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Where Are We Headed?: Directions in Computing and Technology

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Where Are We Headed?
Directions in Computing and Technology

I am pleased to have the opportunity to comment on our directions in computing and technology at Grand Valley, though I do so knowing that projecting future trends in computing and technology is a risky enterprise at best. New technology applications are introduced at a rapid pace. Change is constant and the speed of that change seems to be accelerating geometrically.

Our university is complex and I am not aware of all the activities faculty and staff are engaged in. As I make some observations about the GVSU environment and technology in general, keep in mind that what follows is not intended to be an exhaustive review of what is happening across campus. Rather, the references and examples are intended as illustrations.

The role of the Information Technology unit is to support teaching, faculty and student scholarship, and the university’s administrative applications. The unit strives to provide faculty, students and staff with a comprehensive and reliable computing and technology environment. Improving service, supporting innovation, and increasing user satisfaction are important goals.

The institutional computing and technology agenda assumes:

- All disciplines require contemporary hardware and software, while certain programs require advanced technology.
- Hardware and software must be dependable before most faculty members are willing to rely on them for their teaching.
- Software standards allow better user support and save money.
- Modern students require contemporary technology.
- A technology environment must be attractive and usable for students, and staff.
- Equipment replacement and software updates should be included as part of the budgeting process.
- It is not prudent to project technology at one time to be the same in the future.
- Continuous updates are required.
- Moore’s Law: equipment doubles in speed every 18 months, and the cost per transistor on a chip has been decreasing. The cost per transistor is set to halve every 18 months. In fact, some years ago it was $6 per transistor. As a result, the cost has dramatically decreased. Those of us with a prescience about budgets and forecasting about budgets and staffing support do not live with the prognosticators of the past who generalist. New technology can be addressed by budgets, which are allocated, articulated, and addressed in the Information Technology year horizon. The environment is linked to the infrastructure.

The bedrock of the computing and technology environment and core of the IT environment is built on hardware, performance, including the ability to make hardware work together better. A simple, yet critical, improvement of the technology environment includes articulating the operation of the technology environment to be transparent to the user. The environment includes all aspects, such as the local campus.
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- Modern student and campus services require contemporary software.
- A technology intensive environment is attractive and useful in recruiting faculty, students, and staff.
- Equipment, including infrastructure, must be included as a part of the institution's base budgeting process.
- It is not prudent to buy too much technology at one time—it makes sense to assume a continuous upgrade and purchase program.
- Moore’s Law (1965—Gordon Moore is Intel’s chairman emeritus): The density of transistors on a chip doubles every 18-24 months. The cost per transistor will halve. It is a good bet that Moore’s Law will not be repealed anytime soon—it has been accurate to date and, in fact, some years chip speed has increased and the cost has dropped more than 50%.

Those of us who are responsible for making forecasts about hardware and software as well as staff support do so with some trepidation. Most prognosticators tend to over simplify and over generalize. Nevertheless, forecasts are necessary so that budgets can be requested and space needs can be addressed. Once priorities are set and budgets are allocated, tactical plans must be made, articulated, and carried out. Technology budgets in Information Technology are built using a three-year horizon. The technology plan is directly linked to the institutional strategic plan.

The bedrock on which our multi-campus technology and communication system infrastructure is built is hardware. Excellence in network performance, including its reliability and scalability (i.e., its ability to grow and expand) requires superb hardware. At Grand Valley, the campus network hardware is probably the least known element of the technology program. Since this piece of the operation usually functions flawlessly, it is transparent to the user community. The equipment includes all the components which support the local campus network, including fiber optic cable, routers, switches, file-servers, uninterrupted power supplies (UPS), T-1s and assorted physical connections. This equipment supports computer transactions that traverse the network quickly and securely. The network devices enable and support software applications—Internet browsers, word processors, spreadsheets and the like—to communicate with other computers locally and off-campus. These connections must keep up with the amount of data transmitted by contemporary computers.

It appears that with our growth we will need more capacity for voice, video, and larger data files. In fact, the need for additional network capacity (bandwidth) appears to be expanding exponentially.

Unlike the costs of end user microcomputers which have decreased in the last few years, these network costs are actually accelerating. The implication of this is that as we go forward we must plan to invest more of our resources in infrastructure. The savings we derive from lower cost microcomputers will not be enough to cover the expansion of the networks. The network will carry more traffic, run faster and better, and it will probably cost more than it does now.

One illustration of an enhanced technology delivery mechanism is the current generation of LCD video projectors. Moore’s law, mentioned earlier, states that chip speed will in-
crease and cost will decrease. That law has been at work in this technology segment. This fall all of the new and remodeled classrooms in Mackinac Hall, as well as those in Holland, were equipped with the latest in integrated technology. Each room was fitted with an instructor podium which includes a Pentium grade computer, a VCR, and a connection to the campus network. The podium also controls a ceiling mounted LCD video projector. This arrangement accomplishes a number of objectives:

- it allows faculty to save their presentation and related computer files on the network to be recalled from the network drive in the classroom.
- it makes the computer and video tools more intuitive and reliable.
- it means that faculty do not have to rely on “just in time” delivery of equipment to a room by the A/V distribution group.

We now have forty-eight classrooms in Allendale and thirteen in the Holland building using this technology. There are additional requests for more of these rooms and for more computer intensive classrooms (every station in the room equipped with a computer). In future years, faculty will continue to integrate advanced presentation and network services in their teaching, requiring more technical, hardware and software support. This trend will continue in the near term, and probably will accelerate.

With the infusion of technology in the curriculum, there are a number of interesting implications for students. The cost of a contemporary Windows desktop computer, including a monitor, is now approximately $700. Three years ago the same machine would have cost $2,400. The Information Technology Unit is currently working with a vendor to make purchasing a computer as easy as renting a refrigerator for a residence hall room. This year the University finished wiring all of the residence hall rooms, the living centers, and Laker Village. The goal of providing a computer port per pillow for all on-campus students to connect to the campus network is complete. Only the Ravine Apartments are not wired. The Ravines will be wired this summer. It is important to the University, from a space and equipment standpoint, to encourage each student to own a general purpose computer. It is clear that in the future the University will be required to focus its resources on high end labs for the Schools and Divisions. So far this fall, 449 students have connected their computers to the campus network. While the number is disappointingly low, it represents an increase over the previous year.

In addition to the campus housing initiative, two years ago we wired a number of study carrels in the reading area of Seidman House. The goal of this project was to create stations where students, especially commuters, could plug into the campus network with their portable computers. Unfortunately, to date there has been no demand for this service. Even though we have had limited success thus far in convincing students to use campus supplied connections, we remain convinced that momentum will build and that mobile computing will become a force in technology.

In looking at the near future, many current trends will continue with the:

- miniaturization. Include wearable devices that evolve from the wearable computer. 
- wireless updation of devices from sparsely connected to the network. Library.
- custom computers using your voice. These are on commands. today, but they are predicted.
- expansion of 3D graphics and 3D graphics and computer driven library security.
- preparation for the millenium bug.
- addition of adding optical technology.

The ability to have each other, and work ever changed by the faculty who work and what is now the of the news. For the rest recent and dramatically.

The commercial impact of entire shifts of new applications. Grand Valley is Kalamazoo and Allendale (voice) traffic over the central telephone technology is intr. consequence is that expensive phone calls will be the only type of support telephone (voice) traffic.
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campus housing initiative, number of study car- man House. The stations where student could plug into portable computer- there has been no although we have convincing student-connections, we will build and be a force in tech-

- miniaturization of computers. This will include wearable computers with lots of memory and computational power; these devices will evolve from the personal digital assistants that are available today.

- wireless updating of hard drives and other devices from special stations that will be connected to the network. This might resemble the library security exit at the doors of Zumberge Library.

- custom computer programs activated by your voice. These would understand and act on commands. Many of these programs exist today, but they are not particularly sophisticated.

- expansion of visualization capability. Both 3D graphics and fast rendering programs will be commonplace.

- preparation for the year 2000 (avoiding the millenium bug, also known as the Y2K problem).

- addition of administrative systems. These will take full advantage of the Web and emerging optical technologies, including imaging.

The ability to have us interact more easily with each other, and with information, has been forever changed by the Internet. For many of the faculty who worked in the pioneering years on what is now the commodity Internet, this is not news. For the rest of us, its impact has been both recent and dramatic.

The commercialization of the Internet has lead to entire shifts of technology to the “net.” Many new applications are in development. In fact, Grand Valley is conducting a trial between Kalamazoo and Allendale with regular telephone (voice) traffic over the Internet. This bypasses the central telephone office altogether. While the technology is intriguing, what may be of greater consequence is that this may produce a less expensive phone call. It appears that the Internet will be the only network required. It will support telephone (voice), two-way video and data traffic.
The cost for Internet service is a continuing issue that our university must address. Through MERIT, our Internet service provider, some 5,000 modems throughout the state are available through a local phone call. Also, dialup service is available from anywhere in the world. The current Internet charging structure is based on a flat fee model. There is a potential change under consideration. Instead of a flat fee, a charging algorithm, similar to the one used by the phone companies for long distance calls may be implemented. Thus, distance, packet size, connection time, and service level will drive cost. If that happens, it will increase University costs.

It seems reasonable to assume that Internet2 (this is the next generation Internet) and increased campus activity will result in more bandwidth requirements. With the introduction of Internet2 there is the expectation that there will be a higher quality of service. Internet2 will be better and faster, but it is unlikely that it will be cheaper. Financing these changes is an issue we face. Web centered applications are in the forefront of software expansion. Web sites have increased dramatically:

<table>
<thead>
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<th>Date</th>
<th>Hosts</th>
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<tbody>
<tr>
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<tr>
<td>7/93</td>
<td>1,776,000</td>
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<td>3,212,000</td>
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<td>12,881,000</td>
</tr>
<tr>
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<td>19,540,000</td>
</tr>
<tr>
<td>7/98</td>
<td>36,739,000</td>
</tr>
</tbody>
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(From: Network Wizards at www.nw.com.)

The Web supports users familiar with the syntax of English to query all the computers along the network and subsequently assemble the information requested. It accomplishes these tasks in moments. The real impact, aside from and in spite of the sheer volume of information that can be accessed, is the ability to organize, analyze, and integrate it. The Web is powerful because it supports a common user language required because a common library system is a given. The user can communicate with all the resources.

With seventy-five Valley has a wide range of courses to meet these needs the university supports a wide array of software word processing and specialized scientific applications run on a variety of platforms run locally on a mainframe or remote computer. The user can use what machines they need to serve the end user. From a financial perspective, the university supports a select number of software products.

On an annual basis the Computing Advisory Committee software that is supported to limit the number of applications because staff support is limited because the number of applications. This approach has been successful and will continue.

It is inevitable that for the purchase of software will increase the University will in turn required specialized space and equipment and classrooms. This will increase. It seems clear that specialized space, technical support and these activities will increase.

A critical goal for services in the Information Services offer effective instruction in software, hardware, and analytical. Advanced technology not harnessed to improve the learning process. M
is a continuing address. Through a provider, some 5,000 addresses are available so, dialup service costs are available through the world. The structure is based on a potential change under that fee, a charging model may be implemented. If size, connection cost, arrive cost. If that university costs.

It is inevitable that requests from academic units for the purchase of high-end discipline specific software will increase. This means the University will in turn receive more requests for specialized space and equipment for instruction, labs, and classrooms. This will be a major challenge. It seems clear that the number of requests for specialized space, discipline specific software, technical support and base budget to support these activities will increase.

A critical goal for the educational support services in the Information Technology Unit is to offer effective instruction in the use of computer software, hardware and audio-visual equipment. Advanced technology is of limited value if it is not harnessed to improving the teaching and learning process. Moreover, using advanced tech-
nology is important in the creation of a climate that supports administrative and academic innovation. Supporting people who can innovate is a key technology goal.

Over the last two years, additional collaborative activities have been instituted to support end users. These initiatives include:

- Seminars to instruct faculty and staff how to use both new and existing software and hardware. These are useful in assisting people to get started with the use of new software products.

- The Technology Teaching Circle sponsored by the Faculty Teaching and Learning Center in collaboration with Academic Computing. This is an informal faculty discussion group focused on teaching and technology.

- Technology in Instruction - Academic Computing works collaboratively with the Teaching and Learning Center to provide an annual summer institute focused on the use of technology in instruction.

- Technology User Groups. These are open walk-in workshops offered to faculty to get advice and to obtain answers to specific problems and questions from the Academic Computing Staff, or to work with colleagues to develop new applications.

Improved support of the campus community remains the most critical area for Information Technology to focus on. We get much less from our technology investments if end users are unable to take full advantage of software and equipment. This is true both now and for the future. We have the tools but they are not infused into the organization to the level they should be.

How do growing organizations limit bureaucracy and increase accessibility? This is a question that must be addressed continuously. Rules and regulations, hours of operation, and the nightmare of having to be in a particular place at just the right time to complete administrative business are the scourge of complex organizations. They waste time, money, resources, and worst of all, cause negative feelings.

Technology has made the university accessible 24 hours a day, 365 days a year. Current students and prospective students are applying for admission, updating their addresses, viewing library materials on closed reserve, and performing a variety of other transactions with the university. Soon course exams will be authenticated, money will be disbursed, and additional electronic commerce will be enabled via the net. This will improve service to end users. Those institutions that exploit these technologies will provide their students, faculty, and staff with better service and will improve overall institutional accessibility.

To take full advantage of current technology, reengineering of some internal processes must occur. The Web offers a series of administrative challenges and opportunities. These include managing the site so that it communicates substantive and current information to internal and external constituencies. We know that prospective faculty, students and administrative personnel view our site now to learn more about the university. In many cases, it is their first impression of our university. The currency of information, format and speed at which inquiries are processed reflect directly on the university.

The Web is critically important in the presentation of our programs and our commitment to quality student services. We must move much more quickly. Good service isn't an option. If we harness our technology to provide service in images and data, it can be met simultaneously improve service now. It important to take full advantage of these opportunities.

Grand Valley currently offers 8 degree programs utilizing distance television technology. The Internet enhanced applications of courses and degree programs are selectively supported and will increase reliability of courseware, chat room support, and is the opportunity to develop delivery systems.

In the near term, active video will continue to handle real-time, interactive video. Institutions are now using an instructional approach even though they do not preclude classroom-based programs. The trial stage of using video signal. Grand Valley has video cameras over a campus, and would like to see this type of use. Enter this address into your Netscape address. Click on the text. Now you can access the page, and the traffic speed.

Change will occur at different rates; early adapters; others will follow. Many fiscal challenges exist. Public opinion and the availability of funds make it unlikely that...
The Web is critical in enhancing the reputation of our programs, and it also communicates how responsive and committed the institution is to quality student service. The University needs to move much more aggressively in this area. Good service isn’t about slogans, it’s about action. If we harness our web site potential to provide service in imaginative ways, two objectives can be met simultaneously. We can lower cost and improve service. Competitors are doing this now. It is important that our university take full advantage of these opportunities.

Grand Valley currently offers a number of degree programs utilizing both two-way interactive television technology and on-site instruction. Internet enhanced as well as Distance Education courses and degree initiatives must be imaginatively supported and expanded. With the increased reliability of the software that supports courseware, chat rooms, and group activity, there is the opportunity to improve our academic delivery systems.

In the near term, compressed two-way interactive video will continue to be the best method to handle real-time, two-way instruction. Some institutions are now offering a total asynchronous instructional approach. This format is popular with people who cannot arrange their schedule to meet in person, or who reside in locations that preclude classroom meetings. None of our programs is currently using a totally asynchronous approach even though such formats would increase accessibility significantly. Also, we are in the trial stage of using the Internet for transporting video signal. Grand Valley is testing one way video cameras over the network now. If you would like to see the DeVos Center being built, enter this address http://www.gvsu.edu/it/axis-cam/ in Netscape and select the “Live Video” option. Now you can watch the building go up and the traffic speed by on U.S. 131.

Change will occur. Some organizations will be early adapters; others will cling to past practices. Many fiscal challenges confront higher education. Public opinion and the lack of state financing make it unlikely that significant additional state resources will be forthcoming. Given little additional tax support, the challenge we face is twofold. First, we need to identify collaborative arrangements that can produce additional support for our technology, and second, we must identify the right technology priorities to support with those resources.

There is much more to say about these areas. I would very much like to know your thoughts on these topics and technology in general. Please stop by my office in 225 Manitou Hall, or take a moment to call, or send me email. I look forward to hearing ideas from people across the campus community.