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Digital Dashboards: Driving Higher Education Decisions

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Overview

Would you drive a car without looking at the dashboard? The simple gauges on the instrument panel display what you need to know to operate the car safely and effectively: how fast you are driving, when the engine is working too hard, and how much fuel is left, for example. You cannot drive a car safely without a dashboard. The same can be said for managing a university. Regrettably, many managers currently operate without such an instrument panel, making decisions based on old data or no data at all. Many decisions require current information: Do we need to open another section of English 101? Do we have enough grant funds to take advantage of specially priced equipment? Are there anomalies in our enrollment data that need immediate attention?

Goldstein, Katz, and Olson,¹ in tackling the difficult question of understanding the value of information technology, described a vision for the benefits of improved access to management information. Suppose that managers were able to easily access information that could be used to evaluate the effectiveness of the institution's student-recruiting efforts. Then suppose that this information could enable the campus to discontinue expenditures that do not contribute to attracting applicants from the campus's target population. Suddenly, the benefit is no longer simply having management information for better decision making. Rather, it is having information that directly contributes to increasing the institution's ability to reduce the costs of securing an incoming class of quality students.

Good data can be challenging to obtain. Data stored in institutional computer systems may be difficult to navigate and aggregate, especially for those who are not trained to frame the right queries. Faced with the prospect of digesting intimidating, massive spreadsheets, managers often examine summary data only. These summaries can be misleading and may obscure nuances that would otherwise result in better decisions.

Graphical dashboards turn voluminous business data into something easy to comprehend. A quick glance at the dashboard shows data in intuitive formats, such as charts and other gauges. Dashboards allow you to focus on business priorities by filtering out irrelevant information. Dashboards that provide drill-down capability allow tailored views of reports and data at the level of detail that an individual finds most helpful.

This research bulletin describes how dashboards support strategic thinking and decision making in higher education, where and how they are being used, and suggested processes and infrastructure necessary to build them. To illustrate the value of the dashboard, the bulletin includes specific examples of dashboards being used by executives at Richland College and by faculty, principal investigators, university executives, and academic department managers at the University of California, San Diego (UCSD).

Highlights of Digital Dashboards

Factors such as student recruitment and admission, teaching load, graduation rates, staff turnover, generated funds, and proposal-to-award ratios all affect a university's performance. However, few higher education institutions are able to capture and report their many data points on all levels. A digital dashboard is a management tool for setting and measuring expectations at every organizational level, with easy-to-understand charts and reports of the status of progress throughout the year.² Such tools help users

- Set performance goals and track performance indicators
- Spot trends easily
- Establish measures and criteria for monitoring progress
- Identify, track, trend, and correct problems
- Design and print charts and reports
- Evaluate and understand the organization's health
- Identify operational efficiencies
- Meet regulatory requirements

Digital Dashboards—in the Car and at the University

Imagine how decisions would be affected if institutional leaders could easily consult a dashboard of critical gauges similar to those available in a car. Table 1 illustrates how the gauges might compare.

Table 1. Suggested Dashboard Measures of Performance and Trends

In the Car		At the University	
Gauge	Indications	Gauge	Indications
Fuel gauge	Can you continue to drive?	Resource gauge	Do you have enough resources (money, faculty, staff members) to do your work?
Speedometer	How fast are you going? Is safety threatened?	Threat dial	Is your risk level too high? What will the auditors find?
Battery	Can you start the car? Without a charging system, your vehicle will shut down.	Input graph	Are you getting enough student applicants? What's the quality of the incoming students? Do you generate enough research income?
Tachometer	Is your engine running smoothly? Useful for best fuel economy or best acceleration.	Institutional pulse chart	Are your graduation statistics on target? New building starts and capital growth? Endowments and investments?
Temperature	Is the car overheating?	Opportunity gauge	What is the cultural temperature of the campus? Salary gaps? Morale? Upcoming retirements?
Oil pressure	Just as important to an engine as blood pressure is to a person.	Environmental scan	Where are the pressure points?
Mileage	How far have you gone?	Trend statistics	How close are you to achieving your important goals?
Warning lights	Turn on when something is wrong—may be too late.	Red-flag report	How much money is in overdraft accounts? How much money is lost in delinquent accounts?

Digital Dashboards at Richland College

A few universities recently have embarked on initiatives designed to develop Web-based digital dashboards that enable better institutional management. Steve Mittlestet, president of Richland College, said that his institution has been using dashboards for roughly three years. Richland's dashboards are Web-based spreadsheets of weighted measurements that institutional executives define as important quantitative and qualitative indicators of the health of the college. Through the drill-down capabilities in the spreadsheets, college leaders can focus on factors that are meeting goals or need improvement, where each measure is assigned a relative percentage weight. Aggregated data enables the institution to measure effectiveness on a scale of 1 to 10 in a predefined set of domains, as shown in Table 2.

Table 2. Richland College Key Performance Indicators* (as of March 31, 2003)

Strategic Priorities for Student Learning		
Key Performance Indices (Weighting Factors)	Monthly Score	Change from Previous Month
Richland College Monthly Key Performance Index Score	9.7	+0.6
Respond to Community Education Needs (20%)	9.9	
Enable Student Success for All Student Groups (35%)	9.9	
Enable Success for All Employee Groups (15%)	9.0	+0.4
Implement Purposeful and Economical Use of Technology to Enhance Learning and Operations (5%)	10.0	+0.3
Improve Effectiveness of College Functions (25%)	9.5	+1.6

**All scores based on a scale of 10*

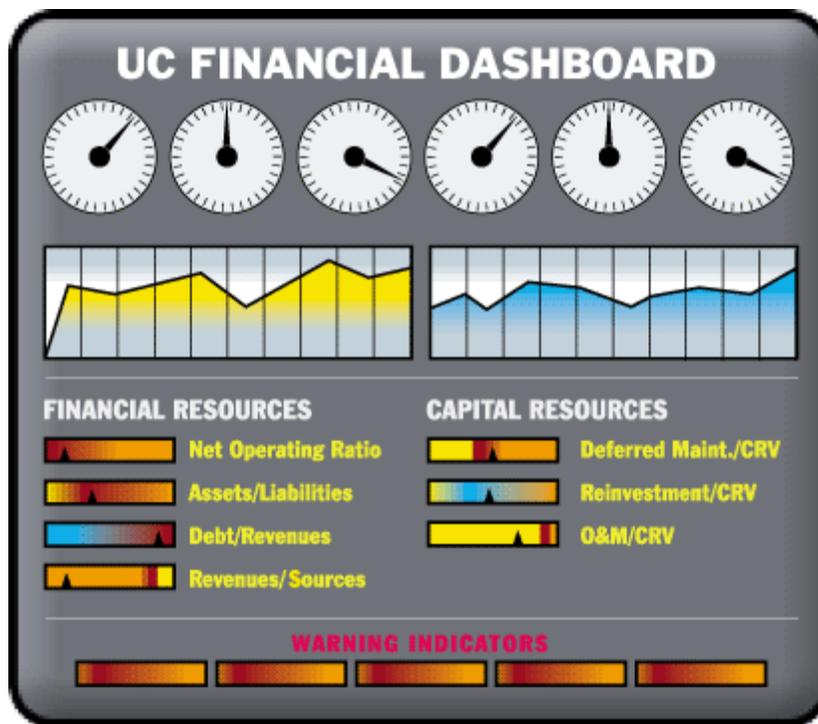
Digital Dashboards at UCSD

The University of California, San Diego launched its first digital dashboards in March 2003. Unlike Richland's spreadsheets, the UCSD dashboards are highly graphical and depend on users to define measures and gauges. The concept, first discussed in the July 2000 report *UC 2010: A New Business Architecture for the University of California*,³ supports an enterprise strategy for delivering high-quality services and support during an anticipated period of unprecedented growth: 60,000 additional students and 7,000 new faculty members by 2010.

The model of a digital dashboard, illustrated in Figure 1, pictures dials, colorful graphs, and measurement bars to display financial resources as well as capital. According to the report, "these tools must be intuitive, easy to access and use, and flexible enough to accommodate data in different formats and protocols. Above all, they must bring the data to life for managers looking to gain a better understanding of their campus or

university-wide financial operations.”⁴ This conceptual model inspired the UCSD dashboard and served as the foundation on which it was developed.

Figure 1. Conceptual Model of a Financial Dashboard



At UCSD, dashboards are seen as tools to support decisions in sponsored research and student services as well as basic administrative operations. Protected access to one’s Web-based dashboard is facilitated through authenticated login to Blink,⁵ the UCSD staff portal. An online tutorial and help screens enable new users to start using dashboards with little or no training. Since the introduction of digital dashboards in March 2003, about 200 users at UCSD have begun using them. UCSD’s vice chancellor for business affairs, Steve Relyea, who served as chair of the planning committee for the New Business Architecture, said, “The Faculty Dashboard can be an invaluable tool for faculty and their support staff to stay on top of their research grants. In these tough budget times, it is particularly important to have the dashboard provide us with key financial information on both an institutional and department basis.”

Leveraging Technology for Growth

Serendipity played a role in the creation of digital dashboards at UCSD. The administrative computing department was in the process of developing Blink when the concept of dashboards gelled. UCSD already had in place many of the key infrastructure components necessary for dashboards:

- A comprehensive data warehouse and sophisticated ad hoc query system (QueryLink, developed at UCSD)

- Security infrastructure, including a single sign-on initiative
- Campus-wide, Web-based transaction and reporting systems (FinancialLink, StudentLink, EmployeeLink, and TravelLink)
- Business portal (Blink)
- Knowledgeable and experienced business users, ready and willing to experiment with new tools
- Technical expertise for building the dashboard components (Java, Web services)
- Excellent relationships and trust across academic departments, functional business units, and the information technology department

Because the UCSD data warehouse was established roughly 10 years ago, the campus had already addressed issues related to data quality and cleanup. While many campuses still wrestle with determining which data elements from which systems constitute “official” campus data, UCSD had mostly resolved those questions. Everything in the data warehouse is considered to be official campus data.

What Is the UCSD Digital Dashboard?

At UCSD, a digital dashboard is an individual’s personal collection of customized charts, graphs, or reports that 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
- Shareable with others who are authorized to view the data
- Customizable by the end user

Authorized dashboard users can create reports, graphs, or charts of anything in the campus data warehouse and place them on a Web site called MyDashboard. During the development of the dashboard process, end users were invited to provide input into what they would like to have on their dashboards. Based on that input, and recognizing that some important data is never stored centrally, MyDashboard was designed to also allow users to create reports from local departmental information and post those reports on their dashboards. This flexibility encouraged use and enhanced the users’ trust in the system. “MyDashboard is a great example of how we were able to leverage existing technologies at UCSD, bringing them together to provide new and important services,” said Relyea. “For dashboards to come into being, all we had to add was the programming time.”

Data Driven

The UCSD data warehouse includes current and historical financial, human resources, and student-records information. In addition to the warehouse, individual departments maintain data specific to supporting their operational goals. Through a set of tools designed as part of the MyDashboard project, users can specify how they want data from these sources combined, aggregated, displayed, and updated.

Karen Andrews, management services officer in the UCSD Department of Physics and one of several end-user advisors on the dashboard planning team, said, “Using MyDashboard in conjunction with UCSD’s extensive campus data warehouse and query tools allows individual principal investigators and fund managers to easily display a variety of financial data and trends. I can, for example, display a year’s worth of expenditures by category: travel, supplies, payroll, etc. Thanks to the logic built into UCSD’s data warehouse, I can build charts on MyDashboard that refer to symbolic periods such as ‘last academic quarter’ or ‘current fiscal year-to-date.’ After the initial setup, these charts are essentially maintenance free: MyDashboard displays updated information each time I log in.”

Automatically Refreshed

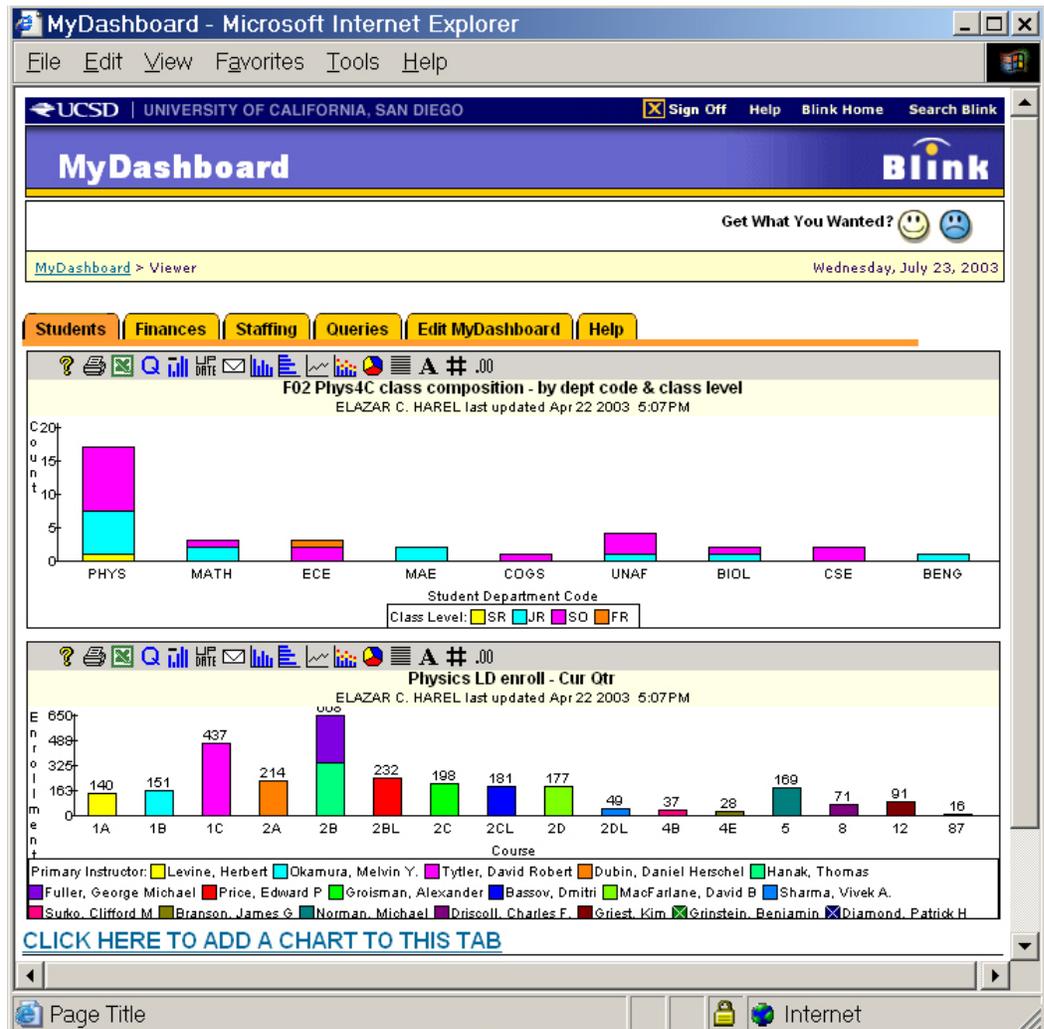
Dashboard displays of charts and reports that draw from information in the campus data warehouse can be automatically refreshed at intervals specified by the end user—for example, upon login, daily, weekly, or monthly. Charts based on information in departmental databases can be refreshed only as often as that data is updated—a responsibility of the owner department. Although departmental reports might not be as current as those that are centrally maintained, this shortcoming is often outweighed by the relevance and uniqueness of the information in departmental reports.

Sharable

As part of the initial conception of MyDashboard, “sharability” was a major goal. It was built into the project from the start and has turned out to be one of the most useful features of the program. The process of creating a dashboard report can be simple or complex, depending on the data sources and how you interweave them. For example, a simple dashboard that displays the number of students taking a specific physics lab might be a simple report to construct (see Figure 2). A more elaborate report might display the change in physics lab enrollments over the past 10 years as compared to overall science major enrollments. Creating the latter report is a more time-consuming process, but it’s worth the effort if, in fact, it can be shared among several or many individuals.

Dashboards can be shared in a variety of ways. You can subscribe to someone else’s dashboard, in which case any changes the creator makes to the dashboard are also reflected for you. Alternatively, you can take a copy of someone else’s display, alter it to suit your needs, and then mount it on your own dashboard. The guiding principle of dashboard sharing at UCSD is that you can share dashboards with others who are authorized to view the information that the dashboard displays.

Figure 2. MyDashboard Example: Analysis of Physics Courses



Customizable

Like a shopping cart at the supermarket, your dashboard can be customized to include everything you want and nothing that you don't want. Indeed, the "art" of dashboard construction—as automobile designers have realized—is to keep things simple: too much information can obscure what is truly important. Charts, graphs, gauges, dials, and spreadsheets display information differently. Choosing the right display format can improve the effectiveness of information processing and decision making. Since dashboards are displayed on your MyDashboard Web pages, you can organize them as you wish. For instance, you can display one or more charts per tab, you can resize them, and you can change the colors to suit your preferences. Dynamically, you can change the display from a graph to a pie chart, or you can display drill-down data as numerical tables. Because dashboards use standard conventions for display and navigation, training people to build them is relatively straightforward. The greater challenge, of course, is defining what should be measured.

The Development Process of the UCSD Dashboard

Dashboards are helping to professionalize the higher education workforce by enabling managers to make decisions based on real, current, accurate, and available data. While presidents and vice presidents use dashboards to reveal macro-level trends (in quarters, semesters, or years) to inform decisions about growth and sustainability of the institution, fund managers and admissions directors use similar dashboards to monitor daily, weekly, or monthly activities related to their operations.

From Concept to Prototype

When digital dashboards were first conceptualized, a small group (approximately 10 people) was formed to prototype the idea. Included in the group were people from administrative computing, business and financial services (controller's office), student affairs (registrar's office), and two academic areas—the physics department and the Marine Physical Lab of the Scripps Institution of Oceanography, representing an academic department and a research unit. The idea was to test some models to see if people saw value in dashboards before investing in their development.

Karen Andrews of the physics department said, “Including end users in the development process proved essential for the usability of the final product. Many design decisions were shaped by the kinds of data we wanted to display and by our feedback on early prototypes.” The group decided early on that dashboards would not be a mandatory system; they would be positioned as a way to leverage existing technologies “on the cheap.” As a result, dashboard development did not become a standalone project with its own budget. One staff programmer worked on dashboard development part time over the span of a year. Keeping the investment and profile low made the dashboard a low-risk project.

The system was developed using the Java programming language and XML, taking advantage of the existing object-oriented framework (jLink) and common system components used in the UCSD QueryLink environment. “Adopting XML early on in the development of our ad hoc query tool greatly simplified the process of converting queries into charts for MyDashboard. And, the use of Java Applets on the client browser provided the rich interface that charting demands,” noted Tim Morse, the programmer who architected and developed the system.

Rollout

MyDashboard was formally announced at the annual UCSD Sharecase technology conference event in March 2003.⁶ This day-long conference attracted 1,800 people who use campus administrative systems. No formal training was planned prior to the rollout; it was expected that the combination of intuitive design, attractive functionality, online tutorial, help screens, and help-desk support might provide early adopters with the support they needed to get started. The hypothesis appears to have been correct because approximately 200 users began using dashboards within 90 days of the Sharecase announcement.

Issues and Lessons Learned

UCSD has learned some important general and specific lessons related to dashboards. Among the more general lessons are the following:

- The infrastructure of the data warehouse, single sign-on, security, portal, and query system must be in place prior to developing dashboards.
- For people to trust the dashboards, the data upon which they draw (local and central) must be clean. Trust is strongest when data in the institution's data warehouse agree with local data.
- A perception that anyone on campus can build meaningful graphs and charts may be dangerous. Interpreting complex data is a learned skill, and dashboards that combine data elements using poor logic are likely to result in bad decisions.
- Data, system, and network security must be in place to ensure that reports are not sent to the wrong place or fall into the wrong hands.
- Users should be advised to limit the number of gauges on their dashboards to assure that they focus on the most important issues. Five to nine gauges appears to be an optimum set.
- Many things can be tracked, but choosing those that are most meaningful and informative is an art.

Next Steps

UCSD has several goals for upcoming dashboard releases, including the implementation of role-based logins and automated dashboards. For example, principal investigators who manage contracts and grants will automatically get information about their funds through a customized MyDashboard tab called MyFunds. These rollouts are expected to be incremental, enabling departments to control the accounts and their visibility. Additionally, faculty members will have a customized MyDashboard tab called MyCourses, and supervisors will have access to a tab called MyStaff.

What It Means to Higher Education

Truly valuable information is often obtained by synthesizing and aggregating data in new ways, but some higher education decision makers do not come from a tradition that focuses on using data to inform decisions. Dashboards have been demonstrated to be effective tools for displaying data for these decision makers.

Institutional Alignment and Decision Support

Aligning institutional goals, assessing value on investments, and understanding the volatile higher education marketplace are all issues with which universities and colleges wrestle. To inform decisions in these important areas, leaders and managers rely on information—data—that should be easy to obtain, aggregate, and analyze. The potential for dashboards goes beyond reports and gauges of current information. It's easy to imagine dashboards that enable institutions to build simulations of new models of higher education development, administration, and academic structures as "what if" scenarios.

How would decision making be affected if you could place a simulated dashboard adjacent to the dashboard that measures current data? Things could get very interesting.

Potential to Reduce Risk

Especially in times of change and growth, data must be analyzed and aggregated in new ways. Higher education administrators, service providers, and academic leaders risk increased exposure by measuring the same things year after year. For instance, for many years, managers of telephone and data network services have measured network uptime—the percentage of time that voice and data can traverse campus networks—and have used those measures to describe information technology service performance. As services become universally adopted and 99.99 percent uptime is the norm, people expect these services to be available 24 x 7. For IT providers, uptime remains necessary as a management measurement, but it is no longer sufficient as a means for communicating the value of the service. Unless new measurements and standards are established, the perceived value of IT is at risk.

Ongoing Information Audits

Up-to-date information is powerful. It is also necessary for responsible and effective management of funds, admissions, registration, human resources, and accreditation. At UCSD, dashboards used in conjunction with the extensive campus data warehouse and query tools allow individual principal investigators and fund managers to easily display a variety of financial data and trends. Access to up-to-the-minute financial information allows fund managers to spot potentially problematic spending patterns or trends. Andrews said that “the built-in drill-down capability within dashboards allows me to zero in on a problem area without having to wade through masses of irrelevant data.”

Key Questions to Ask

- Will a dashboard enhance our decision making? If so, how?
- Is our campus ready for this cultural change?
- Do we have the prerequisite resources to build and maintain dashboards?
- What should our first dashboards display?
- How will we support dashboard users?

Where to Learn More

- Blink, UCSD staff portal, <<http://blink.ucsd.edu/>>.
- UCSD MyDashboard, <<http://blink.ucsd.edu/go/mydashboardinfo/>>.
- “What is a dashboard and why do I want one?,” QIQ Solutions Pty Ltd., Executive Suite, <http://www.qiqsolutions.com/White_Papers/What_is_a_Dashboard.pdf>.

- Executive Dashboard, <<http://www.iexecutivedashboard.com/overview.htm>>.

Endnotes

1. P. Goldstein, R. N. Katz, and M. Olson, "Understanding the Value of IT," *EDUCAUSE Quarterly*, Vol. 26, No. 3, 2003, pp. 14–18.
2. Executive Dashboard, <<http://www.iexecutivedashboard.com/overview.htm>>.
3. *UC 2010: A New Business Architecture for the University of California*, <<http://uc2010.ucsd.edu/pdf/uc2010final.pdf>>.
4. *Ibid.*, p. 31.
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6. See <<http://sharecase.ucsd.edu/>>.

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