Structures, Plans, and Policies: Do They Make A Difference?
An Initial Assessment

by Bruce Rocheleau

There is substantial variation in college and university computing and communications structures, budgeting and charge policies, and planning efforts. Although such management issues have been frequently discussed, there has been little systematic research concerning whether these structures, policies, and plans have any impact on outcomes such as the extent of access to and use of computing by faculty, staff, and students. This article draws on the 1994 CAUSE Institution Database (ID) Survey to provide an initial assessment of these issues.

A 1984 survey by Henry Lucas showed that information services departments had little power and visibility in most organizations. But computing today is becoming a central activity of strategic importance to both higher education institutions and businesses. For example, Mara points out that the definition of a user of information technology at Cornell has changed from a hundred or so central office users to over 20,000 members of the university community. If colleges and universities are to attract and keep top-notch staff, faculty, and students, they need to serve a full range of users and support teaching, research, and administration needs.

To achieve these goals, campus information managers need to know what approaches are effective. What measures can they take to help ensure success? For example, in recent years, many colleges and universities have spent a great deal of time developing technology plans that include strategic, telecommunications, networking, administrative, library, and academic components. Although plans may help to bring about enhanced effectiveness, there is skepticism about the utility of planning because many plans remain on shelves unused. Do institutions that construct formal plans (e.g., for networking) have more successful results (e.g., higher percentage of their workstations networked) than those who do not formally plan? Do plans that are updated annually or linked to the budget have more impact?

The chief information officer (CIO) has become a familiar position in higher education. Slightly more than 75 percent of institutions in the 1994 CAUSE Institution Database (ID) survey reported the existence of a CIO, though only about 56 percent said that the CIO is “recognized as such” in their organization. CIO’s may come under attack if they are not viewed as being effective. For example, a Sloan Management Review article asked the question, “Is Your CIO Adding Value?” In the private sector, several CIOs have been fired, and in the public sector, CIOs have become the lightning rods for controversy in several states. As one former CIO noted, “States have to do more with less and they think that technology is going to pull a rabbit out of the hat for them.”

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Major variable groups studied

- Environmental variables
- CIO and organizational structure
- Planning activities
- Resource allocation variables
- Computer charge & budget policies
- Outcome variables

CIOs in higher education may come under similar pressure as the strategic importance of computing grows. Some observers have noted that the organizational rather than technological challenges have been most difficult and that there still is disagreement about whether centralized or decentralized structures work best in a college or university setting.5

Pitkin studied the role of college/university CIOs and found that they differed from their business counterparts because they did not carry out some roles necessary to be an effective executive.6 The structure and power of the CIO job can vary greatly. For example, some CIOs (about 18 percent) report directly to the chief executive officer (CEO) of their college or university. About 33 percent report to the chief administrative officer, 19 percent to the chief financial officer, and the remainder report to a variety of others.

Does it matter whether there is a CIO or to whom the CIO reports? Is a CIO who reports directly to the CEO without any intervening layers of administration more effective? Does it make any difference as far as use of computers in the curriculum whether the head of academic computing reports to the CIO?

Finally, there has been controversy over whether budget and cost recovery policies are most effective in encouraging use of computing by faculty, staff, and students. Thomas M. Schwen, chair of the Department of Instructional Systems Technology at Indiana University, stated that he was worried about a backlash when campus decision-makers found that faculty only made use of a tiny fraction (e.g., 12 percent) of the capabilities of high-tech classrooms.7

Do student fees and chargeback systems keep students and professors from using the Internet? There have been reports that high network costs have done so.8 Similarly, do colleges/universities with ongoing budgets (about 35 percent of our study sample) for replacing microcomputers and workstations have more faculty and students involved with computing in the curriculum and the Internet? Which policies, if any, positively influence the spread of academic use of computers?

The above questions deserve attention and careful study involving a variety of approaches, including case studies and the employment of experimental and quasi-experimental designs. Our study was exploratory, aimed more at focusing attention on these issues and developing hypotheses than at reaching final conclusions about the questions. But the importance of these issues should not be underestimated.

Many people argue that information technology has been slow to permeate the curriculum of colleges and universities. For example, Cotton found that the percentage of courses in which information technology was integrated into the curriculum was 17 percent, no higher than in her kindergarten to high school study.9 Stager, Williams, McClure, and Smith pointed to the dearth of evaluation studies concerning technology expenditures and the need to conduct such evaluations due to the shrinking economic resources available to higher education institutions.10

Can colleges and universities modify their structures, plans, and budgeting/charge policies to improve outcomes? We hope this article will help to stimulate research on this topic.

Methods

We studied the above issues by analyzing data concerning several relevant items from the 1994 CAUSE ID Survey. The survey sample we used excluded surveys from two-year, specialized, and uncategorized institutions. The total sample size was 296. The total response rate for the CAUSE survey was approximately 39 percent. There is no way to determine whether, or to what extent, the responding institutions are different from the institutions that did not respond to the survey, so caution must be applied in generalizing beyond the respondents to the survey.

Our study examined four major categories of independent variables (planning activities, CIO-organizational structure, computer charge and budgeting policies, and resource allocation variables) concerning their impact on the outcome variables. A detailed list of variables employed in the analysis is provided in Exhibit 1. We included composite measures of both the planning and CIO variables that represented the total of positive responses to the individual questions. Thus the composite measure of CIO power ranged from zero to five. For example, a score of five is assigned to those institutions in which there is a CIO, (s)he is recognized as such, the CIO reports directly to the CEO, and both academic and administrative computing report to the CIO.

Our inquiry used a variety of statistical analy-
Many variables are undoubtedly rough estimates at this point, including the following:

- Percentage of faculty having access to and using e-mail, Gopher, and the World Wide Web?
- Percentage of students having access to and using e-mail, Gopher, and the World Wide Web?
- Ratio of micros/workstations to FTEs
- Size of institution (FTEs)
- Type of institution (Carnegie class)
- Public or private institution?

Despite these limitations, this study addresses significant issues and raises important questions about the impacts of computing on educational outcomes. We need more accurate measures of access and use of these technologies.

In some of our analyses, there are a substantial number of missing cases for several variables, including some outcome measures. Although our analysis examined a large number of potentially important factors, other important variables are undoubtedly missing, especially those measuring the quality of the planning efforts.

This is a cross-sectional study and we need longitudinal studies to test for causal relationships among the variables. Certain causal relationships could be the reverse of what we have assumed; for example, it is possible that increased use of computing leads to structural changes in the academic computing structure and replacement budgets. However, case studies reported in the literature suggest that computing structures and budgeting and charge policies tend to be more the result of the actions of a small group of people such as key information technology personnel, institutional leaders (e.g., president, provost, and other leaders), and a few influential faculty, rather than being due to mass participation in computing by faculty and students.

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Exhibit 2: Outcome variables by predictors (in their order of importance)*

Outcome #1: Percent of faculty making use of computing in the curriculum.
Predictor: Institution has an ongoing budget for replacing micros/workstations.

Outcome #2: Percent of faculty making use of software in the classroom.
Predictor: Academic computing reports to the CIO.

Outcome #3: Percent of academic micros/workstations that are networked.
Predictors:
1. Academic computing reports to the CIO.
2. Institution has an ongoing budget for replacing micros/workstations.

Outcome #4: Percent of administrative micros/workstations that are networked.
Predictor: Institution has an ongoing budget for replacing micros/workstations.

Outcome #5: Composite measure of staff access and use of e-mail, Gopher, and WWW.
Predictors:
1. Academic computing reports to the CIO.
2. Institution has an ongoing budget for replacing micros/workstations.
3. A composite measure of CIO power (negative).
4. Institution is public.
5. CIO is recognized as such.

Outcome #6: Composite measure of student access and use of e-mail, Gopher, and WWW.
Predictors:
1. Institution has an ongoing budget for replacing micros/workstations.
2. Academic computing is covered in the IT plan.

Outcome #7: Composite measure of faculty access and use of e-mail, Gopher, and WWW.
Predictors:
1. Academic computing reports to the CIO.
2. Institution has an ongoing budget for replacing micros/workstations.

* The relationships are positive unless otherwise noted.

Presentation of results
Exhibit 2 summarizes our major findings. One fairly consistent predictor of outcomes was the presence of an ongoing budget for replacing micros/workstations. It was the only predictor of the percent of faculty use of computing in the curriculum and percent of administrative micros/workstations networked. It was also the best predictor of a composite measure of student access to e-mail, Gopher, and the World Wide Web. An organizational structure in which academic computing reports to the CIO was the best predictor of the percent of academic micros/workstations networked and a composite measure of faculty and staff access to the Internet. It was the only predictor of the percent of faculty using software in the classroom. It should also be noted that the strength of the above predictors was quite modest, ranging from about 5 to 15 percent of the total variance (out of a possible 100 percent). Given the limitations of our measures of independent and dependent variables, the weakness of our predictors is understandable.

In the above analyses, we initially excluded the resource allocation variables because we wanted to focus on the impact of the CIO and the structure of computing, computing plans, and budgeting and charge policies. When we added the resource allocation variables to the analysis—such as percent of instructors with exclusive use of an institutional micro/workstation and student access to micros in their dorms—we were able to predict better the percent of faculty making use of software in the classroom and in the curriculum, though the percent of variance still remained modest.

Summary and conclusion
In summary, while our results were mixed, the significance of the ongoing budget and academic computing/CIO relationship suggests that budget and structural factors can have impact. Having a budget to replace micros/workstations is a very concrete activity and appears to have a beneficial impact on networking and use of computing in the curriculum. This impact cannot be explained by a difference in resources; having a replacement budget was not correlated with our measure of resources and wealth. Our results also suggest that a structure with the CIO in charge of academic computing has a positive impact on outcomes.

Generally, while the existence of a plan was
not a good predictor of outcomes, the existence of an academic plan did correlate somewhat with increased overall student access to the Internet. But the existence of an information technology plan that covered academics did not predict use of computing in the curriculum. Likewise, existence of a networking plan was not a predictor of the percent of micros/workstations networked, and neither updating the plan nor linking it to the budget proved to be predictors in the above analyses.\textsuperscript{13}

The quality of the planning effort and the nature of the process may be crucial to the success of the plan, but we had no way of measuring these aspects of planning efforts. Institutions in which academic computing reports to the CIO more often reported superior outcomes. Other CIO-related variables were not important. The fact that the CIO reported directly to the CEO did not have any major positive impacts.

The computer charge variables turned out to be generally unimportant—student fees had no statistically significant correlations with the student index of access to the Internet nor use in the classroom or curriculum. The environmental variables (FTE, public or private institution, Carnegie classification, and our index of resources) had modest relationships with most of the outcome measures.

As expectations concerning information technology continue to soar, colleges and universities need to put more effort into linking their scarce resources (such as time putting together plans) to bottom-line results. Although many of the plans, structures, and policies did not have much effect on our outcome measures, might other variables not available for analysis—for example, incentives for faculty to use computers—have more effect? Finally, the above research was done using 1994 CAUSE ID Survey data. In the last year, there appears to have been a revolution in access to and use of the Internet. Has use of computing in the curriculum had a corresponding change? Can we identify any other practices that influence good outcomes? We need answers to these questions.

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\begin{center}
\textbf{Have You Filled Out Your CAUSE ID Survey?\textsuperscript{*}}
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✓ Access the ID Service and find tips for filling out the survey at http://cause-www.colorado.edu/information-resources/id-service.html

“We have drawn on CAUSE Survey data to benchmark our progress in using information technology and have found it to be very helpful. The survey also provides us with a widely accepted metric that we have incorporated into our strategic planning process.”

Susan Foster, Vice President, Information Technologies, University of Delaware

Douglas Gale, Assistant Vice President, Information Systems & Services, George Washington University