations for staff who were still using dumb terminals. We retrained ourselves in a variety of ways, including reading, free seminars, vendor demonstrations, conferences, consultants, professional training, internal workshops, departmental work groups, and other University resources.

While the client/server team was evaluating hardware and software, the rest of the staff spent a minimum of 20 percent of their time reading about client/server or enhancing their desktop computer skills. Our goal is to replace the majority of our applications by the end of 1997, so we looked for ways to come up to speed as soon as possible.

Many of the mentors attended professional training, but we also used conferences, user groups, and reading in the education process. We found a graduate student with experience in client/server technology at one of the Fortune 500 companies and hired him to consult with some of the mentors.

There were some skills needed by a larger audience; we have managed to provide them in a variety of ways. We felt everyone on our staff needed to understand object orientation. Our object-orientation mentors formed a work group of people who were interested in learning about object-oriented analysis—most of the office! Led by the mentors, the group selected a specific methodology, purchased books, and actually worked through the text, lesson by lesson, in weekly meetings. One of the things that made this work was the formation of small teams within the group. Each week one of the teams was responsible for leading the lesson discussion and exercises. This was a very successful model. It started our staff thinking differently, reinforced team concepts, and helped transition staff into the client/server project before there was actual work.

For our applications development tool, we brought in an instructor to our site to provide a week of training. Some months later, when several projects were under way, we hired a consultant for a few hours a week to help refine the way we were using the tool. The programmers also formed an informal group of their own, with weekly meetings to share experiences, tips, and techniques using the new software.

Finally, we worked with the human resources staff development office to provide a special session of facilitation training for people in our office who were interested. These are skills that we feel will be vital to our staff in the future. It is clear that a large part of providing a solid computing environment is bringing together people, processes, software, and hardware. We are already putting these skills to good use.

We have learned that in our new environment we have to try things before we have all the answers. We have to be willing to implement short-term solutions with a vision of the long term. We have to be willing to try new things and look for creative solutions. We have to be willing to redo. These are concepts that are very different from the carefully studied, tried-and-true solutions we have implemented on the mainframe. It is an ongoing process, and we continue to evolve as professionals and as an organization.

Communicating effectively

As our client/server vision began to develop, we felt that one of the most important steps we could take was to let the University community know what we were trying to accomplish, how we planned to make this move, and how our time frame would affect various areas within the University. We developed The Roadshow, a presentation which gave a brief overview of the current mainframe environment, our vision of the client/server environment, the benefits to the University of this move, and a timeline projecting move.

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Client/server computing will change both the need for and the source of the data available for reporting.

Before we began our move to client/server technology, we had been congratulating ourselves on the excellent job we had done providing data access and reporting avenues to our administrative clients. Now, looking at our expanded clientele, two things became clear:

1. There existed a group of over 145 staff members who were using our mainframe reporting processes as a vehicle to obtain information. Many of these individuals had been trained in the use of what are referred to as 4th-generation query tools (in reality about a 3.2 generation!) and had over the past few years built substantial self-generated reporting structures.

2. There was a considerably larger group of faculty and staff who were using many sources to gather information, often re-entering data on their desktop machines to create reports they were unable to generate from the mainframe administrative processes.

In addition, some individuals in each group had invested time and resources creating departmental systems—desktop database systems, usually populated and refreshed from mainframe extract files. Information that was not available on the mainframe was also stored in these databases. “Value added” is the term we use to describe data that are particular to the business or interests of a school, college, or department.

Each client group offered unique challenges, but they had one thing in common: they were faced with moving from their current technology, investing both time and dollars into a new way of retrieving and reporting on data. Prior to 1992, Information Systems had provided quick turnarounds, ad hoc reporting services for a nominal fee. In 1992 we moved to a process that incorporated the use of a query tool with a user-generated request to combine query results and standardized outputs such as reports, labels, or files available for download. This process worked well for our administrative clients who could access and understand the online systems that provided these services. However, few faculty or staff in academic offices needed or wanted access to these systems.

Client/server Day involved staff from all areas of Computing & Media Services and pointed out very clearly that this entire initiative is a team effort. Staff from each area were available throughout the day to provide information on accessing the campus network, dial-in services, training opportunities, and many other aspects of computing. We answered questions and listened to concerns and suggestions. In fact, there was such an overwhelming response to Client/Server Day that we had to do it all over again three months later!

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the need for and the source of the data available for reporting. Clients will be using PCs or Macintosh-based retrieval and reporting tools. Those already familiar with the world of DOS will find themselves moving into the world of Windows and probably to an upgraded, if not entirely new, set of software tools. The benefit to our clients is that these tools provide reporting and database services through a GUI, point-and-click, easy-to-use presentation, making desktop reporting and record keeping a viable alternative for our current and our new clients. The data warehouse will simplify access by presenting the data in categories, or subject areas, such as student information, human resources, or financials. Current detail, historical data, and summary data will be available for each of these areas. Human resources information was our first subject area and has been available since the spring of 1994. Information on currently registered students was made available during the fall of 1994, and admissions, financial aid, student housing, and historical student information will be available during the fall 1995 semester. We are also starting initiatives in our financial areas, with a December 1995 target for general ledger information.

The availability of this information in the warehouse has created a new audience for us—faculty and staff in academic offices. Our direction at Syracuse University is to encourage greater involvement of our schools and colleges in the recruitment, admission, and retention of students, making access to information essential. In selecting desktop query tools, we had to take into consideration the needs of this audience as well as those of our mainframe query audience. The tools had to provide push-button access as well as powerful selection and reporting capabilities. Other important requirements for a tool, based on our installed base of PCs and Macintosh hardware, was that the software run on both platforms and that it be similar enough in presentation and function to allow training and support to be addressed from a single viewpoint. After reviewing a wide range of products, we selected two we feel meet our needs.

We have recently completed "train the trainer" sessions that included Computing & Media Services staff members as well as key individuals from the registrar’s office, human resources, admissions, and financial aid. Our training coordinator is developing courseware at a variety of levels, from “fill in the blanks” to “so you really want to learn SQL!” Because understanding the software is only half of the learning experience and creating reports is only productive when you understand the data, we incorporated “understanding the data” into our training sessions. We have also created an online metadata database—information about data—of what these code values mean, what operational system supports this piece of data, and what are the special considerations related to this information.

Some of our clients are enthralled with technology and want to set up the office of the future immediately; others are overwhelmed by the complexity and costs of the new environment. The cost of standard desktop machines has moderated over the past few years; however, the level of equipment required to handle multiple software products accessing large reporting or operational databases has become an issue. We have changed our recommended level of equipment several times during the past two years and know that we will need to continue to issue new guidelines based on advances in technology. We work with each department or area to develop hardware, software, and training guidelines based on the information needs of individual clients and encourage everyone to start using the technology sooner rather than later. The operative word here is “start.”

Our evaluation may show that an office should start using the data warehouse. The best way to start using the data warehouse is to purchase one or two high-level machines and start learning Windows or the Macintosh environment. The staff members who will be accessing the data warehouse can then start to learn the software products that will allow them to turn data into information. Because we have a timeline for the movement of our major mainframe systems to the client/server environment, we are able to help offices plan for future purchases of equipment, software, and training. If the online computing services they are currently using are not scheduled for migration until 1996, then a workable computing environment can be phased in, giving a department more time to manage the impact of this change upon their resources—staff as well as financial.

**Training and supporting clients**

Very early in our client/server initiative we realized that while re-training our Information Systems staff was a major project, re-training our client community would be a huge project. It would involve educating large numbers of individuals about a new computing environment, new software, and the data itself. A decision was made to appoint a full-time training coordinator. We were fortunate to have an IS staff member with a strong background in analysis and design who also had experience preparing clients for...
new system implementation. She was prepared to step up to the challenge of addressing training from a University-wide perspective, encompassing staff, faculty, and students.

By combining our network of volunteer staff with professional consulting and training organizations, we have put in place a wide range of training opportunities. We currently have two training facilities at different campus locations. The centers give our clients the opportunity to receive training in a classroom environment, away from phones and everyday interruptions. Where training in the mainframe environment consisted of “how to use the student records system,” our sessions now cover a variety of topics such as Microsoft Word, Using the Internet, and Windows. We also provide training on the tools used to access the data warehouse: Brio Query from Brio Technologies, Inc., and VISION:Data from Sterling Software. Some courses are directed toward faculty and students, while others are designed to address the needs of the administrative or academic department staff. We believe in “just in time” training so the individual can begin putting new skills to use immediately.

Other initiatives are also helping our clients deal with change.

• **Network subscription service.** Areas that have hired a distributed staff member are usually supporting a LAN. Since many University departments do not want to absorb the financial or personnel resources required to maintain a network, Syracuse University has developed a model to make local area network technology available to these departments. Services offered through this model include file sharing, backup services, access to supported software products, printing services, and Internet access. A department can subscribe to one or more of the available services, and the monthly fee is determined by the level of subscription. This model supports the Macintosh and DOS/Windows environments and will be one of the vehicles used for deployment of client/server applications, including access to the data warehouse.

• **Help-desk software.** We have purchased and are installing help desk software, Apriori from Answer Systems. Our help line handles a wide variety of inquiries dealing with all aspects of computing services at the University, and we have seen increased demand as more applications become available in the client/server environment. While this new environment often raises more questions than it answers, we know that problems such as getting your password reset, accessing the server, or getting help with a software error message will probably be repeat inquiries. We know that we will be able to develop standard responses and resolutions for many of these problems. This type of software will help us manage the administrative overhead associated with providing support to our clients.

• **Office technology support group.** We have formed a group to provide both day-to-day support and long-range planning to our user community. Administrative and academic clients can call a single phone number, inquire about network or hardware problems, request an evaluation of their office needs, or find out when their network wiring request is scheduled. Some of the support problems this group is attempting to address require an on-site visit, not always an easy task, since some units within the University, including Information Systems, are located a mile or more away from the main campus. So while the core of the office technology organization is small, they operate as a virtual organization. They can bring together skilled staff from other units to address a request, or they can call on a staff member in a remote location to make that all-important personal contact with a client who needs support and assistance.

**Conclusion**

We know we do not have all the answers. We think we have put into place a framework that will help us identify the questions and develop solutions. We have come to understand that as we plan for the future we can no longer apply the words long-term to our computing solutions, that our plans must remain flexible.