University of California, San Diego: Increasing Operational Efficiencies Through Business Process Redesign and Analytics

Judith A. Pirani, ECAR Fellow
Bob Albrecht, ECAR Fellow

ECAR Case Study 10, 2005
University of California, San Diego: Increasing Operational Efficiencies Through Business Process Redesign and Analytics
EDUCAUSE is a nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology.

The mission of the EDUCAUSE Center for Applied Research is to foster better decision making by conducting and disseminating research and analysis about the role and implications of information technology in higher education. ECAR will systematically address many of the challenges brought more sharply into focus by information technologies.

Copyright 2005 EDUCAUSE. All rights reserved. This ECAR case study is proprietary and intended for use only by subscribers and those who have purchased this study. Reproduction, or distribution of ECAR case studies to those not formally affiliated with the subscribing organization, is strictly prohibited unless prior written permission is granted by EDUCAUSE. Requests for permission to reprint or distribute should be sent to ecar@educause.edu.
Preface

The EDUCAUSE Center for Applied Research (ECAR) produces research to promote effective decisions regarding the selection, development, deployment, management, socialization, and use of information technologies in higher education. ECAR research includes
◆ research bulletins—short summary analyses of key IT issues;
◆ research studies—in-depth applied research on complex and consequential technologies and practices;
◆ case studies—institution-specific reports designed to exemplify important themes, trends, and experiences in the management of IT investments and activities; and
◆ roadmaps—designed to help senior executives quickly grasp the core of important technology issues.

From its most recent research, ECAR published a study, Academic Analytics: The Uses of Management Information and Technology in Higher Education, by Philip J. Goldstein, to assess the accomplishments of higher education’s investments in technology to extract, report, analyze, and disseminate management information. Over the past few decades, institutions have spent hundreds of millions of dollars to improve information access through enterprise resource planning (ERP) systems, data marts, data warehouses, and other technologies designed to help institutions analyze the information they collect. The study addresses whether institutions are doing more with the data they collect, whether they are investing more resources in tools that enable them to collect and manipulate management information, and whether they’re using the information and analyses to support institutional decision making.

Literature Review

Researchers reviewed current literature on several related topics. Specifically, we looked at studies of business intelligence, competitive intelligence, and the role of information to support decision making. We found that much of the literature pertains to industries other than higher education. However, we were able to extract some experiences and findings that are transferable.

Online Survey

We designed and e-mailed a quantitative survey to 1,473 institutions that belong to
EDUCAUSE. Senior managers at more than 380 institutions completed the survey. Most respondents held the position of CIO or a comparable title indicating that they are their institution's senior IT leader.

Interviews
We supplemented survey data with telephone or in-person interviews with IT and functional unit leaders who are significantly involved in academic analytics. In all, researchers spoke with 25 individuals from 19 institutions and 2 corporations. We selected interview participants who reported important characteristics in their survey responses—specifically, that they
◆ excelled at training staff to use academic analytics;
◆ have successfully deployed academic analytics broadly at their institution;
◆ reported high levels of satisfaction with the outcomes they achieve with academic analytics; or
◆ indicated that they were advanced users of academic analytics in multiple functional areas.

Interviews enabled us to deepen our understanding of the factors driving institutions to invest in academic analytics. They provided insight into the factors that drive institutional success and also provided interesting examples of how institutions are using academic analytics.

Case Studies
Researchers conducted two in-depth case studies to complement the core study. We assume that readers of this case study will also read the primary study, which provides a general context for the individual case study findings.

This case study, University of California, San Diego: Increasing Operational Efficiencies Through Business Process Redesign and Analytics, illustrates how UCSD has accomplished a significant business process redesign through its Sponsored Project Excellence Achieved through Redesign (SPEAR) program, a project in research and grants management. The case study describes the project's development and implementation and presents UCSD's efforts with business analytics. Innovative tools including balanced scorecards, dashboards, and other business applications support these initiatives through technology changes and shifts in administrative organization.

A second case study, University of Phoenix: Driving Decisions Through Academic Analytics, examines how developing a data-driven decision-making environment through academic analytics has challenged the University of Phoenix (UOP) throughout its central and campus organizations. It describes some of the issues involved in moving from data collection to the ultimate use of that data. The requirements for new tools must be coupled with cultural and organizational changes to ensure their use. Through overviews and very specific examples, the complex UOP structures and processes provide examples of academic analytics at unit and institutional levels.

Introduction
How does a college or university balance growing student enrollment and sponsored research with diminished government funding? This is a question many research institutions face today. UCSD tackles this issue by leveraging its data warehouse, administrative systems, and Web-based information tools as well as organizational resources in two noteworthy ways:
◆ Business process redesign. Since the late 1990s, UCSD has conducted numerous initiatives to reevaluate and enhance its business processes. Of particular note is UCSD's SPEAR project, which tackles the particularly challenging area of research and grants management. By dividing this
complex process into smaller individual pieces, UCSD has developed an integrated technological solution that streamlines business processes in this area.

- **Business analytics.** UCSD’s Office of Business Affairs realized that greater access to and use of information enables everyone from the vice chancellor to individual staff members to monitor and manage the institution’s business operations more effectively. Consequently, the Administrative Computing and Telecommunications (ACT) area has built an array of supporting tools that includes balanced scorecards, dashboards, and specific business applications.

This case study provides a multifaceted view of UCSD’s initiatives, looking at both the technological issues and the university’s organizational activities. As Karen Andrews, management services officer for physics, notes, “Even if your institution is not ready for the technological solutions, you need to do something. Take one step at a time and you will get there.” By examining both dimensions—technological issues and organizational activities—this case study endeavors to offer guidance that will appeal to a broader audience.

**Background**

The University of California, San Diego, is one of 10 University of California System campuses. Total current campus enrollment is 23,045 students. UCSD’s graduate and professional schools include the Scripps Institution of Oceanography, the School of Medicine, the School of International Relations and Pacific Studies, the School of Pharmacy and Pharmaceutical Sciences, the Jacobs School of Engineering, and the Rady School of Management. The campus also is home to the San Diego Supercomputer Center, the California Institute for Information Technology and Telecommunications, the Center for Research in Computing and the Arts, the Institute on Global Conflict and Cooperation, and the Institute of the Americas.

UCSD’s annual research funding totaled $627 million in 2004. The National Science Foundation ranks UCSD fifth in the nation in federal research and development expenditures. Steve Relyea, vice chancellor, business affairs, also notes that UCSD decided early on that the institution would focus on only a few disciplines to promote academic quality “by recruiting the best people in the world to act as magnets to draw other talented people.” Indeed, UCSD faculty members include eight Nobel Prize winners.

Elazar Harel, assistant vice chancellor, heads up UCSD’s ACT area, which includes

- **Blink,** the campus business portal.
- **MyServices,** a series of Web-based tools allowing users to securely access personal information and conduct university-related business online.
- **The Link family,** an integrated Web-based environment that provides UCSD students, faculty, and staff with access to administrative information including AccessLink, for security and access information for the campus systems; BudgetLink, for budget and staffing records; DataLink, to access the data warehouse for ad hoc reporting needs; EmployeeLink, to perform merit and timekeeping processes and to dynamically generate reports on payroll and employee data; FacilitiesLink, for campus maps, buildings, space inventory, as-built drawings, and floor plans; FinancialLink, to process financial transactions, forecast expenses, and generate reports with extensive drill-downs; JobLink, for UCSD job listings, recruitment information, and procedures for current employees, managers, and applicants; QueryLink, to retrieve data from UCSD’s data warehouse; TritonLink, to process and report on student and course information such as class rosters and student records; and TravelLink, to process,
report on, and learn about travel and entertainment processes.
- The Integrated Financial Information Systems (IFIS), the Integrated Student Information Systems (ISIS), and the Payroll Personnel System (PPS).
- The campus telephone system.
- The campus backbone network.

**Business Process Redesign: SPEAR**

UCSD’s growing popularity has been both a blessing and a challenge through the years. Student enrollment and research activities continue to grow but, unfortunately, at a time of tightening institutional funding. Relyea recalls, “Our annual budget rose from half a million to two billion dollars, and we doubled our student enrollment. At the same time, the state cut our institutional funding. How do you support this growth within this difficult financial framework and still maintain the academic quality? One solution was to look hard at all of our business cost centers and to pare their business processes down to the absolute minimum to streamline costs and to eliminate as many non-value-add steps as possible.”

UCSD left the research-related business processes until late in the institutional evaluation because research administration is so complicated. Lyle Kafader, UCSD’s SPEAR director, notes, “There is so much gray area in research and grants management that people naturally feel that way.” Since research reflects the university’s core mission, Relyea and others wanted to gain experience in other areas first. “Frankly, it was easier to

**Rapid Process Redesign Group**

The Rapid Process Redesign (RPR) Group formed in December 2002 to identify, analyze, and redesign business processes that could potentially yield labor and cost savings across the UCSD campus. Twenty-two team members, representing many academic and central service departments, identified all business processes on campus, ranked them by risk to the institution, and analyzed how to reduce or eliminate their risk.

The RPR Group’s first priority was to identify “what made staff different from everyone else,” states Steve Lopez, director, cellular and molecular medicine. “The first thing we concluded was that a business process is a task or process done to support the university’s mission and performed by people who are not involved with the actual delivery of the mission.” Team members then broke into groups to evaluate the business processes throughout the university. “What evolved was the realization that we are making a mistake if we identify processes by who owns them,” Lopez continues. “So we began to think of a process as originating from a specific area, like graduate studies or housing/dining services. For example, there is a process for keeping undergraduates safe in their dorms that involves several different university areas, so we need to consider all of the relevant players.”

The RPR Group identified 34 potential opportunities for significant cost or workload improvements in campus administrative processes. Eventually they focused on 11 areas: effort reporting, entertainment, FinancialLink development, financial reconciliation, invoice approvals, job descriptions, leave activity summary reports, paper use and disposition, payroll expense transfers, recruitment, and travel. Subgroups, called tiger teams, were formed and evaluated the 11 areas further. The tiger teams presented findings to the RPR group in January 2003, with eight of the original 11 areas targeted for process changes by July 1, 2003. The three remaining areas required additional evaluation.
redesign the travel reimbursement process,” continues Relyea. “On the other hand, the research processes are so intertwined with complex government regulations. As a top-10 research institution, UCSD is on every federal government agency list for audits, reviews, and site visits. We have a federal representative on this campus reviewing our activities 365 days a year. We had to take on research administration redesign because it represents the most costly and labor-intensive business processes of all.”

Indeed, Carole Ring, services office manager, describes a formerly dysfunctional research organization. “The principal investigators [PIs] were very frustrated about depending upon others to learn about their financial situation. The central campus departments were perceived as barriers to getting things done—a real mountain to climb. No one talked to each other. Each area processed their business differently. One area used Excel, another used Paradox. Areas argued over rounding methods—whether to round up or down. If you wanted to get information off the paper ledger, you had to create your own shadow system.”

A New Approach to Grants Administration

UCSD initiated the SPEAR project to evaluate current research administration processes and implement project-sponsored, electronic-based innovations. UCSD administration approached this project differently from previous business process redesign efforts. First, it was cosponsored by the vice chancellor of business affairs, the vice chancellor of research, and the vice chancellor of marine sciences to ensure the project moved forward in a consistent way across the campus and to facilitate its sustainability. Consequently, the initial project team members represented academic, technology, and functional areas. Second, the team members were released from their normal duties during the course of the project to focus on defining SPEAR. Third, UCSD hired PricewaterhouseCoopers (then Coopers & Lybrand Consulting, now PWC) to facilitate the project.

PWC’s first step was to accustom the individuals in the SPEAR group to think like a team, doing exercises like building toys together or participating in an assembly line. Eventually these activities created lines of communications between the diverse areas. “One thing that struck us early on was how much we had in common,” recalls Andrina Marshall, assistant dean, School of Pharmacology. “It was not a knock-down, drag-out fight when discussing issues. This helped us to understand that each area’s problems were not individual situations. It spurred us into action when we realized that each area was not suffering alone.”

PWC also trained team members about research methodologies. “Before this experience, I never heard of a focus group or best practices,” Ring recalls. “The consultants directed us and gave us structure and assignments to keep us focused. If we had been left on our own, we would have wasted a lot of time or not accomplished anything, because the concept of research business process redesign was too huge to get our minds around.”

The consultants organized the team into four areas to gather information:
- processes, to create workflow sheets on current processes;
- best practices, to learn about other universities’ research-related business processes;
- information technology, to understand technology alternatives; and
- customer service, to better understand UCSD researchers’ needs.

On the basis of its exploratory research, the SPEAR team decided to simplify the research and grants administration process by cutting out as many middlemen as possible,
using technology-based tools for proposal writing and submission, budgets, and other tasks. The goal was to make things simpler and to reduce barriers by eliminating as many layers of bureaucracy as possible.

This was easier said than done, given that the team had drawn a research administration process flowchart that, as Relyea recalls, “wrapped all the way around the room.” So the team decided to organize research administration into discrete chunks by categorizing the entire list of processes in the broadest categories possible and to think about the associated processes and potential SPEAR projects. Figure 1 illustrates the result.

Figure 1 shows the entire generic research process, from funding identification to project closeout. Below this process are the UCSD-related processes and then the SPEAR-related projects, as summarized in Table 1.

The team also concluded that a commercial alternative was not the optimal approach for UCSD. “We have not seen a single commercial product that was totally successful from proposal to closeout,” Harel explains. “We decided to take a component approach, building some systems, purchasing others, and integrating them all together. It is not going to be the perfect system, but it will work. It also turned out to be very cost-effective.”

For example, SPEAR evaluated all shadow systems currently in operation around campus for some processes, such as the overdraft reporting system, and adopted the best one for the entire campus’s use. In other areas, like grants management, UCSD purchased a license for MIT’s Coeus system, which UCSD modifies for its specific needs. The overall result is a vanilla, Web-based, data warehouse-based research and grants management solution.

Despite the component approach, UCSD has taken pains to integrate SPEAR projects as much as possible. The common data reduces
duplicate data entry. SPEAR systems all have the same look and feel as UCSD’s administrative systems and the Blink business portal, to facilitate user adoption.

SPEAR projects also follow UCSD’s policy of using single sign-on to enable departments to read, share, and access data more easily. “This is a big benefit because we do not have to implement a very complicated security scheme to prevent someone in biology from looking at chemistry data,” says Kafader. “It can really get complicated if you lock it down to the granular level.” This is especially true for researchers with joint appointments and for interdisciplinary processes and research. One security deterrent is that the UCSD systems support after-the-fact logging. When users log in, they see a screen stating that

---

### Table 1. SPEAR Project Summary

<table>
<thead>
<tr>
<th>Project Name Completed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E and W Account Code Validation</td>
<td>Helps departments track and prevent charges that may be questionable or not allowed on federal awards.</td>
</tr>
<tr>
<td>Early Index Inactivation</td>
<td>Blocks new payroll distributions, new purchase orders, new travel transactions, and recharges on the index.</td>
</tr>
<tr>
<td>ENPET (Electronic Non-Payroll Expense Transfer process)</td>
<td>Designed to improve accuracy and efficiency in expense transfer transactions.</td>
</tr>
<tr>
<td>Overdraft Reporting</td>
<td>Provides information about the overdraft system, which monitors and helps to resolve overdraft conditions.</td>
</tr>
<tr>
<td>Cost Sharing</td>
<td>Tracks cost sharing when the university contributes resources, in the form of personnel or other documented expenses, to a sponsored project.</td>
</tr>
<tr>
<td>Award Data</td>
<td>Retrieves sponsored-project award information on the basis of criteria such as the research person (PI or Co-PI), budget/project dates and amounts, or award status.</td>
</tr>
<tr>
<td>Projections</td>
<td>Uses FinancialLink’s projections capabilities to add salary and expense projections to FinancialLink reports.</td>
</tr>
<tr>
<td>Funding Opportunities</td>
<td>Contracts with the Community of Science (COS), a Web site that gathers information for researchers at universities, corporations, private institutions, and government agencies.</td>
</tr>
</tbody>
</table>

**Ongoing**

| Coeus                                  | An integrated proposal and award system that is linked with IFIS, ISIS, the Chart of Accounts database, and FinancialLink reporting.             |

**Future**

| Financial Reporting and Close Out      | Improves the current financial reporting and closeout process for awards in terms of notification process, prevention of unallowable expenses, reporting process, and closing down of funds and index numbers. |
| Cash Management                        | Improves the timeliness and efficiency of the billing, cash collection, and receivables management of sponsored projects.                    |
their activities will be logged, tracked, and recorded. UCSD system users can see who is looking at what data. “It is not going to prevent anyone from accessing data, but the casual person snooping is going to know his or her actions are recorded,” explains Harel. “It is easier to implement than a complex security solution.” Most information in the research and grants management areas is legally public information, which also impacts UCSD’s security solutions.

Today, SPEAR receives its direction through its sponsors group, which approves projects, recommends priorities, and secures funding for all SPEAR projects. An oversight committee facilitates the creation of initiatives that meet UCSD’s priorities for sponsored projects, monitors progress, and communicates a project’s completion and new process or system to the campus. Typical SPEAR projects go through the following stages:

- **Preliminary.** Once the advisory group has identified a priority, it creates a new SPEAR project. A team leader from a central office or academic department heads the project and shepherds it through completion. Team members consist of representatives from administrative and departmental areas of the campus. Large projects consist of many teams and subgroups that support the project goals.

- **Process.** Teams meet regularly through multiple phases during which they identify the problem and strategy, determine requirements, document processes, and participate in testing. The project is considered ongoing. Due to their scope and magnitude, sometimes involving revamping older systems and creating entirely new systems, ongoing projects can span one or more years.

- **Completion.** Once the project’s goals are met, it is considered a completed project. The team alerts campus groups about its implementation and disseminates information through UCSD’s Blink business portal.

- **Postcompletion.** Since the director is the only full-time staff member associated with SPEAR, the sponsoring department owns the project upon its completion. Usually one person in the sponsoring department becomes the primary contact to handle questions and make recommendations for improvements. Although a project’s goals have been met, the project will likely need maintenance, enhancements, and upgrades. If the department’s process owner determines a need for significant changes or major technological advancements, the team—which remains active in an advisory capacity—can reconvene to assess the project’s requirements.

According to Relyea, the SPEAR project has created a research and grants management system that truly supports the entire management process. “Inventory control, the reduction in time to transfer costs, and other tools—all this adds up to more efficient management control,” he states. There are several additional benefits:

- **Shadow system elimination.** Before SPEAR, staff members in different areas had to chase paper to enter information and reconcile financial information with departmental shadow systems. While areas may process things differently, they now use the same tools, processes, and reports.

- **Centralized tools.** Marshall describes several benefits associated with the centralized tools. “High-quality tools are now available to all areas, whether or not they can afford to employ programmers locally,” she explains. “In addition, they facilitate the management of cross-research collaboration. For example, the School of Pharmacy and Pharmaceutical Sciences frequently collaborates on projects with the School of Chemistry and Biochemistry. Finally, when an area hires a transfer staff member from another UCSD area, there is less training...
Coeus

When UCSD decided to implement a grant management tool, it recognized that it had very specific needs. “The areas around the campus are so different that an off-shelf system that could be powerful, modular, and flexible enough to accept all the different parameters would be practically impossible to develop,” explains Dan Gilbreath, director, post awards financial services. “Additionally, the cost involved in building custom programs would also be tremendous.”

Five years ago, USCD decided instead to license Coeus, a proposal and award system from MIT, for $500. As Kafader notes, “It is not an out-of-box system. We received the code, with promises of limited support. Through the years we made a lot of changes to fit our institution and to integrate it with our IFIS and ISIS systems, the Chart of Accounts database, and FinancialLink.” Kafader believes this is unusual, as most Coeus applications are not integrated with other systems. Coeus began as a preaward management system, but as UCSD recognized and implemented its capabilities, it became a core system.

Lopez, who is also a member of the Coeus development group, describes the ultimate Coeus implementation: “My dream is to access contracts and grants via the Web to submit a proposal. The system will immediately start asking you questions. For instance, it will assign an internal number, will ask for the PI, and will immediately populate the appropriate fields: position, department, organization code, etc. This will cascade throughout the system as it builds the proposal.”

Getting to this point will take considerable effort. Lopez describes Coeus’s development as a “very painstaking process because the first step is data verification. We have finally reached the point where we have confidence in 10 years of solid data. ACT is now verifying the system to access data and to bring back reasonably accurate results.” Gilbreath confirms Coeus’s meticulous development, noting that “from a business perspective, the Office of Contract and Grant Administration (OCGA) and the Office of Post Award Financial Services would be consistent in their thinking and data, but we are not integrated systematically. Coeus forced us to begin to talk the same language and to understand and agree on the same terminology.” Today, all UCSD offices that write proposals use Coeus, as it is the central location that houses this information.

Coeus does talk with the financial system also. For example, all header information across the ledger is driven by Coeus. SPEAR’s next steps revolve around enabling Coeus to provide more information for appropriate departmental use. “For example,” Lopez continues, “I ran a query against one of my faculty members to look at his constellation of funding. The results named the grant and the agency where it originates, but there was no grant number. That is a basic piece of information, and the query that I used did not bring it up.” Minerva Nelson, senior fiscal analyst, also wishes for more interaction between Coeus and IFIS. “If financial overrides are required for projects that span more than one unit, each unit has to input their overrides individually. If someone forgets to override the system—like for new indirect cost (IDC) rates—your area is stuck with the bill for money that you already spent.”

Currently, Coeus is written in PowerBuilder, but UCSD plans to implement the new Java-based version. “We hope the Java implementation will make development easier for us,” Harel says. “One nice thing is that it does seem to be developed modularly. We may break away from MIT in some areas where we are very different, but we can still continue to accept new modules as they are developed, and as we are interested in implementing them.”
and less reorientation time. He or she can provide quality service to customers much quicker because the environment is new, but the system is the same.”

◆ *Centralized communication.* Several staff members describe the pre-SPEAR culture as one of information silos that had tunnel vision, with little communication between areas. It is now culturally accepted—and expected—to use teams consisting of user, technology, and central campus representatives to get everyone’s input when changing or creating processes.

**Future Directions**

The SPEAR program has been reenergized with the recent appointment of its new director, Lyle Kafader. As they wrap up many current projects, SPEAR leaders evaluate the program’s future direction. As senior research assistant Jason DeFay describes, “We have picked the low-hanging fruit and now we have to work our way up the tree.” To accomplish this, SPEAR is investigating several avenues. “We want to create a 10-year plan that examines our finished, current, and potential projects,” Kafader explains. “The technology has changed under our feet, and we want to see how we can leverage emerging technologies and our past projects as well as allocate the appropriate resources. The vice chancellors will provide us with the direction, and the SPEAR work group will have to decide the best means to accomplish that by setting the priorities on the next projects to tackle, whether it will be financial closeout issues, electronic proposal preparation, or something else.” SPEAR also plans to solicit input from the UCSD community, most likely in the form of electronic surveys or focus groups. Other factors impacting future project selection are at-risk processes identified by the UCSD auditors and external influences like UC system-wide initiatives.

Another goal is to create a central repository for research-oriented information. “It is so segmented currently,” DeFay states. “The vice chancellor for research’s area maintains its own staff and its own content, which is very disconnected from the content provided on Blink.” As Kafader explains, “SPEAR is working to pull all the research-oriented content into the Blink environment, deep-linking subject headings on Blink to direct people to the appropriate UCSD site. Another task is to provide a central overview on the research-related ‘how-tos’ on Blink—like writing a proposal—and to provide links to relevant UCSD Web sites.”

**Academic Analytics**

In tandem with its business process redesign efforts, UCSD also began to incorporate academic analytic tools to help managers and staff members administer their business operations more effectively. At the strategic level, UCSD has used a balanced scorecard to support its managerial efforts since 1993 and was inducted into the Balanced Scorecard Collaborative’s Hall of Fame in 2003.

Relyea read Kaplan and Norton’s 1992 article about balanced scorecards in the *Harvard Business Review* and became fascinated with the concept. “The idea of identifying key factors in each of the four perspectives, developing metrics associated with those factors, and then acting on the results made a lot of sense to me. It seemed relatively simple. I could explain it to anyone on the campus, and it seemed to make common sense,” explains Relyea (2004).

**UCSD’s Balanced Scorecard**

To create UCSD’s balanced scorecard, Relyea and his management team worked with outside consultants to develop a nine-point strategic plan that provides the link between the university’s mission and the balanced scorecard, as illustrated in Table 2.
In turn, the balanced scorecard takes a multidimensional look at UCSD’s business operations and, through its metrics, enables the institution to track how effectively it is meeting its strategic plan and university mission (see Table 3). The business affairs area completes an annual cycle to update its strategic goals, set the underlying goals for its 36 departments, and measure their success in achieving them.

The financial perspective examines profitability, efficiency, and leverage for the bookstore, imprints, parking, storehouse, and telecommunications areas. The effective business processes perspective presents specific benchmarks for each of UCSD’s business areas, ranging from administrative computing to travel.

For example, the administrative computing area compares UCSD performance against that of peer institutions in four areas:

- central IT funding per FTE student,
- percentage of total central IT funding spent on IT staff compensation,
- campus computers per student, and
- FTE students supported per central IT staff member.

The telecommunications area measures UCSD’s percentage of classrooms with wireless access and its percentage of research facilities with wireless access. An annual survey measures employee satisfaction. Customer satisfaction is also measured by a survey completed by a sampling of faculty and staff in academic and administrative departments. This survey evaluates the services of 36 business affairs units.

The results, according to Relyea, include increased productivity, reduced costs, and a better understanding of customer needs. The balanced scorecard is also now a vital UCSD management tool. “The balanced scorecard is so ingrained in our culture, we can’t imagine not doing it, because it represents our strategic thinking,” states Relyea. “The basic vision remains the same, though we constantly tweak the strategy and objectives to keep it relevant.”

### Improving Information Access Through Central Data Warehousing

On an operational level, UCSD has created an academic analytic infrastructure that lets users across the institution access information
### Table 3. UCSD’s Balanced Scorecard Dimensions and Metrics

<table>
<thead>
<tr>
<th>Customer Service</th>
<th>Effective Business Processes</th>
<th>Employee Satisfaction</th>
<th>Financial/Stakeholder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managers must ask, “How do our customers see us?” to know if their organization is responsive to customer needs.</td>
<td>Managers need to focus on their business processes to ensure they operate in an effective, efficient, compliant manner. They must ask, “What must we excel at?” and “Are we productive and effective?”</td>
<td>An organization’s ability to innovate, improve, and learn is directly linked to the value it places on its human assets. Managers must ask, “How do our employees feel about the institution and their value within the work setting?”</td>
<td>The organization seeks to be accountable to its sponsors and external stakeholders by asking, “How do we look to our community, the regents, state and federal agencies, and other stakeholders?”</td>
</tr>
<tr>
<td>At UCSD we gather feedback from our customers annually through a customer satisfaction survey that asks the following questions about Purchasing Services:</td>
<td>At UCSD we measure the effectiveness of our processes by gathering the benchmark data from other UC institutions:</td>
<td>At UCSD we gather feedback from our staff about their satisfaction and value through an employee satisfaction survey that measures these aspects of our organization:</td>
<td>At UCSD the indicators that measure our value to the institution and our financial health are obtained by gathering benchmark data from other UC institutions:</td>
</tr>
<tr>
<td>◆ Does purchasing staff understand your needs?</td>
<td>◆ Cycle time to process purchase orders</td>
<td>◆ Communication</td>
<td>◆ Dollar value of annual purchased goods and services processed by purchasing, per purchasing FTE</td>
</tr>
<tr>
<td>◆ Are they responsive and accessible by phone?</td>
<td>◆ Percentage spent and count through EDI, e-procurement, and/or p-card processes</td>
<td>◆ Leadership</td>
<td>◆ Ratio of campus FTE to purchasing FTE</td>
</tr>
<tr>
<td>◆ Do they offer effective advice and provide problem resolution?</td>
<td>◆ Percentage spent through consortium and/or competitive contracts and agreements</td>
<td>◆ Effectiveness</td>
<td>◆ Percentage spent with small and/or Minority and Women-Owned Business Enterprise suppliers as ratio of total expenditures with all suppliers</td>
</tr>
<tr>
<td>◆ Are they professional and courteous?</td>
<td>◆ Dollars/hours invested in professional development per employee per year</td>
<td>◆ Diversity</td>
<td>◆ Compensation</td>
</tr>
<tr>
<td>◆ Is purchasing going in a positive direction?</td>
<td></td>
<td>◆ Morale</td>
<td></td>
</tr>
</tbody>
</table>

Source: UC San Diego Vice Chancellor Steve Relyea, 2005

in different formats for decision-making support. “UCSD always had a culture of sharing information,” states Nelson. “Even before there was the data warehouse, departments could request a tape of the general ledger from the central computing department.
Then the information got moved to the data warehouse and it became more accessible to more departments.”

UCSD’s data warehouse contains more than a terabyte of information segmented by specific areas, including data generated through the campus financial, student, and payroll/personnel systems. Each area has a data steward who creates definitions and owns the data. UCSD is currently migrating its data warehouse from Sybase to Universal Data Base.

In each area, authorized users can drill down to databases and data elements. There are hundreds of thousands of data elements and thousands of tables, linked behind the scenes to the different systems. UCSD maintains a library of queries that staff members tap into with QueryLink, a Web-based tool that lets users cut and paste elements. QueryLink offers two levels of queries: easy queries, wherein the output levels are predetermined, producing a standard report; and user-guided queries with flexible parameters. Intelligence is built in to suggest other queries of potential interest—for example, to help users figure out why a data element is increasing or decreasing.

ACT took several steps to promote usage among the general campus population, as most UCSD staff members are unfamiliar with SQL for custom building queries. QueryLink has the same look and feel as UCSD’s Blink business portal. The query library, too, helps to optimize overall performance by deterring unsophisticated users from inputting queries that might take the system down. More proficient users can use SQL Executer to build queries. Harel notes that UCSD handles about 30,000 queries and produces 100,000 canned financial reports per month.

Users can display and share the information in numerous ways. Output results appear on screen in different formats, like a tab-delineated Excel spreadsheet, an Excel Pivot Table, or an Excel graphics chart. Users can share their queries with others.

**MyDashboard**

Users can also build dashboard items from queries and store them in MyDashboard, one of UCSD’s MyServices, a Web-based tool. Introduced in 2003, “MyDashboard was designed to also allow users to create reports from local departmental information” and from the institutional data warehouse before posting those reports on their dashboards (Harel and Sitko, 2003). The dashboard becomes part of an individual’s personal collection of customized charts, graphs, or reports. These displays are

- based on data in the campus data warehouse or in departmental systems;
- updated as often as the data are refreshed or as indicated by the user—for example, upon login daily, weekly, or monthly;
- shareable with others who are authorized to view the data (a staff member can subscribe to someone else’s dashboard, in which case any changes the creator makes to the dashboard are also reflected on the staff member’s desktop); and
- customizable by the user (Harel and Sitko, 2003).

UCSD defines MyDashboard as a tool that “helps you make better business decisions by displaying charts, graphs, and reports that are relevant to you. You can refresh the information as often as you like … click the MyDashboard icon in Blink to bring up the latest data.” The potential creator is invited on the Overview page to access shared charts, learn how to use the charts, become familiar with the toolbar, and use the tutorial to create a chart using QueryLink. The material is directed to the creator, suggesting that in most cases she will be the primary user.

While the creation of dashboards throughout the university has grown slowly, the usage of dashboards has steadily increased.
(One source estimates that while about 200 have been created since 2003, the usage logs show greater and greater activity.)Although UCSD sources are cautious about estimating the number of dashboards, all agree on their significant effectiveness and efficiency. Expectations for greater numbers and more intensive use are very high.

These new tools are typically used by business officers, fund managers, and other fiscal employees. A recent daylong workshop offered by the Department of Physics for interested people in other departments drew an audience of 90. One of the participants described dashboards as “extremely time-efficient,” adding that she “couldn’t live without them.” She compared the leap from prior tools to dashboards as similar to the move from columnar pads to computer spreadsheets. But those in other departments have been more reluctant to create dashboards. Some interviewees voluntarily expressed puzzlement over the slow growth but no surprise over the increased usage of existing dashboards. Those interviewees believe the rate of adoption simply reflects a typical academic culture. People are slow to change and adopt innovation, however promising. “Perhaps innovation doesn’t occur,” said one source, “because people have no time to learn a new system and insufficient motive to do so.”

This suggestion dovetails with our larger purpose in examining decision making: Perhaps dashboards appeal more to decision makers than to those who collect and post data. In other words, many of those who work with data have little to do with the analysis and application of aggregated data to issues that require decisions. From their point of view, moving from existing spreadsheets to dashboards is difficult and time-consuming, requires more training, and provides little advantage. From an executive point of view, the data becomes far more useful and more timely and doesn’t require their training. (These speculations are not based on thorough sampling of UCSD personnel.)

Perhaps this situation at UCSD extends to similar institutions with numerous research units, PIs, and fiscal support people. Decision-making support systems such as dashboards may be extremely effective and efficient, yet they depend upon people who typically cannot be labeled as “early adopters.”

Using Transaction Sampling to Simplify Financial Processes

UCSD has also developed several data warehouse application tools to help managers and staff members effectively manage their operational areas. One tool, a transaction sampling system developed at the Scripps Institution of Oceanography (SIO), has since been adopted by hundreds of other UCSD staff. As part of the UCSD business process redesign described earlier by Relyea, the vice chancellor of marine sciences wanted to streamline the SIO’s business processes. One area of scrutiny was the ledger reconciliation process. “Traditionally, the SIO fund managers reconciled 100 percent of all transactions,” Nelson explained. “But we no longer had the staff and the resources to continue to do so.”

The vice chancellor of marine sciences approached the controller’s office and the ACT area to get statistical information about the SIO’s ledger. “We found that 60 percent of our transactions were under $100,” recalls Nelson. “So we were all spending hours and hours getting a $2 imprint recharge on a federal contract that really did not pose high risk. Once the SIO realized that, we decided to completely redo our bookkeeping and selectively reconcile our transactions.” Wayne Farquharson, management services officer, concurs: “We had to ensure that we had good front-end controls before expenditures went to central office for processing.”

So in February 2001, the controller’s office helped form the Pilot Workload Reduction
Project, a committee charged with streamlining review processes, encouraging full implementation of FinancialLink, and eliminating other SIO financial systems. Members came from the general campus, the School of Medicine, and SIO, and they included fund managers (the day-to-day users), auditors (to verify the system’s defensibility), and senior administrators (institutional sponsorship).

The first step was to conduct department audits to determine the transaction error rate and benchmark the completion time for 100 percent reconciliations at the SIO. Farquharson recalls that “audit revealed that the discrepancies for all the SIO units were less than $300. Some departments had $0 discrepancies. This encouraged the university to continue to support this initiative.” The audit helped the committee note the error rates to determine what percentage and type of records to selectively sample. The group initially included salaries, allocations, and other financial transactions in the audit, but eventually they focused only on expenses because review mechanisms exist for the other transaction types.

One initial problem the group faced concerned adapting the unique business processes in their departments to facilitate a new process. Each individual department had to go back and figure out the best practices for their area. The main changes, according to Nelson, “were in the routing. Each document initiated at UCSD has a preparer and a reviewer, which represents different routing. With 100 percent reconciliation, some questionable expenditures were approved at the preparer level with the knowledge that a reviewer would evaluate it on the back end. So we had to change the process because we were only looking at percentage of transactions.”

The controller’s office and a faculty statistician created a global sampling profile to apply to the entire institution: 6 percent of all transactions under $100, 5 percent of transactions between $100 and $499, 16 percent of transactions between $500 and $2,500, and all transactions above $2,500. Departments can establish individual profiles to reconcile specific risk areas, though it is recommended that the department wait for six months to generate a suitable sample size for review.

One important adoption factor was that the vice chancellor of marine sciences indemnified the department on project closeouts. If an item not examined under the sampling was questioned by the Office of Post Award Financial Services, the vice chancellor’s office would cover it. To date, no SIO transaction has been indemnified, but this safety net encouraged the adoption of transaction sampling. “A lot of us grew up with stories about a $2 expense blowing up to a $2,000 or $20,000 expense,” Karen Andrews states. “But it was a key to behavior change. Staff members no longer feared getting fired if something slips through due to transaction sampling.” Or, as Farquharson reiterates, “It was key to getting us going, but it is not needed today.”

Rather than create an entirely new system, the ACT department enhanced the SPEAR ENPET system because it offers similar characteristics: selection of transactions to transfer via FinancialLink, streamlined approval process for low-risk transactions, and an automated audit program. Another key piece, as Kafader notes, “was the data warehouse. If we did not have that, it would have been a very difficult project to pull off. The transaction data is easily available and refreshed nightly.” UCSD also uses a group identifier that lets each department manage its own data-entry access security. The single sign-on and flexible security leave much management to the department’s discretion.

After six months of design, the group decided to beta the system, delaying introduction of nonessential features to roll out the system sooner. For example, the group deferred the specialized reporting feature, since users could use QueryLink to build re-
ports from FinancialLink data. During the beta test, users reviewed and reported back on test modules weekly. The immediate feedback helped maintain users’ interest level in the project. Training occurred on two levels: The ACT department held three formal training sessions in computer labs, but more important was the broad user involvement in the beta testing phase. “Working groups of actual fund managers met weekly with the project team to discuss issues, make decisions, and preview updates,” states Kerry Byrd, business manager. “It was training as we went along.”

Although the new transaction reconciliation system was ready for implementation at the 2001 fiscal year’s start in July, the group decided to delay rollout until October. “We wanted to implement it at the start of the fiscal year, but it became clear that people would be too bogged down in closing out the books,” recalls Kafader. “The holiday time was a good time for departments to start file conversion and get their templates ready,” Byrd agrees. “You are not dealing with fiscal closeouts, and researchers may take a holiday vacation, so we could make changes without disrupting operations.”

Eventually the new transaction sampling rolled out across the UCSD campus, with some areas embracing it more than others. Other vice chancellors have not indemnified the new system, leading to slower adoption. Areas must define their risk level to determine whether adoption is necessary. “Every area has to weigh whether transaction sampling is riskier versus their current reconciliation method,” Kafader explains. “They have to determine whether a 17-cent transaction is considered risky—even if it is wrong. In other words, at what point do they start worrying.”

One important venue in which to introduce the new system to the campus community was Sharecase, UCSD’s annual daylong technology event that spotlights new administrative tools and technologies. “People saw our demonstration and asked for a special class for their area that focuses on their specific needs,” Nelson observes.

The management reporting tools give fund managers a new financial management tool. For example, fund managers can identify high-risk areas and create departmental profiles to supplement the institutional profiles created by the controller’s office. Fund managers noted several benefits from the new transaction sampling process:

- **More efficient use of time.** “When our area learned that 60 percent of our reconciliations focused on transactions under $100, we realized that our area was spending too much time on the little-value transactions,” states Andrews. “Now we can target higher-risk items like subcontracts and foreign travel for further analysis.”
- **Greater ability to identify problems.** “Through our audit, we realized that 97 percent of our error rates were due to incomplete documents with no invoice copies,” Byrd says. “We could directly drill down to compare our results to other campus departments and to identify the problem.” For example, in one analysis, Farquharson noticed constant problems arising from a particular lab. So he discussed the issue directly with them and provided additional training. It was more effective than sending out a general communication to everyone in the department.
- **Time savings.** Areas that conducted 100 percent reconciliation and processed many low-value transactions noted immediate time savings. For example, Nelson’s area saved two-thirds of an FTE in reconciliation time, and Farquharson’s area saved about 28 hours monthly. Both noted that their workloads are far more manageable now, decreasing their overtime. The Department of Medicine’s sponsored projects office eliminated two financial assistant positions through
transaction sampling and applied the savings to create another fund manager position. The time savings may not be as straightforward in areas with many payroll transactions, because payroll is reviewed through a different system.

- **Defensible systems.** Because the auditing department created the profiles, fund managers now have a standard and sanctioned system. Fund managers who may be intimidated by their PIs now have tools to present evidence on specific problems. According to the fund managers, the reception is generally more positive when issues are supported with proof.

All these features have helped to transform the fund manager position. “For example, I now have one-third more time to conduct quality analysis and financial management instead of just pushing paper,” Farquharson explains. “We advise the PIs on how they are spending their dollars, becoming a more integral part of the research team. For example, when the PI writes a proposal now, we can advise him or her on the areas that need more funding.”

### Lessons Learned

UCSD staff members outlined several lessons learned; some are general truisms, others are specific to the converged network implementation.

- **Invite all relevant parties to the table.** UCSD involved the auditing department from the beginning of its SPEAR and transaction sampling projects, to proactively address their issues. “This may be controversial because some people believe it may taint the audit function,” states Relyea. “We feel it is more valuable to get them involved from the beginning to avoid surprises after implementation.” The Office of Post Award Financial Services was closely involved in the transaction sampling project because they had to modify their policies on identifying mistakes during project closeouts. “Questionable transactions may slip through until the very end, with the transaction sampling method,” explains Kafader. “So we created a report to address their needs. This won their support, which was crucial to the overall project’s success.” Discussions enabled all the parties to look at the process in new ways and to compromise.

- **Balance central and local needs.** “Our organization is large and fairly complex,” Nelson explains. “If you asked each department the same question, you’d get a totally different answer. One challenge is to build a similar structure that accommodates the university’s needs, but to create opportunities when possible for individualization—for example, checking or unchecking specific options on the system’s screen menus.”

- **Think integration.** All SPEAR projects integrate with each other. “Each project listed under financial management could be done as a silo system, but we looked at our projects with the knowledge that the data needs to be common, so it can be leveraged in other projects and to reduce duplicate data entry,” explains Kafader. “Just as important is to communicate each project to the community so people know
about it, where to get it, and how to integrate their own projects with it. So overdraft reporting, cost sharing, and other projects all spin off the same set of data. You don’t need to replicate things and don’t require additional data entry.” Eventually the individual projects evolved into a suite of fund management tools “that together helped the fund managers have a grasp on many more elements of the job, helping them manage their funds more effectively,” Nelson recalls. “A standard and consistent repository of information across the Office of Contract and Grant Administration and the Office of Post Award Financial Services facilitates new and seamless applications in our area of research administration and research affairs,” DeFay states.

Create a supportive look and feel. All SPEAR projects apply the same look and feel as all of UCSD’s administrative systems and Blink—for example, the same color scheme, header, and footer. The overriding goal is to create an integrated environment so that users intuitively know how to operate the systems. This strategy also enables SPEAR projects to utilize UCSD’s preexisting Web-based infrastructure.

Think beyond the project at hand. Because users, auditing, and senior management were involved in the transactional sampling project, discussions frequently took a broader turn. “For example, some of the discussions covered the policies associated with the system and general auditing requirements,” recalls Nelson. “These were major discussions outside the realm of the system that we were designing. Rather we took advantage of having all the relevant parties at the same meeting to resolve more far-reaching issues.”

Turn beta testing into training. The beta testing process turned into an iterative training process by involving a significant number of users. All the beta users received a modified version every week, tested it, and then gave their feedback. Users became familiar with the system as its final design took shape. This process also illustrated the project’s group commitment to meeting user needs, and a fast response to users’ suggestions kept everyone engaged in the design process. As Harel notes, “You need to train a departmental user or two to push the application out to others.” Eventually the beta users generated favorable word of mouth about the system to interest others in adoption.

Constantly reevaluate. As the SPEAR process spanned many years, the committees soon learned never to consider any system or tool “done.” “We learned so much from developing the early systems that it impacted how we developed later systems,” Kafader states. “Technology changed also. If you get yourself stuck in the mindset that we have already completed a system and don’t plan to touch it again, you really wind up hurting yourself. Users will begin to think the system is outdated and may not use it. Also, because the SPEAR tools are several small integrated systems, the overall system degrades if we do not constantly reevaluate all the systems.”

Don’t forget maintenance requirements. Dan Gilbreath notes that the SPEAR policy of turning over finished projects to sponsoring areas creates additional resource needs. “We have to factor that into our planning, and it can raise some challenges,” he explains.

Conclusion

Using a combination of technological and organizational resources, UCSD fosters a continuous improvement cycle that constantly strives to enhance university business operations. The involvement of users, business process owners, and senior administration results in a set of user-friendly and integrated tools. This involvement, in turn, encourages buy-in, which leads to broad adoption and usage across the institution. It also fosters a culture that encourages further feedback and future enhancements.
Endnote
1. See the ECAR research bulletin *Digital Dashboards: Driving Higher Education Decisions*, by Harel and Sitko (2003), for an in-depth description of UCSD’s use of dashboards.

References

