The Financial Mythology of Information Technology: Developing a New Game Plan

by John L. Oberlin

New economics are driving campuses to reassess their financial strategies for managing information technology investments. Many institutions will be faced with the prospect of developing an entirely new game plan. This new plan will require collaboration among academic, financial, and technical leaders; a rejuvenation of the collective conventional wisdom on campus; a shift to life-cycle budgeting; an emphasis on technology replacement; explicit plans to recycle old technology off campus; and, most of all, a willingness to recognize and accept the significant financial challenge that evolving information technologies will bring.

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The fundamental economic factors underlying information technology are unlike those of more traditional assets. Technologists are finding the new economics to be a slippery slope from which to develop new financial strategies. The rate of technical advancement is accelerating, standards and architectures are changing daily, and prices are falling. Nevertheless, the legacy-based management practices and financial strategies of both technologists and financial officers have changed little in the face of these new realities. The jargon of the technical community is rich with sound bites of financial understanding, yet void of any holistic financial plan to deal with the fundamental economics of information technology. Developing rational and viable financial strategies to accommodate technological change is an institutional imperative for effective information technology management.

The new economics of information technology

The fundamental forces driving the economics of information technology are: (1) the value of information technology is steadily increasing; (2) the demand for technology by institutions, faculty, and students is growing dramatically; (3) the acquisition price per unit of computing power is rapidly declining; and (4) the total cost of owning and maintaining technology is constantly increasing. At the same time, there is a constant, if not accelerating, rate of change in the underlying technology that makes the economic life cycle of many technologies surprisingly short. These forces change the fundamental economic equations that determine the wisdom of investing in and managing these technology systems. The new economics are briefly summarized below; a more detailed discussion can be found in an article published in the Spring 1996 issue of *CAUSE/EFFECT*.[1]

Life cycles

Recognizing the economic life cycles of information technology is at the core of understanding the new economics. Each new technology generation has an economic life cycle that is independent of its functional life cycle. Comput-

[1] John L. Oberlin, "The Financial Mythology of Information Technology: The New Economics," *CAUSE/EFFECT*, Spring 1996, 21-29.

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ers rarely wear out. Instead, they become economically obsolete and are replaced. The record of academic institutions is littered with examples of technology at every level—desktop PCs, departmental servers, campus networks, and shared regional supercomputers—that have become functionally obsolete long before their hardware stopped working.

Asset management

The principles of asset management that apply to buying a computer are fundamentally unlike those of buying a truck. If the physical plant purchased a half-ton pickup truck for $25,000, with an expected life of five years, it would have a capital cost of $5,000 per year. At the end of five years, the truck could be replaced with another truck that would cost more, but still be more or less functionally identical. Computers, on the other hand, are quite different. If the physics department purchased a $25,000 computer and amortized the expense over five years, it would also cost $5,000 per year. However, the physics department will be able to spend significantly less on the replacement and still receive a new computer that is superior to the one it is replacing. In cases where this is true, the rule of thumb for making computer purchases is to adopt a life-cycle model, where you buy as little as possible and keep it for as short a time as possible.

Financial pressures

As long as institutions can expect a continual improvement in their return on investments in information technology, they will be compelled to spend an increased percentage of their budget on it. It is a simple economic reality. Any organization in a competitive environment will be forced over time to invest more of its money where the return is greatest. In the case of information technology, where it pays to invest today, it will pay even greater dividends to invest even more tomorrow. This does not imply that technology budgets will expand to 100 percent of the institutional budget. It does, however, mean that we are in an era where technology budgets should be expected to grow steadily over a relatively long period of time.

The business case

Traditional wisdom governing technology investment decisions views the investment decision primarily as an expense issue. In reality, it is a cost/benefit issue, where the investment is in the goals of the institution as well as the individuals charged with advancing them. No dean or department head would fill a faculty vacancy based solely on the fact that one applicant might be less expensive than another. It should be equally ridiculous to make investment decisions for technology based solely on cost.

Competitive economics

The biggest institutional downside of new information technologies is their potential impact on inter-institution competition. For example, if distance learning enabled by technology becomes viable, it could drastically change the competitive landscape. One result would be to break down the regional barriers to competition. If there is new competition, the one thing we can predict with certainty is that there will be winners and losers.

What can institutions do to effectively manage their technology investments in light of these economic forces? What are the fundamental tenets of a new financial game plan for managing those investments?

Reexamine the conventional wisdom

The first tenet of a financial game plan is to reform the conventional wisdom. Campus constituents need to embrace the evolutionary nature of technology and the subsequent need for institutional change, reengineering, and change management. The need for change should not be seen primarily as a threat; instead, it should be embraced as an opportunity for advancing the institution and empowering individuals. The conventional wisdom needs to accept the tremendous promise of information technology without underestimating the total cost or overstating what it can currently deliver.

Plan for change

The paradox of planning for information technology is dealing with the rate of change. In times of rapid architectural and technical change, when the need for a viable plan is greatest, the tendency is to abandon planning because of the belief that the changing environment makes planning impossible.

While planning in this environment is difficult, it is not impossible. If the one thing known with certainty is that technology will change, then the one thing that must be planned for is change. Any financial strategy that impedes change is likely to suboptimize or even undermine the investments that rely on it. Moreover, in a competitive environment where information technology can be key, staying ahead of the technology curve may actually be a critical success factor for institutions.

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Adapt strategies to the rate of change

The rate of change inherent in information technology systems and the computing industry shows no signs of slowing; if anything, it will continue to accelerate for the foreseeable future. The scholarly record is teeming with false predictions that technological evolution is coming to an inevitable end.[2] Instead, it is becoming increasingly clear that we are not at the end of technology history. Financial strategies will need to support technological evolution so that technologists can optimize campus investments over time. Business models that require long amortization periods, *ad hoc* purchasing decisions, or monolithic architectures, will almost certainly drive poor purchasing decisions.

Create financial, political, and social infrastructure

Part of the mythology dominating information technology management is that it is all about technical issues. It can be argued instead that it's actually all about managing change—technical, social, pedagogical, political, and financial. From this perspective, the notion of building technology infrastructure is inconsistent with the notion of constant and rapid change and should be approached with caution. A foundation to build on is one thing; long-term hardware and system investments that are inflexible or static are another. If the phrase "technology infrastructure" means stable hardware, software, or wires in the walls, it borders on being classified as an oxymoron. If it means "long-term" hardware or software, it is *definitely* an oxymoron.

This doesn't mean there isn't a need for technology infrastructure. However, it does imply that hardware and software may not be the most important aspect of technology infrastructure. The changing nature of technology suggests that standards, architectures, and resource allocation systems that allow us to manage changing hardware effectively may be the real infrastructure needed. More exactly, it's not actually the standards or architectures that are needed. The real infrastructure imperative is to create the underlying processes that can produce the standards, architectures, and governance mechanisms to manage the changing technology.

In other words, the infrastructure most needed to support the information era is financial, social, and political, not technical. Financial infrastructure is the institutional commitment to understand the economics, develop appropriate financial strategies, and fund technology adequately. Social infrastructure is the critical mass of faculty, staff, and students who are willing to accept and work for change. Political infrastructure is the collective resolution of senior administrators, trustees, and legislators to support information technology as a strategic imperative for the campus.

Tell the whole truth

Information technology promises to deliver big benefits down the road, but there will also be big expenses. The cost issue is likely the most misunderstood and misrepresented aspect about the future of information technology. The reluctance of chief information officers (CIOs) and technology leaders at all levels to identify the total costs may amount to "the big lie" for information technology. Their reluctance to document these costs is often justified in the short run, as campus executives, presidents, and trustees cringe at the thought of such large numbers and threaten to shoot the messengers. However, CIOs and other technology leaders may be jeopardizing their long-term credibility and casting technology in a negative light by implying that many of the increased costs are unexpected.

If the biggest financial lie has to do with cost, the second has to do with the benefits of information technology. This is typically born from honest yet excessive enthusiasm. The case for technology is very compelling, but it is not a solution to all things, nor are all the promises deliverable yet. Overselling the benefits may help obtain support or funding in the short term, but will almost certainly jeopardize long-term credibility. Financial planners and CIOs need to be careful to ensure that their business cases don't inadvertently sow the seeds of skepticism as a result of overreaching.

Abandon legacy-based thinking

Considering the relatively short history of information technology, it is rich with legacies—legacy systems, legacy architectures, and legacy assumptions about the economics. Given the rapid change that is inherent in technology, planners need to be careful to constantly reexamine the assumptions on which financial strategies are based. Seven assumptions that bear on the financial case for information technology are briefly reviewed below. They include both legacy assumptions that are clearly no longer valid, and emerging assumptions that seem to be based more on wishful thinking than careful analysis.

Myth 1: Falling computer prices and commodity markets will reduce the total cost of campus technology expenditures. Like many of the myths, this is a seductive notion that is easy to buy into. The truth, however, is that falling acquisition prices do little to lower the total cost, and in truth may contribute to increases. As the acqui-

[2] Dan G. Hutcheson and Jerry D. Hutcheson, "Technology and Economics in the Semiconductor Industry," *Scientific American*, January 1996, 54-61.

sition price falls, more users buy more technology. The growth in demand for more powerful computers and support is growing faster than prices are falling.

Myth 2: Cheap PCs with the power of mainframes are making distributed computing cheaper than central computing. Similar to the assumption above, this myth overlooks the increase in demand for computing power. More importantly, it fails to take into account the additional support costs associated with maintaining distributed computing systems. There are numerous studies by the Gartner Goup that demonstrate the growing total cost of distributed computing.[3]

Myth 3: The marginal cost of supporting another software package, hardware platform, or standard is small. Much of the increased cost of distributed computing systems can be attributed to the decentralized and heterogeneous nature of the environment. The result is a highly complex web of computers and networks that is very difficult and expensive to support. Adding another brand of computer, software version, network protocol, or operating system causes the complexity to grow exponentially. The result is often a more heterogeneous environment and much higher total costs.

Myth 4: Information technology investments can be effectively managed through an ad hoc funding process. One problem with *ad hoc* funding is that it spawns *ad hoc* decision-making. This is fundamentally inconsistent with the need for information technology organizations to proactively manage change to ensure maximum effectiveness. A second problem is that individuals and organizations often have no faith that *ad hoc* funding will be there to replace their three-year-old computers. Therefore, they have strong incentives to purchase today the most expensive computer they can, a practice that leads to excessive spending as well as a loss of future benefits as a result of more timely upgrades.

Myth 5: Personal computers and distributed computing environments mean an end to central computing authority and enterprise-wide standards. PCs are highly valued because of the freedom of choice they give to individuals. Faculty, staff, and students can customize their computing systems to meet their personal preferences. The advent of PCs has clearly reduced the campus hegemony of central computing organizations. But this may be about to change. As stated previously, these environments are becoming increasingly complex and expensive to support, and campuses are under pressure to ensure that it all works together. Similarly, the need on many campuses for enterprise-wide solutions to networking, e-mail, and data storage problems is highlighting the necessity for a stronger central computing authority.

Myth 6: Emerging technologies and technology-based services will be cash cows for higher education institutions. There is a growing consensus that information technologies, and distance learning technologies in particular, will markedly contribute to the financial well-being of many institutions. This belief appears to have its roots in the notion that these new systems will truly disintermediate students from campus and faculty, thus allowing cost savings from reductions in faculty as well as bricks and mortar. There are problems with this assumption. First, the scenario implies that education would be transformed into a highly profitable enterprise. If true, it would spawn a whole new set of profit-motivated competitors that would either drive down prices (and thus profits) or force campuses as we know them today to change radically. In either case, there would clearly be very high costs. Second, even in the best-case scenario, the cost of aquiring and developing the new system will likely make the financial crisis worse before it makes it better.

Some Economic Myths about Information Technology

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Myth 2: Cheap PCs with the power of mainframes are making distributed computing cheaper than central computing.

Myth 3: The marginal cost of supporting another software package, hardware platform, or standard is small.

Myth 4: Information technology investments can be effectively managed through an ad hoc funding process.

Myth 5: Personal computers and distributed computing environments mean an end to central computing authority and enterprise-wide standards.

Myth 6: Emerging technologies and technology-based services will be cash cows for higher education institutions.

Myth 7: Higher education is leading the information technology industry in setting standards and functional requirements.

[3] Gartner Group, "Total Cost of Ownership," *Management Strategies: PC Cost/Benefit and Payback Analysis,* 1993, 36.

"The deciding criterion for investing in technology is not cost, it is cost/benefit."

Myth 7: Higher education is leading the information technology industry in setting standards and functional requirements. Higher education has an important leadership role to play to ensure that emerging technologies deliver on the educational promise. However, the higher education community needs to be mindful that the educational marketplace is only 6 percent of the total technology marketplace, and that the large size of industry and household markets will continue to drive many of the important development decisions and directions.[4]

Do the right financial analysis

A frequent charge leveled at higher education is that it is falling behind the curve of what society is demanding of it. Investments in information technology are an opportunity to help close this gap. However, the decision to invest in educational technologies is often restrained by using either conventional methods of capital investment analysis, or no analysis at all, where the conventional wisdom tends toward ignoring hard-to-measure benefits. When a formal analysis is done, the value of technology is almost always underestimated because of a hesitancy to include anything but the most directly obvious benefits.

Adopt principles of strategic cost analysis

Technology leaders need to expand their level of sophistication when analyzing these decision points and begin adopting the principles of "strategic cost analysis" so their respective institutions can better understand the financial impact of these investments.[5] Shank and Govidarajan argue that traditional methods of financial analysis of information technology investments need to be extended to a more holistic assessment that includes three strategic considerations: value chain analysis, cost driver analysis, and competitive advantage analysis.[6] By doing so, organizations will be better prepared to judge the value of technology. Following the strategic cost management paradigm, institutions will be better prepared to: (1) identify technology's impact on value-creating activities within the organization, (2) understand the cost structure that supports their strategic choices, and (3) realize the implications of how technology allows them to compete more effectively.

Understand cost/benefit and return on investment

The deciding criterion for investing in technology is not cost, it is cost/benefit. The financial game plan would be incomplete without an understanding of the appropriate scope for cost/benefit assessments. Analyzing investments in either central systems or distributed environments without considering the impact on the other, or on the larger institutional environment, will almost certainly produce poor results. As the demand for information technology grows, individual campus constituent groups will pressure administrators to place their respective technology needs ahead of others.

A challenge for central computing administrators in this environment will be to understand each of these perspectives and function as mediator in the funding equation to ensure that the sum of the parts continues to be greater than the individual pieces—a difficult prospect in a decentralized environment. The challenge will be to balance the demands of individual departments against the needs of the institution as a whole. Solving sub-problems does not solve the larger problem. It would not be unusual for a research university with 25,000 students to own 18,000 computers (not counting student-owned machines) with an asset value of $90 million dollars. Maximizing the return on these investments, department by department, may be much different from optimizing their return for the institution as a whole.

Take a life-cycle approach to budgeting

There is a great need to understand life cycles and to budget accordingly. Without this approach, colleges and universities will continue to make purchases that suboptimize their investments in information technology. If faculty, departments, and technologists continue to face an *ad hoc* funding equation when they plan for replacing their current technology, they will continue to make the worst possible investment decisions. Life-cycle budgeting can build confidence, promote coordination, and educate faculty, departments, and campus administrators. It shifts the emphasis away from the acquisition of technology and focuses the financial question on its replacement. The initial acquisition of information technology takes place only once; its life-cycle replacement should be considered a financial perpetuity.

Many skeptics of budgeting and planning for information technology view long-term planning for technology as an oxymoron. Although they may be right in some ways, life-cycle budgeting offers the best chance to prove them wrong. Learning this technique and using it is a critical first step toward overcoming the legacy-based planning biases of the past. Life-cycle planning can be used to: (1) avoid unplanned "expectation inflation," where both planners and users continually underestimate the demand for future

[4] "PC Unit Shipments by Key I.S. Market Locations," *IDC's 30th Annual Computer Industry Briefing Session,* 1994. (Track 5–Services/Consumer. Report #5).

[5] John K. Shank and Vijay Govindarajan, *Strategic Cost Management: The New Tool for Competitive Advantage* (New York: New York Free Press, 1993).

[6] John K. Shank and Vijay Govindarajan, "Strategic Cost Analysis of Technological Investment," *Sloan Management Review* 34 (1992): 39-51.

information systems; (2) combat unrealistic "life-cycle optimism," where planners are coerced by their own false optimism or pressure from superiors to adopt an overly optimistic estimation of the true life-cycle of technology investments; and (3) clarify the forces driving widespread, but largely uncoordinated, "investment creep," where institutions, schools, and departments continue to marginally expand their technology budgets in an *ad hoc* fashion despite their best efforts to hold them flat and deny the need.

Develop new financial strategies

The dominant financial strategies of the past decade include: (1) positioning information technology as a vehicle for cost savings, typically through simple automation applications; (2) supporting distributed computing at any cost, with the belief that personal computers would lower the total cost of computing; (3) treating the funding gap as a problem to be solved by the technologists; and (4) posing acquisition decisions as *ad hoc* funding considerations that are truly one-time by nature. These strategies are inconsistent with the new economics of information technology, and if technologists continue to support them, they will be their own worst enemies when dealing with the economics. The strategic importance of information technology demands a reassessment of the financial strategies assembled to support it, as well as the assumptions underpinning them.

Plan on spending more

Institutions must plan to spend more money on information technology if they expect to realize the benefits. According to the Department of Commerce, 1990 was the first year capital spending on the information economy (that is, on computers and telecommunications equipment) exceeded capital spending on all other parts of the nation's industrial infrastructure.[7] The message for higher education is clear: the only credible financial strategy is to spend more or let the technology wave pass by. Superior strategies will focus on architectures and implementations that support the enterprise, build synergy, and eliminate redundancy. These strategies will offer opportunities for cost avoidance, but not cost reduction.

Articulate the business case

The case for information technology is that it is a long-term investment in the competitive standing and productivity of the institution. Information technology expenditures do not directly compete with personnel and are actually a necessary investment in human potential. They should be considered an implicit part of the college or university benefit package. It is not unusual for a Research-I university with a student body of 25,000 to spend $40 million a year on information technology. Given the increasing demand and the improving cost/benefit equation, pressure will mount to spend even more, perhaps significantly more. In this environment it will be critically important for senior officials and chief information officers (CIOs) to have a good grasp of the numbers and strong financial controls. Developing and maintaining the business cases will rely on getting the numbers right. New money will be hard to find without a fundamental trust in the system that analyzes and manages these investments.

Position the funding problem

Departments, schools, and central computing administrators will need to collaborate to make the case for information technology, but only financial officers, vice presidents, vice chancellors, presidents, trustees, or even legislators will actually be able to solve the financial problems. The funding problem needs to be positioned within the bureaucracy at the appropriate level to have it resolved. Telling a director of academic or administrative computing that a million-dollar funding gap is his or her problem to solve is entirely unacceptable. Similarly, department chairs and deans with funding gaps will have to pass some portion of them forward, as they also can't be solved solely in the academic departments. However, the case of deans and department heads is unique when compared to central computing organizations. Part of the funding gap must be resolved internally in these departments as technology becomes a larger part of their respective budgets. CIOs need to play the lead role in bringing these individuals together and outlining the cases to be made. Many institutions will be looking at expenses of millions of dollars a year (while larger universities will be facing tens of millions of dollars) and will need support and understanding at senior levels before they can proceed.

Fund information technology as a perpetuity

The financial environment for evaluating and managing information technology investments is very complex. These investment decisions are rich with technical, architectural, and management considerations. Moreover, they often involve questions of equity in how resources are allocated, who benefits most, and how much support will be available. These issues, combined with the sheer number of decisions—across central and decentralized units; among

"The funding problem needs to be positioned within the bureaucracy at the appropriate level to have it resolved."

[7] Shoshana Zuboff, "The Emperor's New Workplace: Information Technology Evolves More Quickly than Human Behavior," *Scientific American*, September 1995, 202-203.

Tenets of a New Game Plan

✓ **Reform the conventional wisdom**

- Plan for change
- Adapt strategies to the rate of change
- Create financial, political, and social infrastructure
- Tell the whole truth

✓ **Abandon the myths of legacy-based thinking**

✓ **Do the right financial analysis**

- Adopt principles of strategic cost analysis
- Understand cost/benefit and return on investment
- Take a life-cycle approach to budgeting

✓ **Develop new financial strategies**

- Plan on spending more
- Articulate the business case
- Position the funding problem
- Fund information technology as a perpetuity
- Recycle old technology

faculty, staff, and students; and over academic and administrative units—perpetuate the belief that it is impossible to make rational holistic decisions about these investments. The natural tendency is thus to manage them as a series of *ad hoc* decisions.

There is, however, hope. The key is to separate the myriad of short-term technical considerations from the longer-term funding decisions. Consider faculty desktop computers. Life-cycle budgeting offers the opportunity to convert this chain of apparent one-time funding decisions into an annual expense. The basic life-cycle equation (number of units x price/unit ÷ life-cycle years = annual cost) converts the hardware expense of faculty desktops into a reasonably stable long-term perpetuity.[8] The financial *strategy* is to identify the perpetuity and manage it over time. There will be many technical decisions that will vary over the years (what to buy, what standards, what architectures, what operating systems, and so forth), but the financial equation will be more permanent.

Even though the financial perpetuity is more stable than the technology, it will still vary and will need to be managed. The assumptions about quantity, price, and life cycle require continual review and updates. The financial *management* question is to determine whether the perpetuity is expected to decline, remain flat, or increase over time. The emphasis needs to be on the continuing cost over time, not the arbitrary cost of any particular year.

When this example of faculty computers is combined with other enterprise-wide technology service areas (e.g., networking, data storage, e-mail), a collection of perpetuities can be developed. The financial strategy thus expands to the notion of managing these expenses as a portfolio of perpetuities, where services will come and go, some will grow, and others will decline. The strategic imperative for the institution is to maximize the return on the portfolio.

Recycle old technology

Developing strategies to manage technology life cycles is a fundamental requirement of any new financial game plan. Technology rarely wears out, but it does become obsolete remarkably fast. The result is a clear need to recycle old technology on campus as well as off. Recycling old technology on campus has limited potential because it rests on two problematic options—one is to hand down computers from one department to another, the other is to hand down computers from faculty to staff. There are several problems with both of these cases, including: (1) the cost of physically redeploying the technology is high, (2) there are potential problems with equity between departments, (3) it assumes that the computers will be recycled before the end of their life, and (4) it assumes that there are campuswide network standards in place that will allow them to function at all. The greatest downside of recycling computers is the possibility of redeploying obsolete technology that would make the campus support problems worse, not better.

The challenge is thus to develop financial strategies that recycle old technology off campus. The best strategy to accomplish this may be leasing. Leasing has several advantages: (1) it sets a clear expectation that technology will be replaced on a regular life-cycle basis; (2) it shifts the burden of recycling to the vendor, who becomes responsible for disposition of the computers at the end of the lease; and (3) it offers the opportunity, depending on how the lease is structured, for the institution to recapture the salvage value of old technology before it goes to zero.

A leasing strategy that clearly commits an institution to a policy of life-cycling technology has tremendous potential. It represents an institutional commitment to managing change and is an example of the new type of infrastructure needed

[8] John L. Oberlin, "Departmental Budgeting for Information Technology: A Life-Cycle Approach," *CAUSE/EFFECT*, Summer 1994, pp. 22-31.

to manage technology evolution. It highlights the need to not just set campus standards, but to manage them over time. It also creates new urgency and opportunities to partner with vendors. In this scenario, lead vendors would be asked to play a greater support role, manage the transition from one generation of computer to the next, and participate in developing longer-term campus technology architectures.

Conclusions

The new economics of information technology demand new financial strategies to manage them. The tenets of a new financial game plan must include: (1) a commitment to change the conventional wisdom to recognize the new economic realities, (2) a clear resolution to abandon legacy-based technical and economic assumptions, (3) a shift toward better economic analysis of the investment decisions being made, and (4) an institutional resolution to develop new financial strategies that are consistent with the economic realities of the information era. Two of the most challenging strategies will be the commitment to spend a greater portion of the institutional pie on technology, and the need to manage technology life cycles proactively by focusing on replacement strategies and recycling.

While chief information officers, financial officers, and academic leaders will have to come together to develop and implement these strategies, it is the role of CIOs that is likely to change the most. When viewing information technology systems in aggregate, the CIO's ability to bring information technology to bear on the organizational imperatives of his or her institution might be the single most important factor in determining how technology is valued.

It is not surprising that chief information officers have a difficult job when it comes to delivering a set of services whose value is difficult to quantify and hard to measure directly. To make the information technology function a valuable asset to their respective institutions, CIOs should view their job as adding value to critical areas.[9] They need to know the critical success factors inherent in their institution's plans and be able to link information technology to these plans to create value chains where they are most needed.

As strategists, CIOs need to provide more than just the technology infrastructure. They need to be actively involved in developing the business plans and financial strategies that close the gap between today's realities and tomorrow's promises. It may prove to be more important to have a chief information technology strategist than it is to have a chief technologist.

C/E

Current Issues...

(continued from page 7)

- What can we do? There are several things we can do, including: (1) build an action plan for promoting understanding and support for a diverse environment, (2) train people in how to recognize diversity and how to work with the different perspectives brought together in a diverse work environment, (3) perform cultural audits to provide data on your organization and then use that data when managing the organization or hiring new personnel, and (4) seek ways to diversify the workforce where such change can better lead to achieving organizational goals.
- What are the risks? One risk is that with a broadened view of diversity we may lose some emphasis on the critical issues of under-represented groups. Another is that faced with other pressures (changes in affirmative action legislation, budgets, changes in technology, shake-ups in higher education), we may not give this issue the attention it needs.

➤ Electronic Data Interchange (EDI)

Electronic data interchange is a set of transaction templates defined by the X.12 standard that occur in a secure environment and permit application-to-application transmission of information. While several hundred templates exist for business purposes, EDI for education has only recently become available. For example, EDI permits the transfer of grades from a junior college to a four-year college or university. To date, the use of EDI by education has lagged far behind the private sector, where some companies only accept electronic transactions; for example, Ford Motor Company will only do business with suppliers that can process transactions by EDI. Certain services, such as credit card purchases for business purposes, may only be available if EDI is used to process the billing and payment transactions.

- What issues must be addressed for EDI to be effectively used in education?
- Do we have an accepted definition of EDI?
- What are the most likely applications of EDI in higher education?
- How will security and privacy be addressed?
- What are the costs of doing EDI? What are the savings?
- Does EDI require a value-added network (VAN), or can the Internet be used in place of a VAN? If so, how?
- How will the secure World Wide Web protocols affect the use of EDI?

C/E

"As strategists, CIOs need to provide more than just the technology infrastructure."

[9] Michael J. Earl and David F. Feeney, "Is Your CIO Adding Value?" *Sloan Management Review* 35 (1994): 11-20.