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**ACUTA's Core Values are to:**
- Share information, resources and insight,
- Respect the expression of individual opinions and solutions,
- Maintain our commitment to professional development and growth,
- Advance the unique values and needs of higher education communications technologies, and
- Encourage volunteerism and individual contribution of members in support of organizational goals.
Information technology is critical to the future of every institution and the present funding model used to fund too many IT operations is inadequate and unpredictable.”

Tritsch, Metz and Kuhn, page 6

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Is the Sinking Fund Sunk?
Geoff Tritsch, Dave Metz, Bob Kuhn

Today we find IT exploring chargeback models similar to those used by telecom. This article looks at questions we need to ask, such as: “What is the role of a sinking fund in today’s financial environment?” and “If it is to exist at all, how much should it be?”

Hosted Services: It’s Not Your Father’s Centrex
Jay Brandstatter

For those considering IP telephony alternatives, the hosted PBX offers the key advantages and economies of scale of the centralized approach and the rich feature capability and flexibility of the IP-PBX: truly, says Brandstatter, the best of both worlds.

Analyzing Costs, Setting Rates, and Improving the Bottom Line
George Denbow

Denbow describes how the University of Texas calculates rates and establishes cost models using methods that are flexible enough to accommodate the inevitable changes.

Will Cellular Services Deals Restore the Bottom Line?
Curt Harler

Many campuses are turning to cellular services offerings to replace at least some of the revenue lost with the demise of long distance resale. Read what some of these campuses have to say about the possibilities and the unknowns.

How Telecom Managers Are Adding Value Within the IT Organization
Randy Burns

The merger of the management hierarchy in voice and information technology offers both challenges and opportunities to university telecom professionals. Burns explains how savvy telecom managers are creating value for their organizations using their expertise in cost allocation and billing.

Introduction to Finance
Maggie Lenke

Today’s communications professional participates in the budget process. This article describes some basic approaches and how you might present each one to earn for yourself an extra measure of credibility.

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From the Executive Director
Jeri A. Semer, CAE

Thanks to the companies who support ACUTA by advertising in our Journal.
ACUTA's recent seminar on Financial Modeling for Communications Technology was extremely well attended, and the majority of first-time attendees were from the financial side of the information technology organization. Clearly, funding for communications technology now and in the future is a priority for all campuses.

At Northern Illinois University it was simple to do financial modeling during the last decade when toll minutes and revenue were increasing and costs were declining. Now that costs are stagnant or increasing and revenues have dropped by more than seventy percent, things are a little more complex. While the university was fortunate to use the telephone model of department chargeback for network connections at the beginning, it did subsidize these rates with revenues from toll-resale. Trying to increase rates while everyone is suffering budget reductions is not an easy task.

At my last campus task force meeting on technology, many asked if we would ever see the benefits of the good old toll-resale days, and I had to answer no. But services are needed, and people do communicate. The place to begin financial planning is to get a handle on all your costs and tie those costs to the services you provide. The next step is to see what kind of rates you need to support these costs and compare them to market rates for similar services. Whether you charge back or receive direct funding, being able to compare your institution to the outside marketplace helps with justifying more money or having to pay serious attention to cost reductions or outsourcing.

At Northern we will eventually raise our rates for data services as we currently charge much less than the marketplace is charging for similar services. In addition, wireless is huge with our students and becoming more important to faculty and staff every day. In spite of the difficulties, it is clear that we will get into cellular resale and more WiFi services. NIU will also pursue providing music, movies, and HDTV for revenue opportunities in the near future. We have spent the last two years in cost-control mode and hope that this will be the last year of reductions, and that small but positive increases will begin in 2005.

One interesting phenomenon from our past experience is that we have automated everything and reduced staff in almost every department except one—customer service. Our primary job is still to provide an education for our students; and as technology becomes much more pervasive, the need for help to make it work continues to grow. It is clear to me that all of us must become surgeons at budget cutting during times of reductions to ensure that our mission can continue and that when funds are available, we will be near the front of the line and not first on the outsourcing table.
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Is the Sinking Fund Sunk?

by Geoffrey C. Tritsch
David C. Metz
Robert M. Kuhn, PhD

A growing part of our technology consulting work seems to be revolving around financial issues these days. This is not surprising. Many institutions are struggling with the same issues: Technology is vital to the future of today’s institution; however, technology is expensive and money is tight. Services that always have been “free” cannot continue to be unallocated and untracked, especially when costs spiral upward and the demands for new and better services continue to increase.

Before we get to the specific question of sinking funds, let’s take a minute to address the question of why there is a growing interest in new funding models and charging for IT services. The reasons are both financial and technical.

Most schools have traditionally charged for telephone services but have not charged for data services. This worked fine while information technologies were new, unusual, and/or limited in scope and use. Now that network access, e-mail, administrative computing, technology in the classroom, and all other aspects of IT services are critical to the day-to-day functioning of almost every department on campus, however, IT can no longer be treated as a specialized application. Everyone needs it. Everyone uses it. It is a part of every university’s strategic plan. Therefore, it is imperative that the institution recognize the critical role that IT plays and understand the fact that IT must be adequately funded. The funding method is not of major importance. Telephone service is a utility and it is chargeable; electricity is a utility and it is not. A funding model, however, whether funded centrally or allocated to the users, must

- Provide identified pricing/funding strategies that can adjust to meet future needs, whether foreseen or unforeseen.
- Allow services to be evaluated within a broad framework of fiscal responsibility and accountability.
- Equitably address long-term, cost-effective IT operations.
- Have flexibility to cover a wide range of clients and services.
- Be scalable under the ever-increasing pressure of escalating demand for network throughput and new network services.
- Meet the technology objectives put forth in the institution’s strategic plan.

Furthermore, with technology moving inexorably toward the convergence of voice and data (with technologies like voice over IP, unified messaging, soft phones, and multimedia documents), it will become increasingly difficult to tell the difference between voice and data technologies. Voice will eventually become just another application on the network, and the telephone may become just another application on the PC. The pros and cons of all this is the subject for another article, but now is the time to
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Without a significant change in the way that technology is funded on campus, IT will not be able to meet the long-term goals of the institution, implement new technologies, or even continue to support the current technologies already on the campus.

begin the process of combining telephony and data under a single, unified business model with a single, unified method of allocation, if not chargeback.

As part of our cost allocation/chargeback activities for clients, we are often asked, "Should I make allowances for a sinking fund as part of the financial model?" The answer, in good consulting fashion, is "yes and no." (I've often thought that if you ask a consultant his favorite color, the answer would be "plaid.")

Financially, a sinking fund is defined as a fund into which a company sets aside money over time, in order to retire its preferred stock, bonds, or debentures. Over time, however, especially in the world of higher-education technology, the term has come to mean money set aside for the future purchase of new systems.

The idea of a reserve or sinking fund is not new. Sinking funds gained a great deal of popularity during the heyday of student resale when telecommunications departments were generating excess revenues that were used for everything from student phone systems, to wiring dorms, to LAN expansions and even dorm renovations. At that time, the idea of putting money aside to buy the next generation of equipment made sense. Given that the future is always uncertain, for those schools able to hold on to money beyond the fiscal year's end, putting money aside was certainly preferable to turning it back to the general fund. Everyone had their eyes on telecom's pot of gold, and certainly much more than phone systems were funded from this source.

Today's Reality

Today, the uncertain future has come to pass. The resale cash cow is dead. Funding is tight. Cutbacks of budgets and personnel are the rule rather than the exception. But still the lure of being able to set up a sinking fund lives on. Now, as we find IT exploring chargeback models similar to those used by telecom, we need to ask the questions "What is the role of a sinking fund in today's financial environment?" and "If it is to exist at all, how much should it be?"

Let's take a concrete example. Most of us need to take out a car loan if we want to buy a car. We pay that back over a period of time along with interest. This is the standard postpaid environment (paying for the car after the fact). Let's say that through some good fortune you have cash-in-hand to buy a new car. You know that down the road, however, you will eventually need another car and may not be so lucky as to have the money again in the future. But you do have a good job and therefore decide to bank what you would have paid for a car loan so that you will be sure to have the money when you need it 3, 4, or 5 years down the road. This is a sinking fund. And in this case you have prepaid for your next car rather than borrowing money for it.

The same is true for a telephone or data system. In the standard postpaid environment, you pay for equipment as a one-time capital expense (or finance, lease, or rent it in order to spread that one-time cost over time) and then collect money from the users to cover that required debt service or ongoing cost. But let's say that, for whatever reason, your endowment fund has more money than is needed for operational expenditures, and the fund gives you the up-front money to buy your system. You still charge your users as if you were making debt-service payments, but you squirrel away the collected money for purchasing equipment in the future because you are smart enough to know this largesse will never happen again.

When money was plentiful (especially money from "outside" sources), interest rates were high, and technology was king, the idea of setting aside some money for future purchases made sense. If you have the money initially, prepaying can be financially beneficial because of the earning power that money has over time. (Or had over time. I don't know about you, but I get about as much interest from the money in my sock drawer as I do from the money in my savings account.)
The idea of being able to fund tomorrow's new system from today's revenue stream, however, may no longer be valid. Money is tight all around, and it is not fair to current users to both expense the current capital expense and create a replacement fund, as those users end up double-paying for the equipment. If you do decide to move from a postpaid to a prepaid environment, it should be done over an extended period to ease the burden.

The Annualized Funding Model

This concept of keeping technology up-to-date brings us to another aspect of this issue: The IT budget needs to be expanded to include the funding for ongoing hardware or software replacement or upgrades.

For IT to be up-to-date and responsive in a rapidly changing environment, IT must, to the greatest extent possible, move away from a one-time funding model and toward an annualized funding model. Most capital items at colleges and universities (e.g., buildings, landscaping, power plants) have lifetimes of 10 years or more and are often upgraded as parts wear out, not as a whole. This approach does not work for technology. Technology life cycles are short—frequently less than 3 years and often less than 2 years—and the systems must be kept up-to-date if they are to be of reasonable use.

Buildings are frequently funded with a large amount of money up front and a small amount (if any) for ongoing support and maintenance. We refer to this financial model as a "pulse-funding model." Unlike buildings, however, technology changes. Over a given period of time, the capabilities of any given technology increase while the costs for that technology decrease. Pulse funding forces the university to buy technology all at once (up front) when the costs are high and the capabilities low. Going to a flatter, annualized funding model would allow
the university to buy the technology as needed, getting more capabilities for each dollar spent.

The other common use of a sinking fund is to smooth out the bumps of system ownership. This is still a valid concept and a prudent one. Any good chargeback methodology should include some money to be set aside for enhancements, expansions, upgrades, and hardware and software release updates. Without it, a system tends to stagnate when funding for necessary enhancements must compete against other, more glamorous uses of capital. The costs of keeping a system up-to-date should be viewed as part of the ongoing maintenance and operational costs of ownership. With this in mind, we recommend that a sinking fund should probably be in the range of 10–20 percent of the debt-service amount set aside for upgrades and enhancements. (I repeat, upgrades and enhancements, not growth. We'll talk about funding growth later.)

Operating Leases

Another common way to attempt to address these upgrade/expansion issues is through operating leases. An operating lease can be attractive in times of short product life cycles and low residual values, such as we see today with information technologies. In addition, this type of leasing moves the expense from a capital cost to an operating cost and helps to even out the unpredictable spikes that result from one-time capital allocations.

Leasing also has its downside. A lease forces the upgrade/replacement of the leased equipment at the end of the lease, often at a time that is not convenient or necessary. (This may not be true if it's a lease/purchase. Then again, do you really want to buy the equipment at the end of the lease? It's used, it's obsolete, and the reason you leased in the first place was that you didn't expect the equipment to have any residual value.) In addition, most leases also carry a cost of money that is higher than what the university can obtain on its own. All of this results in the fact that IT should be allowed a great deal of discretionary use of its funds and allowed to implement streamlined purchasing procedures. When a product has a useful life of 3 years or less, budgeting, approval, and procurement cycles that take more than a year are not productive.

Room to Grow

Most schools have no set methodology for dealing with the change and growth that is occurring almost daily. Technology change includes the addition of totally new services, applications, and technologies, as well as augmentation and expansion of existing technologies and services. It is self-evident that any such new technologies will have associated costs. It should also be clear that the expansion of a service will increase costs. Yet, it is not necessarily evident to the users or to the university when such expansion has taken place.

Let us consider the network infrastructure. Almost any school will tell you that there has been growth in the number of network connections. This is not the whole story on the network, however, because in addition each network connection is consider-

ably busier than it was. Not only are there more smart classrooms than before, but each is being used in more sophisticated ways that require more sophisticated support. Some, but by no means all, of this increased activity is itself offset by improved technology. Improved network management tools, better networking software, and better interfaces mitigate some of the pressure of Moore's Law. It is therefore imperative that technology funding reflect the increased demand being placed on technology, and that it scale with demand.

Compass recommends the establishment of a “per-port growth cost” by dividing network infrastructure cost by number of ports. One must keep in mind, however, that because of increased complexity of the network and the increased activity per port, the marginal cost per port is not necessarily linear. This calculated escalator needs to be built into future budget projections, whether or not this increase is funded by any internal charging. One should not be lulled into the belief that such an amount would suffice to support the network indefinitely, however. Ultimately, growth is not enough; new equipment is required, and the cycle starts all over again.

All of this discussion assumes that you can set that money aside and carry it forward from year to year. In many institutions, especially state schools, that kind of carry-forward is not permitted. If that's the case, you need to try to build that 10–20 percent into your operational budget. Not easy.
Summary

Four points stand out clearly:

- Existing services must be quantified and expansion in those services must be funded, whether or not there is any cost recovery for those services.
- Funding for researching new services is most often inadequate.
- New services should only be added when a source for ongoing funding is provided.
- New ports should only be added in accordance with the calculated "growth per port." In the case of new building construction or major renovation, these up-front costs should be built into the total project budget.

Sinking fund or no sinking fund, purchase or lease, one thing is ultimately clear: Information technology is critical to the future of every institution and the present funding model used to fund too many IT operations is inadequate and unpredictable. Without a significant change in the way that technology is funded on campus, IT will not be able to meet the long-term goals of the institution, implement new technologies, or even continue to support the current technologies already on the campus. There are no simple solutions. There are no "right" answers. There are no "silver bullets." Generally, the approach must be to recognize the value of IT to your institution as a whole and fund it in such a way that technology requirements can be supported now and into the future.

Geoff Tritsch is president and Dave Metz is vice president of Compass Consulting International, Inc., an independent consulting firm specializing in the unique technology needs of higher education (see www.compassconsulting.com). Geoff and Dave can be reached at tritsch@compassconsulting.com and metz@compassconsulting.com, respectively.

Dr. Robert Kuhn is executive director of technology for Simmons College in Boston. Reach Bob at robert.kuhn@simmons.edu.

Footnotes
1 In purely fiscal terms, this makes a lease unattractive unless the residual value realized at the end of the lease exceeds what the institution could attain on sale.

2 Moore's Law states that computer hardware doubles in speed every 18 months. This rate of growth can be seen with most hardware, such as hard disk capacities. This growth rate pushes the usage and hence computer capacity.

3 To see that this is the case, consider the complexity of the network in terms of the possible "conversations" or interactions between devices. If there are n devices on the network, then there are \( n(n - 1)/2 \) pairs of devices. So, complexity would be expected to rise as the square of the number of devices. Of course, there are going to be some economies of scale, so it is not evident how the cost-per-port will change with the size of the network. Nonetheless, if you add a few hundred ports to the thousands currently in place, a linear approximation (i.e., dividing the cost by the number of ports) is the best available approximation providing it is understood that an occasional adjustment will be required to keep the per-port growth cost in line with real costs.

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For those considering IP telephony alternatives, the hosted PBX offers the key advantages and economies of scale of the centralized approach and the rich feature capability and flexibility of the IP-PBX: truly, the best of both worlds.

Can Centrex survive or perhaps even thrive in the era of convergence? The PBX has dominated enterprise voice communications for many years. Hosted or “centralized” voice services, often called Centrex, had been in decline for some time when voice over Internet protocol (VoIP) started to accelerate in the late 1990s. The capabilities and possibilities of the emerging IP-PBX added to the attractiveness of premises-based solutions for the enterprise. Centrex has significant value for many users: It eliminates most of the expense of buying and operating a PBX, and it has key central-solution attributes, such as easy growth/scalability and use of highly reliable carrier-class platforms. Centrex success has been limited, however, and has generally not kept pace with premises-based solutions in functionality, flexibility, and cost-effectiveness.

What can be done to revitalize Centrex and give telephone companies and other service providers a hosted offering that competes with the premises-based solution, especially the IP-PBX? The movement to communications convergence and the economic downturn have been accompanied by new challenges and new ways of looking at old problems. Some believe that a new breed of competitive hosted voice services has already arisen. These solutions are driven by a number of factors including the following: (1) the inherent advantages of IP communications, (2) advances that allow the limitations and inflexibility of original-generation Centrex to be overcome, and (3) renewed attention to outsourcing in the current economic climate.

There are analyses and trade-offs between hosted approaches—some of which include the Centrex label—and customer-premises voice systems. The terminology of these variations in IP-based telephony is itself confusing and a little intimidating to the uninitiated. For example, what are IP Centrex, Centrex IP, IP-PBX, and hosted PBX? How do these alternatives compare?

**Historical Perspective: How Did We Get Here?**

A brief historical perspective may make our examination of IP telephony alternatives more meaningful. Centrex or provision of PBX capabilities from the telephone central office (CO) was made possible by computer-controlled switch technologies. Early on (in the 1960s and 1970s), the feature and function set of the typical PBX was not particularly robust, so replicating it was fairly straightfor-
ward. Also, early on, the phone companies (AT&T, in particular) retained the dominant position in PBXs. However, over time, the gap between premises-based PBX capabilities and the less functional version “hosted” by the CO grew significantly.

The rules changed with divestiture in 1984. All of a sudden it wasn’t just an internal accounting exercise when PBXs were sold— it was lost revenue. The phone companies needed a competitive price-performing Centrex product to do battle with the customer’s PBX. In the last 15 years or so, PBX functionality has continued to grow and expand, and Centrex has hardly kept pace, even with ISDN added to the mix. However, Centrex has found some success in generic small medium enterprises (SME) and selected large-scale deployments in government, education, healthcare, and commerce.

The limited Centrex success in SME was due, in large measure, to the lack of cost-effective premises-based offerings for that segment. Penetration by Centrex in many of the larger deployments was because of limited staff, resources, and infrastructure in the user organization. In the main, however, feature/functionality richness, user control, and favorable ownership economics have maintained the PBX as the dominant approach. Moreover, Centrex providers were typically slow to respond to users’ needs and charged high prices for even simple moves, adds, and changes (MACs).

Certainly the technologies of IP telephony and convergence have changed the landscape. As noted, the IP-PBX emerged in the late 1990s, posing not only new threats to traditional Centrex but also new opportunities for Centrex and Centrex-like hosted solutions.

**IP Telephony Options**

There are numerous ways to provide IP telephony at the premises of an enterprise or organization. In the legacy circuit-switched environment, the user site either had local switching equipment, such as a PBX or key system, or it did not. If the site didn’t have that equipment, then its phones received service from a switch located elsewhere—for example, Centrex service provided from a CO. There were a couple of variations of this model: A few lines (or phones) could be handled as “off-premises” extensions of a distant switch, and “remote” switches, connected via T1s (or ISDN PRIs), could extend the range of a distant switch for larger groups of users. These means of extending the range of a switch apply to both PBX and Centrex environments. Physical distance is a significant factor in legacy telephony; but many options change, and distance limitations are
basically eliminated with the openness and geographic independence of IP communications. This includes the reduction or elimination of many distance-sensitive costs (i.e., mileage charges) of legacy telephony. Further, there is now more room for new kinds of IP telephony service providers in addition to the previous model of the end-user organization or the local carrier as service provider.

The IP-PBX has, of course, received significant attention in the last 4 to 5 years. The following are three variations of this system:

1. **IP-enabled**, where the legacy PBX has additional interfaces for IP trunks and/or IP lines but retains the time division multiplex (TDM) switch and everything else.

2. The **converged (or hybrid) approach**, which has both native IP networking and the TDM switch fabric for legacy connectivity and CPE.

3. The **client/server model**, which is an all-IP approach with appropriate gateways or “media converters” for interfacing to legacy lines/trunks, devices, and the PSTN.

There are analogues of these approaches in Centrex and hosted options. Note that two significant aspects of the IP-PBX are the applications and services provided to users in addition to and often far in excess of basic telephone capabilities.

Looking at adding IP capability to the Centrex/hosted solutions, one could start with the “big iron,” the Class 5 switch (e.g., 5ESS, DMS 100) in the CO, and give it IP capabilities. Centrex IP is, in fact, IP-enabling the Class 5 switch with IP interfaces or added IP adjunct equipment to deliver Centrex services over an IP network to leverage IP transport. The Lucent iMerge approach is an example of this, as is the Nortel Succession Centrex IP. The key is that the Centrex features remain resident in the Class 5 switch and are the same for IP or legacy endpoints. Centrex IP, as the name implies, starts with Centrex; in fact, one can remember or interpret it as Centrex delivered by IP with the delivered by implied. It also starts with and, by and large, retains the limited feature set of legacy Centrex. Vendor nomenclature confuses this definition since Lucent refers to iMerge as IP Centrex, but the solution is clearly IP-enabling the TDM CO.

IP Centrex in name and architecture starts from the perspective of an IP-based solution. A key difference between this approach and Centrex IP is that an applications server platform provides Centrex features, call control, and other line-side capabilities. There are two basic architectures for IP Centrex. The first allows the Class 5 switch in the CO to be retained for network functionality, such as number translation and SS7 interconnection, and uses the applications platform to supply calling features, voice messaging, and the like. This approach is referred to as the **Class 5 Extension** architecture and is a hybrid that is somewhat analogous to the converged/hybrid IP-PBX. More important, it allows carriers or service providers to utilize their existing Class 5 switches and offers an incremental migration path to hosted IP services.

The second approach is the **softswitch** architecture that replaces the Class 5 switch with a softswitch media gateway and applications server. The softswitch typically provides routing, trunking, translations, and most call-control/management services. This architecture is similar to the client/server model and to some is a “pure” form of IP Centrex, since the Class 5 is replaced. The approach certainly applies to areas with minimal TDM infrastructures (e.g., developing regions) and to new carriers offering IP voice.

The following chart summarizes the architectural analogies between premises and hosted approaches.

<table>
<thead>
<tr>
<th></th>
<th>Premise</th>
<th>Hosted</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP-enabled</td>
<td>Legacy PBX with IP lines and/or trunks</td>
<td>Centrex IP</td>
</tr>
<tr>
<td>Converged/hybrid</td>
<td>PBX with TDM fabric and IP</td>
<td>IP Centrex-Class 5 extension</td>
</tr>
<tr>
<td>Client/server</td>
<td>IP-based PBX</td>
<td>IP Centrex-softswitch</td>
</tr>
</tbody>
</table>

Premise-based devices and systems connect to the IP Centrex structure via integrated access devices and other interfaces as shown in Table 1.

A recent development in hosted voice evolution is hosted PBX services, which enhance IP Centrex to be feature or function competitive, if not richer, than the IP-PBX. So far, we've seen ways of replicating Centrex in an IP network environment. But since the feature/function gap between Centrex and PBXs (IP or otherwise) is so great, there is much to do before a Centrex variant can be more acceptable than a PBX-based solution. IP Centrex may be acceptable to many SME customers, but more capability in a hosted solution is needed for the larger, often distributed, enterprise or organiza-
Either architectural framework of IP Centrex discussed previously can be enhanced by the addition of application server software and additional application servers, if needed, to provide unified messaging, instant messaging and presence, call centers, find-me/follow-me, call screening, and a variety of more robust and comprehensive features and capabilities. Moreover, the hosted PBX from its origins retains the carrier-class and mission-critical attributes that are generally beyond the reach of the IP-PBX.

Comparing the Options

Figure 1 is a qualitative comparison of the VoIP options already addressed. Note the following:

- The Centrex IP and IP Centrex options are fairly close, but the edge is given to the IP Centrex approach because of its flexibility in external servers, lower reliance on...
legacy Centrex, and migration case to more robust hosted alternatives.

- IP Centrex and hosted PBX provide Web integration for a variety of purposes, including browser-based tools for customer management of MACs and phone features. This is faster and more economical than previous Centrex offerings in which these functions were the responsibility of the service provider.

- The reciprocal or inverse of total cost of ownership (TCO) is used to maintain consistency in low, medium, and high ratings (i.e., so L (low) means highest cost and hence the lowest rating, which is the case, typically, for the Centrex IP option).

- The hosted PBX alternative shares the economies of scale of Centrex, such as carrier-class reliability, scalability, and support, and the feature/application richness of the IP-PBX. In addition, it is typically, the lowest cost option because of factors like access costs (T1 vs. PRI), use of open, standard CPE, and operational and maintenance staff and support cost reductions.

There are numerous features that can be added to IP Centrex to construct the more capable and agile hosted PBX. This is illustrated in Figure 2. Among the key added capabilities as noted previously are unified messaging, instant messaging, and presence features. In many respects, it is a snapshot view based on current technologies and current user requirements. The hosted voice architecture and its openness permit new servers and software to be added as conditions and market demands warrant. This kind of flexibility is a significant improvement to previous telephone industry attempts at service enhancement and service creation, which were constrained by vendor-proprietary, closed CO platforms.

Because the features, functionality, and flexibility of Centrex IP and IP Centrex options are clearly not competitive with the IP-PBX, they can be removed from further consideration. Figure 3 outlines a comparative analysis of the hosted PBX versus the IP-PBX. The bottom line is that the hosted PBX has distinct advantages over the IP-PBX alternative: The application/feature gap has been closed, the location-independence nature of IP communications for the multisite user is leveraged, economies of scale are realized, and new technologies integrated easily. Multisite

---

**Figure 2. IP Centrex—Hosted PBX feature comparison**

<table>
<thead>
<tr>
<th>IP Centrex</th>
<th>Added with hosted PBX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic features</td>
<td>Call management</td>
</tr>
<tr>
<td>• Call forward</td>
<td>• Click-to-dial</td>
</tr>
<tr>
<td>• Call transfer</td>
<td>• Phone lists/directories</td>
</tr>
<tr>
<td>• Call waiting</td>
<td>Unified messaging</td>
</tr>
<tr>
<td>• Last-number redial</td>
<td>• Outlook integration</td>
</tr>
<tr>
<td>• Consultation hold</td>
<td>• Voice mail</td>
</tr>
<tr>
<td>• Calling-line ID</td>
<td>• Facsimile/e-mail</td>
</tr>
<tr>
<td>• Three-way calling</td>
<td>Instant messaging and presence</td>
</tr>
<tr>
<td>Dialing features</td>
<td>Call screening</td>
</tr>
<tr>
<td>• Extension dialing</td>
<td>• Ringing priority/styles</td>
</tr>
<tr>
<td>• Speed dial</td>
<td>• Call acceptance/reject</td>
</tr>
<tr>
<td>• Calling plans</td>
<td>Remote office</td>
</tr>
<tr>
<td>Other Features</td>
<td>Other advanced features</td>
</tr>
<tr>
<td>• Hunt groups</td>
<td>• Alternate numbers/shared appearances</td>
</tr>
<tr>
<td>• Voice messaging</td>
<td>• Auto attendant/attendant console</td>
</tr>
<tr>
<td>• Voice portal</td>
<td>• Account/authorization codes</td>
</tr>
<tr>
<td>• Web/browser-based MACs</td>
<td>• Call center applications</td>
</tr>
</tbody>
</table>

---

**Figure 3. Hosted PBX versus IP-PBX comparison**

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Hosted PBX</th>
<th>IP-PBX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalability</td>
<td>Essentially unlimited</td>
<td>Typically, 1-10K users</td>
</tr>
<tr>
<td>• Multisite Networking</td>
<td>Uniform dialing plans</td>
<td>Hard-to-manage dial plans</td>
</tr>
<tr>
<td>• Full feature set</td>
<td>• Centralized management</td>
<td>• Limited network features</td>
</tr>
<tr>
<td>• Call waiting</td>
<td>• Robust IP networking, including</td>
<td>• Service islands</td>
</tr>
<tr>
<td>• Hunt groups</td>
<td>• geographic redundancy</td>
<td></td>
</tr>
<tr>
<td>• Calling plans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Origins of ownership</td>
<td>Lower cost with outsourcing</td>
<td>Higher costs overall: key 1: Staff and support</td>
</tr>
<tr>
<td>• Access (PR) vs. (T1)</td>
<td></td>
<td>Access (PR) vs. (T1)</td>
</tr>
<tr>
<td>• Open and standards</td>
<td>Open and third-party CPE</td>
<td>Limited, closed CPE</td>
</tr>
<tr>
<td>• SIP-based</td>
<td></td>
<td>Major proprietary content</td>
</tr>
<tr>
<td>• Carrier-grade Platforms</td>
<td>Typically, five 9s only by complex,</td>
<td></td>
</tr>
<tr>
<td>• (typically well over five 9s)</td>
<td>expensive methods</td>
<td></td>
</tr>
<tr>
<td>• Cost borne by service provider</td>
<td>• Cost borne by enterprise</td>
<td></td>
</tr>
<tr>
<td>• Sun Solana and other mission-</td>
<td>• Use of Windows and other less-</td>
<td></td>
</tr>
<tr>
<td>• critical elements</td>
<td>hardened elements; Unix/Linux</td>
<td></td>
</tr>
<tr>
<td>• Robust IP networking, including</td>
<td>Software reliability and churn</td>
<td></td>
</tr>
<tr>
<td>• geographic redundancy</td>
<td>remain an issue</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology risk</td>
<td>Bore by service provider</td>
<td>Bore by enterprise</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Operations and management</td>
<td>Centralized system management</td>
<td>Separate management systems</td>
</tr>
<tr>
<td>• Carrier-grade Platforms</td>
<td>• Located at CO and/or data center</td>
<td></td>
</tr>
<tr>
<td>• (typically well over five 9s)</td>
<td>• Supports multiloc and multi-tenant usage</td>
<td></td>
</tr>
<tr>
<td>• Cost borne by service provider</td>
<td></td>
<td>Non-networked</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Delphi, Inc.
Enterprise networking is an important edge for the hosted PBX versus the IP-PBX. Generally, a network of multiple IP-PBXs (and/or legacy PBXs) does not have a large, common set of features at each site; moreover, constructing a uniform dial plan and overall management of that network are very difficult. These are issues for PBXs and IP-PBXs from the same vendor; the problem is exacerbated significantly in a multivendor network.

The hosted PBX overcomes these problems and has the scalability to handle the required scope of the enterprise network.

Also, generally, the hosted PBX has a lower TCO than the IP-PBX. For example, there are certainly advanced capabilities on today's IP-PBX; however, for the most part, they are premium items when they are available at all. The economies of scale of the hosted approach can make these new advanced features available at significantly less cost to users than their cost with an IP-PBX. Further, new customer features can be added and integrated into the applications servers of the hosted PBX faster, in general, than the process of modifying IP-PBX software generics.

Hosted IP solutions are certainly part of a paradigm shift that is changing the way voice services are delivered and how providers and users alike think about voice in this age of convergence. We now know that hosted voice—the hosted PBX, in particular—“is not your father's Centrex.”

Jay Brandstadter is an independent telecommunications consultant specializing in IP telephony and related solutions. Reach Jay at 301/871-1021 or by e-mail at j.brandstadter@worldnet.att.net.
Analyzing Costs, Setting Rates, and Improving the Bottom Line

by George Denbow

Colleges and universities, whether state supported or privately funded, must establish a cost model with rates that will recover adequate revenue to operate their telecommunications infrastructure efficiently. Success comes from knowing how to collect and analyze data, so that you can determine the true cost of service, and being flexible enough to recognize and accommodate the inevitable change. Although not many institutions are as large as the University of Texas at Austin (UT–Austin), perhaps our experience can serve as a model for campuses that need to reevaluate their rates.

Background, Facts, and Figures

In 1982, UT–Austin installed a Nortel SL100 switch with 7,500 lines at a cost of $4,500,000. Funding for this capital expenditure came from accumulated cash balances carried forward over previous years of billing departments for services. Since that initial purchase, the Telecommunications department has spent approximately $25,000,000 on software and hardware upgrades. The current average annual cost to maintain and upgrade is $850,000. Current line capacity is 30,000. Additional capacity is planned for the near future.

In January 2001, UT Telecom was merged with academic computing, administrative computing, video services, data services, and networking to form Information Technology Services (ITS). The department employs approximately 80 staff, of which 40 are involved in installation.

The telecom portion of ITS’s annual budget is $10,000,000, with approximately $3,000,000 used for payroll. Only $950,000 of the annual budget is state funded. These numbers are down because of a 9 percent state budget reduction, early retirement incentives, layoffs, and a hiring freeze. Voice services are charged to university departments on an annual basis at the beginning of the fiscal year in September. Adds, moves, and changes are billed monthly on a pro-rata basis. The revenue produced from dial tone still represents approximately 40 percent of the ITS budget.

Enrollment at the university in September 2003 was 51,320 students, of whom only 6,800 lived in residence halls. Each room has one voice and two data connections. The cost of service for students in the residence halls is included in room and board and is billed by Housing and Food. Student long distance is a negligible income factor since only 120 students purchase their long-distance service through Telecom.

There are approximately 10,000 staff and 10,000 faculty, with 21,000 lines currently in service. Most faculty and staff have DID service, but some key systems still exist. A few VoIP phones, fewer than 100, are in use. Elimination
of key systems and implementation of additional VoIP systems is ongoing. The vast majority of equipment currently in use is Nortel compatible, moderately priced, single-line analog and digital.

Services and Billing

Some 712 two-way trunks provide local service. Long-distance service is regulated by the state through the Department of Information Resources. The contract for state service is bid every 3 years, and its use was mandatory until last year. Last July, another service provider was selected by the university, which resulted in lower rates for long-distance service for students, faculty, and staff.

There are 184 long-distance circuits currently in use. Costs for voice service are based on type of service as follows:

- Dorm line: a single line installed in the residence halls. Students provide their own phone and can call on and off campus. Long-distance calls must be made using a long-distance service. Cost for dial tone is included in the cost of the room. Housing and Food is billed annually for the cost.
- Campus-only line: a line commonly referred to as a "house phone." Only local calls terminating on campus can be made from these lines. Long-distance calls can be made if the caller has an authorization code. Cost is billed annually to the department that owns the line. Phones are billed separately from the department.
- Analog line with message waiting: a line with the same features as campus only but with voicemail capabilities.
- Digital line with message waiting: a digital line with all features available.

Voice mail is billed separately and offers three mailbox sizes: 10-, 25-, and 50-message boxes. Lines, equipment, voice mail, and all chargeable features are priced monthly and billed annually at the beginning of the fiscal year.

Technicians who work for the university perform all installations. Labor rates are established based on average hourly rates plus fringe benefits. These rates are updated annually. Installation items are as follows:

- Installation of a line
- Installation of voicemail
- Charge to write an order
- Trip charge

A cable price has been established using R.S. Means Cost Works. It allows for input of all data related to labor, building type, and number of drops. This formula produces a price list that is accurate and easy to read by our customers. It has been a tremendous asset in giving price estimates for cable jobs.

How to Determine Actual Costs

Step 1. Look at the Tariff: The first step in determining actual costs is to look at the tariff provided by your LEC. Figure 1 represents elements that could be used to determine cost of local service. This information provides an accurate picture of hard costs on a monthly basis. If service costs increase or decrease, simply adjust the rate in the table.

Figure 1. Elements Used to Determine Cost of Local Service

<table>
<thead>
<tr>
<th>Local service trunk elements</th>
<th>Quantity</th>
<th>Unit cost ($)</th>
<th>Extension ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSRP1: Number Portability Service Charge</td>
<td>31</td>
<td>1.65</td>
<td>51.15</td>
</tr>
<tr>
<td>CLT: Extra Listing</td>
<td>811</td>
<td>6.00</td>
<td>4,866.00</td>
</tr>
<tr>
<td>PT82X: Federal End User Port Charge</td>
<td>31</td>
<td>49.01</td>
<td>1,519.31</td>
</tr>
<tr>
<td>FLX: Foreign Listing</td>
<td>2</td>
<td>6.00</td>
<td>12.00</td>
</tr>
<tr>
<td>RCRGU: TEX-AN 2000 Smarttrunk Credit - per Trunk</td>
<td>31</td>
<td>-10.00</td>
<td>(310.00)</td>
</tr>
<tr>
<td>H3M1X: Flat Rate Point-to-Point DS1</td>
<td>17</td>
<td>130.00</td>
<td>2,210.00</td>
</tr>
<tr>
<td>SEH1X: Expanded Local Calling Service Surcharge</td>
<td>155</td>
<td>0.20</td>
<td>31.00</td>
</tr>
<tr>
<td>KF1CX: Two-Way Service</td>
<td>712</td>
<td>17.00</td>
<td>12,104.00</td>
</tr>
<tr>
<td>TZ1P1: Smarttrunk Port - Initial Service Term</td>
<td>31</td>
<td>243.00</td>
<td>7,533.00</td>
</tr>
<tr>
<td>SPZP1: Federal Universal Service Fee</td>
<td>31</td>
<td>7.71</td>
<td>239.01</td>
</tr>
<tr>
<td>PZRIP1: FCC Approved Customer Line Charge</td>
<td>31</td>
<td>26.40</td>
<td>818.40</td>
</tr>
<tr>
<td>Total cost for local trunks per month</td>
<td></td>
<td></td>
<td>29,073.87</td>
</tr>
<tr>
<td>Total cost for local trunks per year</td>
<td></td>
<td></td>
<td>348,886.44</td>
</tr>
</tbody>
</table>
Step 2. Create a Spreadsheet: The next step is to carry the cost of the local trunks to a spreadsheet that includes all costs associated with providing dialtone. This is the most critical step because a variety of costs make up the true cost of dialtone delivery.

Rate elements comprise the following information (see Figure 2):

- Local trunk charges: See Figure 1
- Local DI trunks: A non-billable charge for directory assistance. The average monthly cost of calls should also be included.
- DID number cost: The monthly charge for the block of numbers used on campus.
- Institutional circuits: The monthly charge for circuits used institutionally.
- Administrative support: The annual salary and fringe benefits of specific personnel who provide customer service to the university community.
- Switching system maintenance: All switching personnel salaries plus fringe benefits.
- Outside plant maintenance: All outside plant staff salaries plus fringe benefits.
- Switch expansion and replacement, based on historical annual costs.
- Interbuilding infrastructure maintenance: One staff member’s salary and fringe benefits.
- Furniture, fixtures and equipment: Costs of furniture, computers, supplies, etc.
- Contingency: An amount included to cover unexpected needs.

This method of rate setting has been in place since the switch installation in 1982. When costs change appreciably, the “Monthly cost” column can be adjusted which will cause a change in the “Annual cost.” The “Monthly line contribution” is calculated by dividing the number of active lines (21,061 in this example) into the annual cost, then dividing that by 12. This is very helpful for a “what if” computation to determine rates for possible new service.

In addition, labor and materials orders are billed at actual cost for materials used and hours charged to the job. A loaded labor rate is used that is equal to the average of all technicians’ salaries and fringe benefits on an hourly basis. These types of orders generally relate to repairs of duct banks and other noninstallation type orders.

Equipment prices are established following similar guidelines. All equipment is Nortel compatible, the majority of which is manufactured by Meridian. Both new and refurbished sets are used, and all equipment is fully guaranteed. There is no charge to replace sets that are not functioning properly. Both analog and digital equipment is installed on single- and multiline orders. Equipment is offered for rent on a monthly basis, billed annually, or for purchase at a one-time cost with a small annual maintenance fee. Equipment prices range from $1.50 per month for a single-line analog set to $9.25 for high-end digital sets. Installation, trip, and order charges are included on each order.

Once rates are set, all data should be analyzed to ensure accurate calculation. All expenses need to be considered: salaries, fringe benefits, sets, cable, fiber, miscellaneous parts, capital improvement needs, and institutional costs. Our rate
structure allows us to accumulate cash balance forward funds that are earmarked in our budget for capital improvements. Some improvements we have funded in the past and are currently funding are unified messaging, switch upgrades, existing infrastructure upgrades, a campuswide security system, departmental server upgrades, MSAC console upgrades, satellite switch equipment integration, and line equipment hardware and software upgrades.

Conclusion

There are many methods used to calculate rates and establish cost models, and the one explained in this article is just the method used by UT–Austin. The most important thing to remember is to include everything and make your method flexible enough to accommodate the one consistent factor in our business—change.

For more information, visit one of UT–Austin’s websites listed below.

http://www.utexas.edu/
http://www.utexas.edu/its/
http://www.utexas.edu/its/tn/
http://www.utexas.edu/its/voice/index.html
http://www.utexas.edu/its/tn/order/index.html
http://www.utexas.edu/its/network/cabling/costs/index.html

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Will Cellular Services Deals Restore the Bottom Line?

by Curt Harler
Contributing Editor

A story is told about a customer who complained to her butcher that his sausage was half full of sawdust. The butcher explained, “These days, it’s hard to make both ends meat.”

The butcher could have been a telecom director trying to balance a budget. Income from long-distance revenues has dried up like the desert in a drought. Students and faculty members are using alternatives ranging from prepaid phone cards to personal cellular phones.

This year, a number of colleges hope to capture a chunk of that cellular phone revenue in an attempt to make both ends of their budget meet.

“We’ve gone from over a half-million a year to under $50,000 on student resale,” says Buster Clark, telecommunications director at the University of Mississippi. “Walk around campus and everyone has a cell phone up to their ear.”

Many telecom managers figure, if you can’t beat them, join them. They have begun reselling cellular service. “It is a way of bringing back lost long-distance revenue,” agrees Lee Ann Hall, supervisor of telephone and business services at Ohio Northern University, in Ada, Ohio. “I know we’re not going to make it all back, but we’re hoping this will be a start.”

This fall’s class is the first to be offered service. “We’ve had quite a few inquiries,” Hall continues. Each summer, telecommunications does a mailing about service offerings, and brochures were distributed in this summer’s mailing. In addition, students will found fliers in their school mailboxes, and information was posted during move-in weekend.

Hall says they expect to be in position to do a better marketing job next year. “We’ll get them at orientation,” she says.

“We are working with CampusCell this fall,” Hall continues. “I’ve checked on several plans to resell cell phone service and this seems to be the most risk and hassle free.”

CampusCell is a division of Laconia, New Hampshire-based Central Billing Incorporated (CBi; www.collegebilling.com). Smaller colleges, especially, might recognize CBi as a provider of invoice tracking and billing solutions for standard phone service. Under CampusCell, they market Verizon Wireless plans. A similar program is run by Telispire PCS (www.telispire.com), which offers Sprint plans at a cost comparable to Verizon. These companies position themselves with deals costing about 15 percent less than what a student might pay in town at retail. A package might offer 300 daytime minutes, 3,000 nights-and-weekend minutes, and most include long distance. There are no activation fees, contracts, or termination liabilities with CampusCell. The company says a school typically will get...
$1.50 to $2.50 a month for each student.

Admittedly, Ohio Northern does not yet have much experience; however, Hall says that she knows many universities are already reselling cell phone service. Ohio Northern also was approached by Sprint, offering pooled cell/PCS minutes to be administered centrally for resale on campus.

Like everyone else, Jeanne K. Spinosa, manager of telecommunications and networks at Johnson and Wales University in Providence, Rhode Island, also wanted to replace lost revenue. She looked at CampusCell and turned them down. "At the time it was not a compelling offer," she says, adding that CampusCell has changed their offer since that time.

One stumbling block was the lack of free phones. Since their talks, CampusCell has begun offering phones, and Spinosa says she might be willing to talk to them again next year. She does agree that they offer great commissions to the school and likes the fact that they handle billing. "I believe we might look at it differently next year," she says.

Clark also backed away from his first cellular offering. A year ago, Ole Miss offered a plan to faculty and staff. His office paid the bill and then tried to collect from the users. "It quickly got out of hand," Clark says. After 3 months, he killed the program.

But Clark has not given up on cellular resale. "I've issued an RFP to provide faculty, staff, and students a plan," he says. The RFP calls for the cellular firm to bill for personal use and provide the school a commission. Among those requested to make bids are Bell South, Verizon, AT&T Wireless, and Cingular.

In a different twist, Johnson and Wales had Verizon Wireless on campus at registration. "It was not under the umbrella of the school," Spinosa says. "They offered no discount or commission to the school. We did it simply to make it easier for the students and their families to sign up."
For much of the market—both the vendors and the colleges—there are a lot of unknowns out there. What is a good market penetration?
Will students, especially, always go with the lowest bidder? ...Will cellular service come anywhere near replacing lost long-distance revenues?

It was the first time a wireless carrier was on campus, however.

Loyola University in New Orleans signed up with Nextel Communications and Cingular Wireless. They offer students a free phone and waive the activation fee. "Having two providers gives the students a choice," says Jay Bertucci, telecommunications director. The program, which started last March, passes on the 10 percent savings to students.

Other features of the program include a waiver of the $35 to $50 activation fee and free cellular phones (or reduced rate on premium phones) provided to administration.

Loyola used to get $30,000 to $50,000 a year from its One-Plus long-distance resale program. But as cell phone use grew, that amount evaporated, says Bertucci. At one time, 85 percent of Loyola's 1,500 dorm residents were long-distance customers. Before the program was put to sleep last summer, that figure had dropped to 10 percent.

Bertucci maintains the program is a win-win for administration and students.

Nancy Kinchla at Harvard works with Verizon. "They bill us for the faculty/staff phones, and we rebill them to the departments," she says. "Theoretically, the pricing should be less because they are billing us and not each individual. There are commissions for usage," she adds.

At Harvard, the individual departments do not have to use the Verizon contract. "However, they typically do," Kinchla says. "They can get the Harvard customized ordering info on the Web."

**Big Potential**

Cellular service is big business. College students (not counting faculty or staff) represent a market of $3 billion nationwide, and the average college student spends just under $50 a month for cellular service, according to Student Monitor, a Ridgewood, New Jersey, market research company (www.studentmonitor.com). Based on the company's 100-campus survey, 78 percent of college students, or about 4.4 million people, have cellular telephones, and at least one third of those without cellular service say they plan to get it soon.

This has changed the dynamic for service providers. Two years ago, just 40 percent of students had cell phones. AT&T Wireless, Sprint, and Verizon were the top three providers. Today, Verizon is the service provider of choice for students.

"Verizon's growth in the student market has come at the expense of both Sprint and AT&T Wireless, each of whom has lost share," says Milly Gichner, vice president of Student Monitor. "These share declines may not be necessarily apparent when looking at sales figures, since we continue to see an increase in the number of students with cellular service."

"It is also likely that Verizon's momentum served to blunt the sharp growth that Cingular had been experiencing," Gichner continues. Cingular is a joint venture of SBC Communications, Inc., and BellSouth. Gichner's figures are based on a study done at 100 different 4-year colleges, involving 1,200 full-time undergrads.

The new kid on the block is T-Mobile. They now have about 10 percent of the student market. Gichner says T-Mobile could eclipse AT&T Wireless shortly.

The packages offered are pretty good. Telispire, for example, uses CDMA to offer a host of network features: long distance, voicemail, caller ID, caller ID block, call forwarding, call waiting, three-way calling, toll block, directory assistance, operator services, and 911 emergency services.

**On-going Support**

In theory, departmental users at Harvard can go to the college's Web pages and order their phones directly. There is no need for them to talk to anyone in telecommunications.

"I think we all realize that, no matter how vanilla you try to make the plans, they are confusing to most people," Kinchla says. "As a result, we continue to get a large volume of calls
about the plans, asking assistance in picking the right one or figuring out the bill.

"I think that Verizon is among the better vendors in terms of phone support, but as soon as anyone runs into a problem with the vendor, they call us," Kinchla says.

Customer support is not a small responsibility. "We track all the expenses and income for cellular on its own product model, and the commissions still do not cover the cost of supporting the service," Kinchla says. Harvard has programs available for students, but not too many have taken advantage of it. "We find that no matter how good the discounts are, someone out there is pushing a promotion that undercuts us by a few cents — especially in the fall," Kinchla says.

Sometimes it only appears to be undercutting, but the bottom line might not be better.

On a campus of 3,400 students, Ohio Northern's Hall expects she will still have a certain number of students come to her office for help. "We are a small campus, and we service the students," she says. She fully expects inquiries about billing and broken phones. "We will give them a phone number with CampusCell when they call. CampusCell will handle all of the inquiries."

An increasing number of freshmen arrive on campus with the phone they used in high school. "It is a new phenomenon," Kinchla says. A key objection to using a school-related phone is the need to change their cell phone number. "Number portability may change the whole business," Kinchla expects. "My hunch is that if this program were widely adopted by the students, our support time would rise exponentially—and the recovery mecha-

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nism just isn't there; the margin is too small."

"While we expect continued growth in the number of students with a cellular phone, increasingly cellular providers will be marketing to switchers rather than new users of cellular service," Gichner says. "That's a very different selling proposition."

Indeed, it will change the way both the carriers and the schools will market services.

One change Ole Miss's Clark fears is a loss of traditional phones. "I don't want to see landlines taken out of the residence halls," Clark says, citing safety factors among other reasons.

Learning While Doing

For much of the market—both the vendors and the colleges—there are a lot of unknowns out there. What is a good market penetration? Will students, especially, always go with the lowest bidder? Is university branding a value-added proposition? Will cellular service come anywhere near replacing lost long-distance revenues? Is answering questions about cellular service going to become a time-drain hassle at larger campuses?

"If I had it to do again, I'd like to take the program in-house," Loyola's Bertucci says. "I did not realize what a revenue generator it could be. I could have made a lot more money, even with setting up billing and hiring an in-house person to run things."

Meantime, Bertucci is renewing an 800-number aggregation program, only with a different vendor. "I'm not so much looking at it for revenue generation as cost reduction," Bertucci says. The new program includes a free T1 loop. Although income has tapered off recently, it still puts some cash on the bottom line.

"For [Ohio Northern], it is a learning experience," Hall says. "I don't expect a large percentage of students to buy from us." However, the contracts are between CampusCell and the student. CampusCell offers a number of packages, and it's up to the student to pick and choose.

"I'm thinking if we get 5 to 10 percent, we're doing well," Hall says.

That kind of income figure will not balance anyone's telecom budget. But it might be a solid step in the right direction.

Curt Harler is a contributing editor to the ACUTA Journal and a freelance journalist and speaker who specializes in communications technology topics. Reach Curt at curt@adelphia.net.
Tom West has served as the president and CEO of the Corporation for Education Network Initiatives in California (CENIC), since March 1999. More than four decades of executive management in the higher education industry includes tenure as a college president, as vice chancellor for administration for regional campuses in a public university system, and as the chief information technology officer for two large public university systems—Indiana University (1973-1981) and the California State University (1981-1999).

West has been actively involved in the development of networking for nearly a quarter of a century. At CENIC, he and his colleagues are implementing their own fiber-based, statewide, multi-tiered research and education network.

Walt Magnussen, Ph.D., is a member of ACUTA's Publications Committee. He is the Associate Director of Telecommunications at Texas A & M University.

Magnussen: For the benefit of our readers, briefly profile your organization as a 501C3 not-for-profit corporation in terms of organizational structure, financial and funding models, research activities, and services provided to members. How do you decide on your network technology strategy and sustainable funding models? What new projects are you most proud of?

West: CENIC stands for the Corporation for Education Networks Initiative in California. It is a not-for-profit corporation that was created in 1997 by five major research institutions—the California Institute of Technology, the California State University, Stanford University, the University of California, and the University of Southern California. It has subsequently evolved into also serving the California Community Colleges System and the K-12 system.

We are organized with an independent board of directors. There are 13 members on the board. Three are appointed by the president of the University of California, three by the chancellor of California State University, and one each by the presidents of the University of Southern California, Stanford University, and California Institute of Technology, and the chancellor of the California Community College System. In addition to those ten individuals, there are three at-large directors who are appointed by the Board itself.

The financial and funding model is based primarily on the members underwriting the cost of the administration as well as the operation of the networks. These funds come from institutional sources. The one exception is that CENIC receives funds from the state of California, via the University of California, to provide connectivity to the 58 counties to serve all the K-12 schools.

This organization was created for high performance research networking as part of Internet2. It has subsequently evolved into providing a multilevel network infrastructure. We provide connectivity across the state and linkage to Internet2 and other research networks. Also, we provide all K-20 commodity Internet services.

We have undertaken a number of projects over the years. First, we created CalREN-2, a network for high performance research computing. Subsequently, we implemented the Digital California Project designed to provide connectivity to the K-12 schools. We are in the final stages of integrating 4CNet, which has served California state universities and the
community colleges, with CalREN so we will have one integrated infrastructure.

What project are we most proud of? The answer is the next one, of course. We have just launched A Gigabit or Bust by 2010 initiative for the state of California. It's designed to promote the target of having a gigabit of connectivity to every school, every college, every business, and every home to advance the socioeconomic development of the state of California.

Magnussen: In terms of sustainability, your model combines K–12 and higher education. How important would you say the sustainability aspects are of incorporating the K–12 components?

West: I think we have had a sustainable financial model from the very beginning. It was based just on the five universities participating. When we brought the K–12 in, we were careful to keep their funding separated so we would be able to sustain the universities if the K–12 did not continue on. And vice versa, we wanted to be able to demonstrate to K–12 that funds that were designated for their connectivity were not being spilled over into serving the universities. The result is we are getting a much bigger bang for the buck by pulling together the resources of all these entities.

Magnussen: All 50 states are going through some financial issues, and obviously California is receiving a significant amount of press in that light right now. There will likely be some significant cutbacks within California. How has this impacted your prioritization or do you think it's going to? What areas do you think you should be targeting as a result of the financial circumstances?

West: With the member institutions funding CENIC, one of the things we are most proud of is that since the inception of this organization in 1997 the fees to the universities have remained static and the capabilities have grown. What an institution was paying in 1997 is what it is paying in 2003–2004.

When we accepted the state's invitation to bring the K–12 system into our fold, we were very careful. We calculated what it would take to initially capitalize and then to sustain serving K–12. We started out with $32 million per year funding for K–12 which we determined was needed to sustain a high level of service. As a result of the severe budget cuts this year, the funding for K–12 is at $14 million. So we are faced with some very difficult decisions.

Magnussen: A little earlier you were talking about the 2010 project, or the Gigabit or Bust Project. Do you envision being able to support the gigabit connections at approximately the same budget that you have now or do you think that's going to end?

West: A very good question. The Gigabit or Bust initiative is not one where we see CENIC as the service provider. Rather we are playing the role of facilitator, bringing together a wide range of constituencies, whether they be providers, consumers, businesses, schools, or whatever, to try to facilitate strategies in various parts of the state to accomplish this goal. We do not see CENIC, or the CalREN network infrastructure, as the primary vehicle to supply those services. That would be crossing the line in terms of our nonprofit status. We have to be in neutral court where we can bring a wide range of parties together that historically may not have worked with each other and would not under normal circumstances.

Magnussen: That leads us into our next question. It sounds like you're kind of a hybrid. On the backbone you are essentially a facilities-based company, but for access you're still using the carrier, LECs, cable companies, and others. But actually you did put yourself into a facilities-based operation which before this hadn't been all that common. What do you see as major drivers on that? Where do you see this whole industry going? What are the applications that are pushing us to go there?

West: Our first step was to develop a facilities-based backbone statewide; but as part of our efforts, at every major research university we made certain that we have fiber from the campus to the CalREN backbone. This is an essential part of the game plan. We are now talking to the California State University system and have proposed a plan for them to install fiber from each of their campuses to the CalREN backbone.

Basically, our long-range strategy is to become a fiber-based, facilities-based network infrastructure all the way to every institutional site, K–20. That will certainly take some time.

The primary drivers of our strategy include: control, flexibility, the ability to be responsive to multiple needs throughout the K–20 community, and costs. If you have fiber into a campus, you can serve the undergraduate needs
as well as the research needs and in fact keep them from being in competition with each other for a limited resource.

Of course, cost is a major driver. We have found that leasing circuits for the last mile is a very expensive proposition, and, therefore, a facilities-based infrastructure strategy just seemed to be the right approach for the future. And it is proving to be very cost-effective.

You asked about killer applications associated with the Gigabit or Bust initiative. We hired Gartner Group to do a major study, and the conclusion was that there isn’t any one killer application that one can point to, like the creation of the Web. But the fact of the matter is that our society is based on human communications, and that means that we need to be able to provide these kind of capabilities and capacities to serve a whole host of applications in medicine, health services, education, entertainment, etc.

So the answer is there is not one killer application out there. It is a combination of things. It was Erv Blythe, vice president of Virginia Tech, who captured the essence of this initiative when he said, “You have to recognize that every individual is not only a consumer of information but a potential provider.” I think that perspective changes how you must look at provisioning infrastructure.

Magnussen: So where you are providing your own dark fiber it sounds to me like you’re kind of doing a combination of building your own on the local loops but relying somewhat on IRUs on the long haul. For those who might not know what IRUs are, can you talk a little about how much you use them, what the advantages are, and what an IRU really is?

West: IRU stands for Indefensible Right of Use. It’s a legal term used by the telecommunications industry. Basically you buy a 5-, 10-, or 20-year right to use of fiber from a telecom-
munications provider. It’s ownership for a designated period. At the end of the term you return the fiber back to the original provider. In the meantime, you have full control of its use. You pay a total amount up front, and you pay an annual operation and maintenance fee, a nominal amount paid to the company, to make sure the fiber stays together.

IRU is a new term for those of us in education. The advantage of it is that we move away from leased circuits, and we have ownership of it, and somebody has already invested in making it available; so it’s a lot cheaper than digging a trench and pulling your own fiber.

One of the things we were concerned about was if we entered into an agreement and the company went belly-up, what would happen? Well, the IRU protects you from the bankruptcy as long as you separate that agreement from the contract for O and M.

Magnussen: Basically what’s happening is if a company does go into bankruptcy and the assets are transferred over to a completely separate organization, your right to use that fiber is transferred along with the fiber itself. The company can’t come in and take that away from you.

While we’re learning about IRUs and everything else, another new term comes in: dense wave division multiplexing (DWDM). While an arena that very few universities have been involved with in the past, DWDM has been very commonly used in the telecommunications industry for years. All of a sudden we’re being exposed to concepts we have never had to deal with, such as disbursement of compensation. What challenges have you found in dealing with these new technologies? What do you see as some trends in the optical industry?

Realistically, the whole industry itself has seen some significant slowdown in growth. What kind of opportunities do you see in that?

West: That is a series of good questions. We are using DWDM on our backbone. That is what you have to use to light the fiber.

We were fortunate: As a community of higher education we are still in a situation where pricing of equipment is very good because it is a very slow market. We did a competitive bid and have acquired optical equipment from Cisco Systems, but our relationship goes beyond that with Cisco. Vendor stability is a very real issue. We saw some fascinating technology from startups, and at the end we were not able to convince ourselves to take that risk. But I think the fact that we are using DWDM positions us for the next cycle, because people are still developing new technologies, and the market is going to turn up again at some point just because of the aging of equipment. We will be able to take advantage of the new technology step by step rather than making a quantum leap.

Magnussen: Can you talk briefly about the advantages of DWDM over other technologies?

West: There is a very fundamental difference between doing an optical, facilities-based network infrastructure based on DWDM and doing a leased-circuit approach. Once you own the fiber, once you light the fiber, you can actually have multiple networks. That is what we are doing in California, for example. We are going to have CalREN DC, Digital California. That will be a network that will serve everyone in K–20. It will be our education network. Several million students, faculty, and staff will have access to CalREN DC in terms of the education part of our mission, and it will also be the network that will be linked to the commodity network.

Then we will be able to have another network by taking this fiber and slicing it into what is called waves, and we will be able to provide for our research community a high-powered research network that is in essence our part of Internet2.

We also intend to provide our experimental development network capability where there may actually be a number of specific projects that want a dedicated network capability between San Diego and Chicago or San Diego and San Francisco. They don’t want to have anybody else on that network. We will be able to give them their private network as well. Now the researcher has to share the same resource as the second grader. In the future, that does not have to happen. That is the fundamental difference between owning your own facilities-based DWDM infrastructure and leasing big circuits. That is probably the key statement of this whole interview.

Magnussen: What you’re saying is that by multiplexing several different lightwaves together on the same fiber, you’re minimizing the amount of fiber you actually have to buy to be able to provision all these separate services. Through IRUs you still have to pay by the mile for the fiber, so you want to minimize that cost if possible.
Changing directions a little, if you look at the security aspects, you have your provider of a layer 1 and layer 2 network, but there are security aspects that everybody’s looking at on top of that. What do you see as your specific role in the network aspects of security, and have any of the policy issues involving, for example, the Patriot Act and Department of Homeland Security, had any impact on what you’re doing or what you’re planning to do?

West: This is probably the most complex question but the simplest for me to answer. CENIC is an organization that provides the transport capability, and because we serve so many different communities that have so many different needs and establish so many different policies, we really are only tangentially involved with the kinds of network security, the U.S. Patriot Act, and those kinds of issues. Each institution that uses our capabilities has its own set of policies and therefore controls its own destiny.

We have been having conversations with the Homeland Security people in California about the possibility of using our infrastructure to create some homeland security capabilities for them, and because CalREN is facilities-based, they could have their own private network for homeland security purposes. I think the simple answer to your basic question is we are somewhat insulated from those issues because of the nature of what we are doing.

Magnussen: Some members of Congress are considering legislation to hold individuals and companies responsible for providing minimum levels of security for their systems. For example, California recently passed the Database Security Breach Notification Act, which requires notification when the security of specific systems is compromised. Do you think any of this will have any impact on what you are doing, or do you think that isolation will still be pervasive?
West: Every one of these things has an impact on us, but they come at us from the other end. If there is an impact on our institutions, then ultimately we will feel some impact from it. Again, the weight of the burden is on the individual institutions or university systems and school districts. For example, nobody has raised an issue with regard to the Database Security Breach Notification Act in California in terms of CENIC doing something with its CalREN Network capabilities.

Magnussen: In an article in *Harvard Business Review*, Nicholas Carr contends that the strategic value that information technology can provide is declining as it becomes more pervasive. Folks are sort of looking at this and saying so what. Can't this be done by industry? What advice can you offer on this debate? What will be the next wave of information technology development?

West: Well, I haven't read the article. If his statement is true, it is because information technology use has become so pervasive and has become so much a part of our socioeconomic fabric that it is difficult to discern its value. That is just natural. We just take things for granted after a while. The evolution of the use of the automobile is another example.

Magnussen: But I don't see how that really adds to the argument that it's losing its strategic value.

West: No, and that is my counter argument to him. Because information technology is so pervasive, it may not be as discernible in terms of its value because it is just second nature for people to value it. It has become so much a part of our being. I think it is good news when he says that; that means it has value and the value is growing. It is just not as measurable because it is so widespread.

Magnussen: Our next question in this series that we're asking of both you and Hunt Williams of Merit, I think, was basically set up for you, Tom. The National LambdaRail Project continues to receive coverage in the press and literature. Briefly profile this endeavor for the benefits of our readers. What is the significance of this project to your organization? How will it benefit higher education as a whole? This is kind of an opportunity for you to talk about what you've spent the last year of your life working on, right?

West: That is true. The National LambdaRail is about providing the capabilities for our research and education community by initially focusing on the needs of the networking research community, the experimental research community, the large science research community with the capabilities they need to conduct research to advance science, engineering, and the discovery of knowledge in every discipline.

The nature of research is calling for increased collaboration among research groups and researchers worldwide. At the same time researchers within specific disciplines like to have some sense of privacy. They want their own private network. So a nationwide facilities-based optical infrastructure that enables research universities to connect to each other and to provide multiple private networks for different research groups can only enhance the advancement of science and other disciplines. From a strategy standpoint it is a matter of the higher education research and total education community taking control of a very important asset that advances their research and education missions because of the flexibility, responsiveness, and cost. The underlying, long-range vision for NLR is to provide connectivity for every educational enterprise in the country to serve the next generation of researchers, teachers, and learners.

Magnussen: This project is not completely unique to the United States, either. Aren't there similar initiatives going on in Chile, Europe, and other sites? This is obviously something that's picking up some significant global interest.

West: That is true. There are other initiatives worldwide. I do not want to say we are behind because we want to be simultaneously competitive and collaborative. It's important for us to be serving our researchers in a way that enables them to conduct their research and collaborate with their colleagues whether they be in the next room or the next university or in Chile, Japan, or Germany. From a CENIC perspective, we're one of the members of the National LambdaRail Project, and we believe that it is absolutely critical in serving our California research and education community to be deeply involved in this effort. I think it will benefit not just higher education but all of education and as a consequence society as well.

Magnussen: We really appreciate the leadership that you have taken with this, and are happy you could share some of the lessons you have learned. What you are doing is important to universities in other states, too.

*ACUTA appreciates Tom West taking the time to speak with us. Tom can be reached at twest@cenic.org.*
Hunt Williams has been the president of Merit Network in Ann Arbor for the last two years. Previously he worked for American Broadcasting Company, the Gannett Center for Media Studies, and the Johns Hopkins spinoff company Community of Science, Inc. He graduated from Yale College and earned a D.Phil as a Marshall Scholar at Oxford.

Merit Network, Inc., is a nonprofit corporation owned by all thirteen of Michigan’s four-year public universities. Merit develops and promotes advanced Internet services for research and education. Merit’s regional network connects universities, community colleges, K-12 schools, libraries, state agencies, and cultural organizations. Through these organizations, Merit serves more than one million people in Michigan every day. More information about Merit can be found at http://www.merit.edu.

James S. Cross, Ph.D., is vice provost of information technology at Michigan Technological University. Jim is a past president of ACUTA who currently serves as chair of ACUTA’s Publications Committee.

Cross: For the benefit of our readers, briefly profile your organization as a 501C3 not-for-profit corporation in terms of organization structure, financial and funding models, research activities, and services provided to members. How do you decide on your network technology strategy and sustainable funding models? What new projects are you most proud of?

Williams: Merit is a 501C3 nonprofit organization. We were founded in 1966 by the University of Michigan, Michigan State University, and Wayne State University. Merit was America’s first regional research and education network and helped pioneer the technology of packet-switched networking which underlies the Internet. The organization has expanded over the years and is now governed by all of Michigan’s public universities.

Over the years our funding model has swung from grant funding to fee-for-service funding several times. Our initial funding came from the National Science Foundation and the Michigan State Legislature in the 1960s. Merit shifted to a fee-for-service model in the 1970s. In 1987 Merit won the NSF contract to engineer and operate the NSFNET backbone. For the next 10 years our funding was primarily research grants and contracts. More recently the pendulum has swung back again. We are primarily a fee-for-service organization and actively seek grant funding for networking R and D and Internet-based learning initiatives.

Merit has a very good group of technologists and engineers, and they are constantly either developing new networking tools or they are monitoring new products and services from companies like Cisco, Juniper, and other vendors. Regarding sustainable network funding, Merit is undergoing a seismic shift. It has become obvious that delivering Internet service through leased circuits from telco organizations is not as cost-effective as
customer-owned fiber. Merit’s funding model is moving from one where Merit leases infrastructure and passes those costs through to our members and affiliates to customer-owned fiber solutions that enable research and education organizations to satisfy their ever-growing need for bandwidth at an affordable cost.

The new project that I’m probably most proud of is one that you, Jim, have been closely associated with. It’s a “virtual bridge” project to link the two peninsulas of Michigan. As you know, Michigan is a large state surrounded by the Great Lakes. It has an Upper and a Lower peninsula. There’s not a lot of telecommunications infrastructure in the northern part of the state, and the northern part is separated from the southern part by the Mackinac Straits. With the help of a new state agency, the Michigan Broadband Development Authority, Merit has put together a deal with a major cable company to build and acquire about 900 miles of fiber-optic infrastructure. This will put research and education organizations in the northern part of the state and the general public on an equal footing with the institutions in the southern part of the state from a telecommunications infrastructure point of view.

**Cross**: How do you differentiate between members, affiliates, and users of your services?

**Williams**: Merit has a customer nomenclature that has evolved over the years. Our members are the public universities in Michigan. They make up our Board of Directors and govern Merit. To the extent that a nonprofit organization can be “owned,” they are the owners. Our affiliates are other nonprofit research and education organizations in Michigan, as well as for-profit organizations involved in Internet-based research collaborations with both groups. Merit operates on a cost-recovery basis. We aren’t out to make a profit, so we consider both members and affiliates as partners of the organization.

**Cross**: Many campuses throughout the U.S. are facing cutbacks in funding, causing some institutions to reduce their capital and operating expenditures. What has been the impact of these reductions on your organizations and its financial model? How do you determine your priorities? What decision models have you found to be helpful?

**Williams**: Like the Biblical seven years, after a period of prosperity public higher education in the United States has moved into a period of relative famine. The impact on Merit has been that a number of discretionary programs that the universities support as extensions of their core mission, such as K–12 outreach, have been cut, or Merit has had to find alternate funding for them.

The budget cutbacks in higher education have imposed an almost private-sector discipline on the organization. Merit has prided itself over the years on providing unparalleled technical and customer service. It’s hard to do that with fewer staff, but we have had to reduce staffing levels significantly. This is not just because of budget cutbacks at our members. In a competitive ISP market, we have also had to become more operationally efficient. In terms of the financial model, this financial restraint has caused Merit to try to move the pendulum back to grant funding, so that we can continue to maintain a high level of staff expertise, but funded through research projects instead of fee-for-service activities.

Importantly, the shift from leased infrastructure to customer-owned infrastructure that I described a few minutes ago is not the result of funding cutbacks. Merit would be doing this even if we were still in a period of prosperity. Facilities-based networking just makes good business sense. It is an essential step for any research and education organization that views high performance networking as a strategic priority.

**Cross**: Some state higher education organizations are now facilities-based, long-distance carriers for their constituents. What are the drivers for this? What is your vision of the future for optical networks and the industry? What are the killer applications that will spur growth and the major impediments to widespread use in the marketplace? Are there specific regulatory issues that must be considered?

**Williams**: The primary driver for the shift to facilities-based networking is the fact that scientists in a number of disciplines, for example high-energy physics, meteorology, and earthquake simulation, produce and need to analyze in real time massive amounts of experimental data. I would also add environmental monitoring to this list. There are terabytes of experimental data coming out of places like CERN, in Switzerland, earthquake simulation facilities in California, or Great Lakes monitoring facilities here in Michigan. It is simply not economical for an organization like Merit to provide the bandwidth needed to transmit, analyze, and store that data using infrastructure delivered on a “pay-by-the-sip” leased circuit business model. The telecommunications industry is in the commodity Internet business, not the research Internet business. And so the research and education community has had to go back to its
roots and innovate in the optical networking arena as we did in the days of ARPANET and NSFNET.

Cross: For clarification, in owning these facilities, are they owned by Merit, or are they owned by members, or by some combination of the two?

Williams: In Michigan we are developing a condominium ownership model. Because Merit is governed by its members, the issue of who owns the fiber is much less important than who gets the benefit of it. In northern Michigan, because we needed state and federal funding for the “virtual bridge” project, Merit will own the indefeasible right of use (IRU), the universities will provide financial guarantees, and the universities will have a right of assignment for the fiber in the event that such an assignment needs to take place over the 20-year IRU period. In southern Michigan, Merit’s founding institutions are purchasing the fiber IRU and making it available to Merit to operate on their behalf. In mid-Michigan, the third part of our statewide plan, the K–12 school districts have built local fiber, and Merit is stitching together the local segments to form part of our statewide backbone.

Cross: An IRU serves as the instrument of choice to provide access to the fiber for extended periods of time (i.e. 20 years). Can you briefly describe what the IRU is and why you would use it, and share with us any challenges and issues that must be considered in negotiating one? Are there any specific legal issues that must be considered?

Williams: An IRU is like a long-term leasehold. It conveys a property right, but it’s a contractual arrangement with a specific duration. It’s not a new legal construct. Its origins, I’m told, date back to the laying of the first transatlantic telegraph cable between the United States and Europe. IRUs have come back into vogue as the legal mechanism for the telecommunications industry to build and swap different parts of national and international fiber infrastructure, and for customers like Merit and higher education institutions to make use of this infrastructure. For a higher education institution, buying a fiber IRU is like building a power plant. Instead of using metered electricity from a utility, the university generates electricity itself.

Twenty years is the normal period for a fiber IRU. You can acquire an IRU on the fiber directly, or on individual optical wavelengths. Wavelength IRUs are typically for five years or a shorter duration. Negotiating to acquire an IRU is a highly technical and complex activity. There are a handful of experts in this field. I have to tip my hat to Tom West and his colleagues at CENIC in California, who have taken the lead for the higher education community in the United States in this area. Bill St. Arnaud and his colleagues at CANARIE, in Canada, were even ahead of the United States. Anyone who is considering acquiring an IRU needs to have a good lawyer and should be prepared to commit adequate financial resources to make sure their legal rights are protected.

Cross: Is it something that will transcend bankruptcy of a vendor or the company that you acquired it from?

Williams: Typically an IRU will survive a bankruptcy, although the wording in the IRU contract needs to be carefully drawn so that the contract is non-executory rather than executory. To my knowledge, in a bankruptcy that leads to a liquidation; on the other hand, the IRU will not...
Except for major trading exchanges like NASDAQ, most of what is novel and innovative about the use of information technology in large organizations has historically taken place first in higher education. So you need not only to have a good lawyer, you also need to acquire your IRUs from organizations that are solvent and have a real business. That way, if they go into bankruptcy, the assets are reorganized rather than liquidated.

Cross: While dense wave division multiplexing (DWDM) technology is heavily used by the long-distance carrier industry, it is not a technology traditionally used by the end users. Is this a technology you are considering or currently deploying? What are the key trends and challenges driving the optical network marketplace? With lack of growth in the optical network marketplace, are there issues of vendor stability in the industry? What percent of your network infrastructure is optical technology?

Williams: Merit is considering deploying DWDM technology on the fiber that we and our members are acquiring. The value of DWDM technology is that it makes it possible to generate multiple Lambdas or optical wavelengths from a single pair of fiber-optic strands. In terms of the power plant analogy, it’s like getting an unlimited amount of electricity for a fixed capital cost. But the cost of deploying DWDM in today’s marketplace is still very high. In the financial models we’ve developed, the cost of the underlying fiber infrastructure represents about 10 percent of the overall cost. The cost of the DWDM equipment, including optical regeneration over longer distances, is several times higher than that. Unfortunately, with the dot.com bust a number of vendors with promising technologies and products in this area have fallen by the wayside. We need competition in next-generation DWDM and Ethernet products in order for prices to go down. The early adopters will be the ones taking the financial risks.

Cross: Information technology security continues to be a thorny issue for campus leaders. How might higher education balance the dilemmas and challenges of vulnerability while ensuring that the academy remain a forum of expression and learning? What is your role in network security and how far up the network stack should it go? What policy issues have the war on terrorism, U.S. Patriot Act, and the creation of the U.S. Department of Homeland Security had on your organization?

Williams: This question concerns internal business processes at our member institutions more than Merit. The Department of Homeland Security and the Patriot Act have had minimal impact so far on Merit. The Patriot Act has had a significant impact, certainly, on our library customers. To the extent that cybersecurity is part of Homeland Security, and I would argue that it is a big part, 9/11 has increased awareness in Washington of the need to continue to provide government funding for advanced network research, and that has been a plus for Merit.

In terms of viruses, bugs, and denial-of-service attacks, one issue higher education faces is the need for biological diversity in our IT infrastructure. Most of the attacks that we’ve experienced over the last two years haven’t had anything to do with terrorism or 9/11. It has been talented hackers exploiting security flaws in Microsoft or, more recently, Cisco software systems. This is more of a vendor issue than an academic mission issue.

The challenge for higher education is to retain a sense that bandwidth and unfettered network access are like air, water, and “open stacks” access to library resources, and not something that should be constrained due to financial considerations or by temporary problems with the RIAA over peer-to-peer file sharing of copyrighted music.

Cross: Some members of Congress are considering legislation to hold individuals and companies responsible for providing minimum levels of security for their systems. For example, California recently passed the Database Security Breach Notification Act, which requires notification when the security of specific systems is compromised. A similar bill has been introduced in the U.S. Senate by Senator Diane Feinstein. Should a particular level of computer security be mandatory? What are the policies governing connectivity for users of your network? What are the viable options for higher education?
Williams: I am not an expert on the legislative and regulatory front, but in my opinion voluntary standards and compliance are far superior to legislatively mandated standards. So to answer the question, “Should a particular level of computer security be mandatory?” the correct answer for higher education is probably yes, but those requirements should be set by higher education and not by state or federal government.

Cross: In an article in *Harvard Business Review*, Nicholas Carr contends that the strategic value that information technology can provide is declining as it becomes more pervasive. This view has elicited protests from some who believe that advancing technology contributes to realizing competitive advantage. What advice can you offer on this debate? Does the pervasiveness of IT mean there will be less incentive to develop innovative products? Why has Carr’s article struck such a raw nerve? What will be the next wave of information technology development?

Williams: I have not read the article, but it sounds like Nicholas Carr has struck the same raw nerve that Bill Joy did with his article “Why the Future Doesn’t Need Us.” Joy expressed a similar view not in financial or business terms, but for social value. It’s possible that Carr is describing the hangover effect from the dot.com and Y2K period, when either money flowed freely or there was a crisis that needed to be averted. It may also be the private sector is regrouping after spending massive amounts of money on enterprise computing, and needs to find new metrics for assessing the value of information technology in the workplace.

For higher education, I see no signs of retrenchment or lassitude. Quite the contrary, except for major trading exchanges like NASDAQ, most of what is novel and innovative about the use of information technology in large organizations has historically taken place first in higher education. Campuses have great demographics and intellectual vitality as physical and virtual institutions. I believe higher education will continue to play that role in the future.

In networking, higher education is about to enter a new period of innovation. National LambdaRail and the regional networks connecting to Internet2 and to it are examples of this change. Web services, which is basically distributed information-sharing through structured documents and roles-based authorization, will be another major development in the next five years.

Cross: The National LambdaRail Project continues to receive coverage in the press and literature. Briefly profile this endeavor for the benefits of our readers. What is the significance of this project to Merit? How will Merit be involved in this development? How will it benefit higher education as a whole?

Williams: NLR is a project to develop a sparse national fiber backbone serving the scientific and research needs of leading higher education institutions across the country. It grew out of CENIC, the regional research and education network in California, when Tom West, the president, realized that it was economically possible for universities to acquire fiber not just in California and in the western United States but all the way across the country for a relatively affordable price. That realization coincided with the new trend in e-science that I described earlier, where high energy physicists and earth scientists require dedicated Lambdas, 10 gigabit wavelengths, to transport and collaborate in real time in the analysis of experimental data.

Dedicated lambdas are point-to-point circuits as opposed to shared IP services. NLR includes a number of organizations around the nation including Internet2. It represents the third wave of innovation in national higher-education networking, the first being the NSFNET, which Merit managed, and the second being Internet2’s shared IP network. National LambdaRail basically moves this recurring concept from leased or donated infrastructure to university-controlled fiber infrastructure.

As with the NSFNET and Internet2, it will be the responsibility of regional networking organizations like Merit to develop fiber infrastructures that can directly connect their research institutions to the National Lambda Rail backbone with dedicated circuits at 10 gigabit speeds or above, while continuing to meet the shared IP networking needs of their member and affiliate organizations that we traditionally associate with the Internet. Customer-owned fiber makes both of these goals possible and affordable. It’s all very exciting, and the people in higher education who are making it happen at NLR, Internet2, and regional organizations like Merit are making a concerted effort to share information so that best practices emerge and can be communicated and adopted quickly by other organizations.

*ACUTA appreciates Hunt Williams taking the time to speak with us on these hot topics. Hunt can be reached at hw3@merit.edu.*
How Telecom Managers Are Adding Value within the IT Organization

by Randy Burns

The merger of the management hierarchy in voice and IT offers both challenges and opportunities to university telecom professionals. Savvy telecom managers are creating value for their organizations using their expertise in cost allocation and billing.

Counting on Dialtone: The Utility Paradigm

As telecom professionals, we certainly recognize that dialtone is expected to be as readily available and dependable as water and electricity. The dependability of dialtone was even used by Bill Gates as a target benchmark of excellence in an e-mail sent to all 50,000 Microsoft employees. In that e-mail, Gates challenged his staff to make computing as reliable, dependable, and secure as a telephone’s dialtone (Fast Company, October 2003). What a tremendous tribute to all the telecommunications professionals who often work quietly behind the scenes to make dialtone seem like a utility.

Perhaps it is because of this “utility paradigm” that it is easy to underestimate the continuing role of telecommunications services. As a result, in some organizations, IT initiatives take on a much higher profile in the minds of the organization at large and with IT management. When voice and IT operations are centrally managed, this utility paradigm can create a challenge for the telecommunication manager, particularly when he or she reports to an IT professional who has not had much exposure to voice operations. As one telecom manager in higher education remarked in a recent Telecom Manager’s Voice Report article, “You are always justifying your value to the enterprise.”

The need to be creative and show your value to the organization is not necessarily a bad thing.

From the early days, most telecom managers have been required to account for usage and provide cost allocation strategies that foster cost containment. Consequently, for many years, battle-tested telecom veterans have been leading the way in creating effective methods for cost containment through department- and staff-level asset tracking and usage measurement, which worked in concert with robust bill-back and cost allocation processes.

Central management of telecom and network services has some real benefits. As Sheila Sanders, director of telecommunications services for the University of Alabama at Birmingham (UAB) recently said, “Prior to this policy [central policy for connecting devices to the voice, data and video network] being implemented, we were challenged... [but] the move to centralization has, in the long run, allowed us to provide many additional services, in particular, securing the network.” (ACUTA Journal, Fall 2003)

In today’s centrally managed IT organization (where voice and data operations are combined), asset tracking, usage measurement, and cost allocation experience can be very valuable indeed.

Consider this: IT cost containment is one of the most pressing needs in many organizations. According to Meta Group, “Ninety percent of IT organizations will be pushed into some form of discrete application pricing model.” Recent Gartner Group research also indicates that IT spending has outpaced IT budgets in each of the last 5 years.

In the May 2003 issue of CIO.com, consultants from Booz Allen Hamilton suggested that the “traditional approaches to IT cost management aren’t effective anymore. It’s time for a new approach. Our recent experience indicates that managing the ‘demand’ for IT services yields as much, if not more, benefit than traditional supply-focused cost-reduction programs. But managing demand is not simply a matter of assessing the overall appetite for IT services; it requires the IT organization to put in place a set of capabilities and processes that enable it to truly understand business needs.”

Understanding the real needs of voice and IT users is critical to delivering key IT services while containing...
costs. As more services are delivered through the shared voice and data infrastructure and network usage becomes more varied and costly, several important questions arise: What information tracking system is in place to develop the granular data that is needed to analyze the organization’s business needs? How will we respond to CIO level inquiries to assist in cost allocation and containment?

The CIO may even be pressured to provide data to assist in evaluation of proposals from IT outsource providers who routinely pitch upper management for the opportunity to handle all voice and data services through outsource contracts.

To contain costs and to accurately compare true cost with outsource options, IT managers must develop data at the appropriate level of granularity. This means that, over time, more and more IT organizations will develop processes for measuring, monitoring, and allocating costs.

These types of requirements are familiar to most telecom managers. Consequently, the management systems for voice routinely perform the following tasks:

- Track assets and services by department and end user
- Measure traffic patterns to improve service and lower costs
- Streamline the change management processes
- Track and report usage activity in order to allocate costs
- Scrutinize supplier invoices for errors and overcharges

University of Louisville and Harvard

For example, the University of Louisville’s (U of L) IT unit manages five service centers, with a total revenue budget of $13 million. Service centers include Communication Services, Contract Information Systems, Contract Technology Support Services, Contract Instructional Support Services, and Design and Print Services.

Tom Sawyer, assistant vice president for IT at U of L, says, “Continued university-wide budget reductions require IT to enhance accountability and containment of technology spending and usage.” To better meet the challenges of this mandate, Sawyer initiated a search for an IT cost allocation system in order to streamline the operation and create a single bill for all IT services (including voice services) that would be easily understood and accessible to customers.

Sawyer and his director of IT communications, Jo Ann Kaelin, realized that many of the needs of the IT services group could be met with the telemanagement system her voice group had licensed from Compo, an e-business communications management software company based in Brentwood, Tennessee.

Nancy Kinchla, director of telecom at Harvard University, and her colleagues Mike Rowe, telecommunications system manager, and Dan Joyce, director of network and server systems, decided to leverage one billing system for a variety of IT services. By eliminating a stand-alone billing system for mainframe services and an arduous tracking system for network billing, the department is now able to present customers a billing format that is consistent across network, server, and telecom accounts. Working through Kinchla’s staff and Harvard’s telemanagement vendor, a new pricing model for selected IT services was designed and implemented in the existing telemanagement system. The network and server systems group has realized benefits from the ease and accuracy of billing, as well as from gaining an important tool for contract administration.

Characteristics of Successful Billing

Even though IT chargeback shares many similarities with traditional telecom cost allocation, there are a number of telemanagement system design characteristics that are critical...
for success in IT billing. From a high level view, these factors include the requirements and benefits shown in Figure 1.

According to Jo Ann Kaelin, “System flexibility is the most important ingredient of all. Without that, you’re in trouble. We are glad we were able to use our telemangement system to create value for the university.”

Flexibility is a critical attribute in a centralized billing system because the system must address the unique needs of a variety of end users from different service centers, yet operate from a common integrated platform. Naturally, the detail components that are tracked in each service area vary considerably. For example, one service center might need a point-of-sale type environment because the users interact directly with customers. Users in this environment require customer information screens that are well organized to put information at their fingertips. On the other hand, another service center may be driven by electronic data that is fed automatically into the system for chargeback to the end user. Flexibility for this group would involve the system’s ability to adapt to new and changing data feeds.

System flexibility also means the application must be adaptable to changing technical as well as market requirements through the life cycle of the product. The data content for services often changes over time. New services must be added. Management reorganization is a common occurrence, and a flexible system can easily incorporate new service or business centers. The system must adapt to these technical and market changes.

**Summary**

Every college and university is unique, so there is no “silver bullet,” no one process, no single approach that always works. As you evaluate opportunities to leverage your expertise in areas outside of telecom, you may want to consider the following:

- Your institution’s written policies relating to technology
- The unwritten rules and mores that you have observed
- Managerial reporting you would want if you were the CIO

Perhaps the most essential element of all is to ask the right questions. Before you begin asking questions, you may want to consider what might be realistic and appropriate high-level outcomes. Then ask questions that will uncover needs where your expertise might be applied. The following are examples of outcomes that might be on your list:

- Centralizing voice- and IT-service delivery and customer service
- Creating a common voice and IT asset tracking system
- Improving network security by tracking asset and port assignments
- Increasing the cost-recovery dollars for network devices
- Creating a central chargeback platform for all IT services
- Reducing costs and errors associated with maintaining separate databases
- Streamlining the change-management service requests
- Lowering the time staff spend responding to routine customer inquiries

When you combine a telemangement system designed to handle both voice and IT services, with a little investigation and creative thinking, you can help control IT costs and create value for yourself and the organization. Contributions like that go a long way in demonstrating telecom’s value—not just in dialtone, but in overall management as well.

Randy Burns is vice president of Compro, a Brentwood, Tennessee–based provider of communications management and invoice auditing software solutions. Reach Randy via e-mail at rburns@compro.com.
Communications Systems and Networks

3rd Edition, 2002
Author: Ray Horak
Publisher: Wiley Publishing
Reviewer: Walt Magnussen, PhD, Texas A & M University

| Chapters |
|-----------------|-----------------|
| 1 Fundamentals of the Technology: Concepts and Definitions |
| 2 Fundamentals of Transmission Systems: Technology and Applications |
| 3 Voice Communications Systems: KTS, PBX, Centrex, and ACD |
| 4 Messaging Systems: Facsimile, Voice Processing, and Electronic Mail |
| 5 Public Switched Telephone Network |
| 6 Fundamentals of Data Communications |
| 7 Conventional Digital and Data Networks |
| 8 Local Area Networks: Connectivity and Internetworking |
| 9 Broadband Network Infrastructure |
| 10 Broadband Network Services: Frame Relay, SMDS, ATM, GbE and 10GbE, B-ISDN, and AINs |
| 11 Wireless Networking: Emphasis on Mobility |
| 12 The Internet and World Wide Web |
| 13 Video and Multimedia Networking |
| 14 Network Convergence |
| 15 Regulation: Issues and (some) Answers |

The third edition of Ray Horak’s book continues in the tradition of the first two editions (1996 and 1999) but adds descriptions of many new and evolving technologies. The book is a fairly comprehensive narrative of the past and present of voice and data communications. Horak notes in his preface that he has given up on predictions for the future due to the volatile nature of the industry.

The 678-page book includes fifteen chapters and two appendices. The chapters could be divided into six subject areas:

- Fundamentals of communications systems
- Principles of voice communications, including key systems, PBXs, Centrex, voice mail, and the public switched telephone network
- Data communications, including the basics of data communications, traditional data networks, and local area networks
- Access, including broadband infrastructure, current broadband access networks (cable modem, ADSL etc.), and wireless services
- Popular applications, including current Web trends and multimedia applications
- Management issues, including network convergence and regulatory issues

Horak covers most topics that could be discussed in a fundamentals textbook. The book is not intended to provide a great deal of detail on any one topic. Few if any topics receive more than one or two pages of coverage, and some are limited to one or two paragraphs. Rather, this is an excellent resource for short, clear, and concise descriptions of most aspects of communications systems.

The third edition covers some newer technologies such as dense wave division multiplexing, free-space optics, 10 gigabit Ethernet, and 2.5G and 3G cellular data services. Horak provides a significant amount of detail in these new technology sections, especially in the cellular section.

If you are looking for good narrative information about a wide array of technologies, you don’t need to look any further. If you are looking for detailed specifications and frame formats, you’ll have to look at other sources.

For the continuing education course on data communications that I am teaching, I ordered a copy of this text for each of the students as I felt that it would be a very useful reference. I am certain that you will find value in the information presented in this book, and I recommend it for your professional library.
Introduction to Finance

by Maggie Klenke

Finance is about managing money. Successful managers understand basic financial concepts and are able to read and interpret financial information. Managing money means knowing how to develop a budget for the department and to spend money in the department budget according to the plan. When managers are knowledgeable about financial management, they can negotiate for their department's budget in terms that senior management will relate to and accept. If managers do not have firsthand knowledge of the purpose, underlying assumptions, and interpretation of the budgeting process, they will be at a disadvantage, and funding for new projects or upgrades will be limited.

Basics of Finance

In addition to the annual operating budget (planned income and expenses for the year), most business entities acquire new technology and fund new initiatives with capital dollars. Developing an effective business case and receiving approval for the use of these funds can spell the difference between an up-to-date facility and one mired in old technologies and practices.

An overriding factor in many cases is how the department is positioned within the organization. This role can be determined partially by the organization to which the department reports. For example, some call centers are in the marketing function, while others are in service or administration. When the vice president responsible for the call center changes, it is common to see the focus and performance metrics change as well. The marketing vice president will look at revenue, cross selling, customer retention, and the center's ability to gather important demographic information. The vice president of administration might be interested in some of the same issues as marketing but is likely to put heavier emphasis on operational efficiencies, such as one-call resolution and root cause analysis for call avoidance.

Capital Budgeting

Capital budgeting involves the process of generating, evaluating, and selecting projects for long-term financial gain. Some of these projects may require new purchases, while others are related to replacement decisions. Equipment may need to be replaced to keep up with evolving market and customer demands. Some capital budgeting decisions that a company might consider include cost reduction projects, replacement of assets, and obtaining new facilities (or expanding existing ones).

Capital budgeting needs to conform to the cash position, financing strategy, and projected growth rate. Projects should be selected based on long-range planning and should take into consideration departmental as well as campus strengths and weaknesses. Consideration should also be given to the time, cost, and the cost justification of the project.

After a project has been approved and completed, the project managers should calculate the actual results. The purpose of the postproject assessment is to evaluate the original calculations in the business case assessment. Were the original calculations and assumptions correct? What
factors were identified during the course of implementing the project that impacted the original calculations? During the implementation of the project, these calculations can also be used as a means of promoting the financial benefits to the organization, customers, and partners.

Main Components of Capital Budgets

Capital budgets are used to cover the cost of items that are not part of the operating budget. The items may be purchased, leased, or even rented, but the costs are incremental to those planned for ongoing expenses. Capital budgets may also include an element of revenue and/or cost savings to justify the expenditure.

In the call center, the most frequently considered items for the capital budget are technology and equipment purchases. For example, the center may be expanding and need more cubicles, furnishings, computers, and telephones. Or, the center may believe that implementing interactive voice response (IVR) technology is needed to provide customers with a 24/7 self-service option and to reduce staffing costs to handle calls. These acquisitions would be handled under the capital budget process.

Financial Decision Making:

Types of Models

Cost justification, or the calculation of savings/benefits can be accomplished several ways. There are several commonly used strategies to determine if a project will yield an adequate return. These methods include net present value (NPV), internal rate of return (IRR), payback period, and return on investment (ROI). (Two other methods, return on assets and activity-based costing, are not covered here.)

1. Net Present Value

The calculation of the discounted projected cash flows of an investment derives the NPV. Present value is a concept that is intuitively appealing, simple to compute, and has a wide range of applications. It allows comparison and aggregation of cash flows that occur at different points in time. Cash flows can be either positive or negative in any given period. Cash flow in the future is generally worth less than a similar cash flow today because people generally prefer present consumption to future consumption, inflation decreases the value of currency over time, and any uncertainty or risk associated with the future cash flows reduces the value. The process by which future cash flows are adjusted to reflect these factors is called discounting, and the magnitude of these factors is reflected in the discount rate. The higher the discount rate is, the lower the present value will be for future cash flows.

When comparing two potential projects or options within a project, the timing of the cash outflows and inflows might be quite different. For example, a campus might have a choice of purchasing a software tool or using an application service provider (ASP) with a usage-based pricing plan. In the purchase, a large sum will be spent initially, but ongoing costs will be low. In the ASP plan, the initial costs will be lower or zero, but the ongoing costs will be higher. Comparing the total effect of these costs and any returns expected from the project requires that all the costs and returns be converted into a common point in time, which is the role of the NPV analysis. It is particularly useful for projects in which there is no expected return, but the investment must be made anyway. This might occur in the case of purchasing a telephone system for a new building. There is no option as to whether a phone system will be needed, but the choice between the various options of rental and purchase can be compared with the NPV method.

The NPV allows you to determine the value of $1 a year or more from the date of the calculation. A dollar in today's currency is worth $1; however, $1 one year from now is worth less than $1 today because of the time value of money. For example, assuming that the discount rate is 10 percent, then $1 today is worth $1.10 one year from now; however, $1 one year from now is worth $0.91 in today's dollars, because the interest earned on the $0.91 over the course of a year at the investment's yield rate of 10 percent would be $0.09. Adding the interest earned during the year, $0.09, to the net present value, $0.91, equals $1 one year from now. (See Figure 1.)

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Figure 1. Present value of $1.
The formula for NPV is as follows:

\[ NPV = CF_1 + CF_2 + CF_3 + \ldots + CF_n \times \frac{1}{(1+R)^1} + \frac{1}{(1+R)^2} + \frac{1}{(1+R)^3} + \ldots + \frac{1}{(1+R)^n} \]

Legend:

CF: The net cash flow for each year that the NPV is to be applied. The net cash flow represents the difference between the annual costs of the proposed environment and the annual costs of the existing environment.

R: The discount rate or investment yield rate for the organization at the time the NPV is being calculated. Other options for choosing a discount rate include the cost of capital and the return rate of alternative projects.

n: The total number of years for which the NPV calculation is to be applied. The calculation is performed for each year being considered.

The example in Figure 2 shows the calculation of NPV on an investment of $130,000 for a new IVR system. The company has forecast savings in agent labor costs due to off-loading some of the calls to self-service method, but will have to pay a maintenance fee each year for the system. There is a positive net cash flow each year, which increases as more customers are anticipated to use the system over time. The company assumed a 10 percent discount rate.

The total NPV of the savings over 4 years is $181,755 but the $130,000 initial investment is made in present value dollars and reduces the total return to $51,755. This is still a solid return that would justify the expenditure in an organization where the "hurdle rate" is 10 percent. The savings and return depend on the length of the analysis period. If a 3-year analysis is done, the savings ($133,945) will barely pay for the investment; but if the analysis is done for more than 4 years, it will look even better than the 4-year savings shown here. Therefore, the sensitivity of the time frame for the analysis is an important consideration. In many cases, the time frame for the analysis will be driven by the technological and/or economic life expectancy of the technology being acquired. If the system is expected to last 5 years, then the study should not assume a longer time frame. But if the system is likely to last 7 years, then analysis for 4 years may be too short to display the options fully. Be sure not to confuse the life expectancy with the depreciation period offered by the tax code.

NPV is often used to compare two ways of paying for a solution, such as a purchase or a lease. Because the outflows will vary between the two payment methods, but the savings are likely to be similar, the NPV is a good way to see the impact of paying less up front and more each year for the lease alternative. In Figure 3, the lease costs have been analyzed.

Now, the call center is in a good position to compare the two financing options over a 4-year period. The NPV of the purchase is $51,755 and the NPV of the lease is $56,935. If all other factors are equal (and they rarely are), the lease appears to be the better financial decision. Once again, however, the time frame of the analysis is key. The net return for each additional year is quite different from the purchase to the lease, and the purchase NPV will outpace the lease NPV in Year 5.

2. Internal Rate of Return

The calculation of the IRR is similar to the NPV calculation with the exception that the equation is solved for the variable "R," which is the internal rate of return. The IRR represents the inherent discount rate or investment yield rate produced by the project. (This rate is sometimes referred to as the "hurdle rate," which is the minimum rate of return that a firm will accept for taking on a given project.) This IRR is often the rate at which the company makes money through its investments, and so for a project to be worthwhile, it must make a return that is at least equal to the investment.

For example, you are presented with the option of receiving $8.07 today or $1 dollar at the end of one year from now. The inherent discount rate of the $0.87 today versus the $1 dollar at the end of one year is 15 percent ($0.87 + $1/(1+R)). The formula for IRR is as follows:

Initial investment =

\[ CF_1 + CF_2 + CF_3 + \ldots + CF_n \times \frac{1}{(1+R)^1} + \frac{1}{(1+R)^2} + \frac{1}{(1+R)^3} + \ldots + \frac{1}{(1+R)^n} \]

Legend:

CF: The net cash flow for each year that the IRR is to be applied. The net cash flow represents the difference between the annual costs of the proposed environment and the annual costs of the existing environment.

R: The internal rate of return.

n: The total number of years for which the IRR calculation is to be applied. The calculation is performed for each year being considered.

The NPV and IRR methods are viewed as competing investment deci-
sion rules, but they generally result in similar conclusions. However, there are some differences. The most obvious is the impact of the scale of the project. The NPV will be stated in dollars while the IRR is stated as a percentage rate of return, which is standardized for the scale of the project. This is similar to looking at budget versus actual in which the comparison in total dollars can be compared to the difference in percentage. So, a large dollar item might be off only a couple of percentage points, but will still be a large amount of money, while a small budget item can be off a substantial percentage and still have a small dollar impact. As in budget results, it is not unusual for both analyses to be done to ensure that both impacts can be easily understood and compared with other projects competing for approval.

In comparing two projects with very different investment requirements, the best choice will need to take into account the capital-rationing constraints of the organization. Capital rationing refers to the scenario when the firm does not have sufficient funds to take on all of the good projects that it would like. If there is plenty of capital, the highest dollar return looks good, but in a constrained situation, the highest percentage return may be a better choice. Some firms use the profitability index or the NPV of a project divided by the initial investment as a scaled version of NPV.

3. Payback Period

The payback is the number of months or years it takes to recover the initial investment. For example, if the initial investment is $450,000 and the cost savings anticipated from the investment is $45,000 per month, then the payback period is 10 months. Most companies require a payback period of less than 3 years to consider a technology acquisition, but as economic climates change and the competition for capital dollars shifts, so does the payback period required to win approval of funding. The payback formula is:

\[
\text{Payback period} = \frac{\text{initial investment}}{\text{(NPV of saving/years)}}
\]

Legend:

n: The total number of years for which the NPV calculation was applied.

In Figure 4, the payback period is calculated for the same IVR purchase as explored previously in the NPV section. The initial investment is $130,000, and the payback period seeks to determine at what point in the future the returns equal that $130,000.

If the company must recover $130,000, it is clear that it won’t happen until some time in the third year. At the end of Year 2, $81,375 has been recovered in savings, and by the end of Year 3, it is more than $130,000. So the way to determine the exact month of payback is to subtract $81,375 from the initial $130,000 to determine the remaining balance to be recovered ($48,625) during the third year. Then divide the $52,570 recovered in all of Year 3 by 12 to determine how much is gained per month ($4,381). Now, divide the $48,265 by the monthly amount of $4,381, and the payback is in the 11th month of Year 3. So the total payback is at 35 months (24 months for the first 2 years and 11 more in Year 3).

It is not uncommon to see payback period analyzed without calculating the NPV of the cash flows and just using the actual dollars. This is an incorrect process and will produce a faster payback assumption than will actually be experienced. In the previous example, the payback without NPV will be 30 months rather than 35 months as calculated with NPV considerations.

4. Return on Investment

The most commonly used cost justification approach involves ROI. The ROI calculation evaluates the NPV of projected cash flows derived from the project divided by the initial investment. This assesses the benefit of the project over the initial cost. For example, if the NPV of savings on the project are estimated at $1.5 million and the initial investment is $1 million, then the ROI is 150%. The ROI formula is as follows:

\[
\text{ROI} = \frac{\text{NPV of Savings}}{\text{initial investment}}
\]

In the IVR investment example, the ROI would be calculated by dividing the NPV of $181,755 by the initial investment of $130,000 to yield a 1.4 or 140% ROI.

Summary

There is almost no skill a manager needs more than a clear understanding of finance since this is the language of business. Today’s telecommunications professional will participate in the creation of operating budgets as well as capital budgeting projects. The annual operating budget process varies widely from one institution or firm to another, but the basic elements of the budget are essentially the same. Capital budgeting processes are also handled in the specific way that each organization designates, but knowing the options and how to present each one will earn one a great deal of credibility.

Maggie Klenke is a founding partner at the Call Center School. Reach her at maggieklenke@thecallcenterschool.com.
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As the technological development and deployment of VoIP and other non-traditional telecom services (such as voice over CATV and possibly voice over electrical lines) continues to grow and expand, it is apparent that the old regulatory models will no longer be sufficient to govern these new communications services.

In fact, the differences between calls using the PSTN and the Internet are becoming less distinct, as even the major telecom carriers are routing some of their voice traffic via IP to reduce costs. According to some analysts, in coming decades nearly every telephone call will use the Internet in some manner. It is clear that new regulatory models will need to be developed to address these changes.

At a recent conference of the United States Telecommunications Association, a member of FCC Chairman Michael Powell’s staff said that the FCC is likely to begin a rulemaking proceeding on VoIP before the end of the year. The Washington Post reported that this official commented, “The Commission is also considering whether to establish different policies for different types of VoIP such as peer-to-peer and VoIP for private networks.”

States are also addressing these issues. Minnesota regulators ruled that VoIP provider Vonage must register as a telecommunications carrier and obtain a state license to operate as a carrier. However, a U.S. District Court judge overturned the decision, ruling that Vonage and other VoIP providers are providing an “information service” rather than a telecommunications service. Therefore, the judge ruled, the state cannot require them to obtain a telephone operator’s license.

Judge Michael Davis stated in his ruling, “State regulations would effectively decimate Congress’ mandate that the Internet remain unfettered by regulation...Until Congress speaks more clearly on this issue, Minnesota may not regulate information service providers as if they were a telecommunications provider.”

In California, the Public Utilities Commission (PUC) ruled in September that VoIP providers are subject to the same rules as other telecom service providers. The PUC has requested six VoIP providers to become licensed telecom carriers. The companies have filed letters with the PUC disputing the decision, stating that they are a data service, not a telephone service.

Wisconsin and several other states are in the process of adopting or have adopted similar decisions. Their success or failure will likely be affected by the decisions of the FCC and the courts.

Both sides in this argument have valid points. Clearly, the public policy-makers who sought to nurture the development of new technologies by minimizing the regulation of emerging Internet-based technologies and services were well intentioned. We might even observe that this strategy has been successful. On the other hand, we have a real need to maintain a robust telecommunications infrastructure in the U.S. For this reason, the regulatory and financial issues surrounding VoIP will need to be addressed.

ACUTA is studying this rapidly evolving situation and its potential impact on major telecommunications users, including colleges and universities. We are also monitoring discussions in other higher education and telecom user organizations, and seeking counsel from our legal advisors. We would value your input on these issues as we develop comments for the eventual FCC rulemaking. Feel free to address your comments and suggestions to me at jsemer@acuta.org, and I will forward them to our Legislative/Regulatory Affairs Committee and Board of Directors.
From the Executive Director

Regulatory Models for Voice over IP

One of the more far-reaching issues in financial models for telecommunications services is the battle currently being waged over the regulatory treatment of voice over Internet Protocol (VoIP) services. State public utility commissions, the FCC and various courts are all addressing this important issue. The core question is whether VoIP telecom services should be treated as traditional telecommunications services and subject to all of the attendant regulatory controls, or rather as information services and therefore exempt from telecommunications regulations.

This is a very complex issue with broad implications for the regulatory and financial models for telecommunications services. According to CNET, there are nearly 2.5 million subscribers to IP telephony in the United States, and VoIP calls are nearing 10 percent of all calls placed at the present time. Those statistics in themselves may be surprising, but some analysts predict that there will be 7 million VoIP telephones in the United States by 2007. There is general agreement that the trend is toward major growth in IP telephony, particularly in the business sector, and all ACUTA members are aware that many universities are exploring or implementing VoIP services.

Until now, Internet-based telephony has been largely exempt from taxes and assessments that are imposed on traditional telecom services. Congress and the FCC have sought to foster the development of Internet-based services by minimizing regulation. However, as the percentage of telecommunications traffic that is shifted to IP telephony grows, regulatory agencies are beginning to look at the financial implications of this policy.

For example, there are serious ramifications for future funding of the Universal Service programs that support schools and libraries, rural health facilities, and services in high-cost rural areas. Currently, carriers pay a percentage of their interstate and international long-distance revenue into the Federal Universal Service Fund to support these subsidies. As that long-distance revenue shifts to IP telephony, that funding source is shrinking. State Universal Service funds will be similarly affected.

There will likely be reductions in other local, state, and federal tax revenues (sales taxes, excise taxes, and support for E911, telecommunications relay services, and other fee-supported services) for calls that do not travel over the public switched telephone network (PSTN).

In addition, access charges paid by long-distance carriers to local carriers to maintain the cost of the local infrastructure will also shrink as fewer long-distance calls are made over the PSTN, reducing revenue to LECs that they will likely seek to recoup elsewhere.

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Although most experts agree that IP telephony or voice over IP is the likely way of the future, getting from here to there may not be simple. This seminar will provide a reality check on ways that higher education institutions are making the transition. University presenters and consultants will discuss migration plans that are relevant for higher education institutions. They will also discuss applicable industry trends in IP telephony. Specific challenges in the higher education environment will be stressed, including quality of service, implementation in decentralized environments, financial models, and the impact on staff and organizational structure.

Track 2
Student Telecom Services

Students are a major constituency for communications technology managers on university and college campuses. Whether they reside on campus or not, students are early adopters of technologies and have unique expectations. This seminar will cover student use of cell phones, PDAs, instant messaging and other handheld devices. The implications for campus telecom managers might include the impact on telephone resale and provision of wireline vs wireless phone service in residence halls, and pricing services for students. Student access to music or video over the Internet and the acceptable use and security policies governing their use will be covered. Additional topics may include cable TV, videoconferencing, and enhanced 911 issues.

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