In November 2002, the National Research Council released its report, *Preparing for the Revolution: Information Technology and the Future of the Research University*. The sterling panel of leaders of higher education concluded in their report, among other things, that “The extraordinary pace of information-technology evolution is likely not only to continue for the next several decades but could well accelerate. It will erode, and in some cases obliterate, higher education’s usual constraints of space and time. Institutional barriers will be re-shaped and possibly transformed.”

The report goes on to say that it is impossible to predict the future, but that it is important for universities to develop “sufficient in-house expertise among faculty and staff to track technological trends and assess various courses of action; the opportunity for experimentation; and the ability to form alliances. . . .”
Creating a Networked Virtual Organization:  
An Experiment in Higher Education

Two years earlier, in mid-2000, a Summit on Technology in Liberal Arts Colleges sponsored by the Andrew W. Mellon Foundation was held at Middlebury College in Vermont. At the end of the meeting, presidents and chief academic, financial, and information officers representing 44 small residential liberal arts colleges urged the foundation to support the integration of technological advances on college campuses by sponsoring coordinated activities in the following areas:

- technology training and mentoring;
- dissemination of best practices and best systems;
- exploration and demonstration of emerging technologies;
- development of sustainable, scalable resources for sharing;
- assistance with campus technology strategic planning;
- assessment of the effectiveness of technology-enabled teaching and learning; and
- collaborative opportunities with research universities and other entities.

Ongoing discussions with the foundation led to the emergence of the Centers Strategy, a national network of colleges and distributed regional technology centers that could organize and support interinstitutional collaboration on several levels—
intellectual, infrastructural, and financial—to realize the potential of technology for improving liberal arts education. In September 2001, the foundation implemented the Centers Strategy and gave birth to the first national networked virtual organization in higher education: The National Institute for Technology and Liberal Education (NITLE), of which I am the director. Presidents of 81 liberal arts colleges signed on to be affiliated with the institute and its three regional technology centers (in Vermont, Texas, and Michigan, for the Mid-Atlantic and Northeastern, Southern, and Midwestern colleges, respectively).

NITLE’s explicit mission is to serve as a catalyst for innovation and collaboration for national liberal arts colleges as they seek to use technology effectively in enhancing teaching, learning, scholarship, and information management. NITLE delivers a specific set of products and services that enables small residential colleges to eliminate redundancy, lower cost, and retain individual institutional competitive advantage while benefiting from shared resources, procedures, and results of research and development efforts.

NITLE and the regional centers have involved a large number of administrators, faculty, information technologists, librarians, and students in a wide variety of initiatives:

- Presidential and executive briefings were held in each region on topics that included technology infrastructure, planning of new learning spaces, strategic alignment of institutional mission with technology planning, and technology-enabled learning and teaching.
National, regional, and interinstitutional programs were held to provide professional development opportunities to faculty and staff, to showcase effective practices, and to share resources in emerging areas of curricular interest such as geographic information systems, new media, and bioinformatics.

NITLE and the regional centers have reached out directly to advanced student technologists and provided them with intensive programs in software engineering, Web applications development, and new media studies.

The 81 colleges affiliated with NITLE share remarkably similar missions, curricular offerings, governance structures, and business processes. Regarded as a business sector, they have an annual combined operating budget exceeding $10 billion. Yet none of them could afford to mount its own research and development efforts. With the establishment of NITLE, research and development efforts were launched to develop tools and technologies explicitly designed to enhance the teaching and scholarly activities in liberal arts colleges. For example,

- NITLE has enabled liberal arts colleges to participate in open-source initiatives such as the Open Knowledge Initiative (OKI), contributing learning management applications that reflect the learner-centered pedagogy of liberal arts colleges.
- NITLE has undertaken research in advanced search technologies, developing a semantic search engine
for automated organization of unstructured data that could greatly facilitate research and scholarly communication.

While launching these initiatives, NITLE was conscious of the need to accumulate metaknowledge. We are interested in observing and recording the changes in the behavior of institutions and of the individual members in these learning communities. We also endeavor to keep track of the changing world outside academe and its impact on academic communities. Lastly, we are aware that as a large, networked virtual organization in higher education, NITLE is an experiment in itself, and thus lessons learned should be documented, studied, and shared with the higher education community.

Metamorphosis of the Liberal Arts Learning Environment

When James Garfield proclaimed at a Williams College alumni dinner in 1871 that the ideal college is “Mark Hopkins on one end of a log and a student on the other end,” he was defining the tradition of a residential liberal arts college environment—that is, intimate relationships between mentor and student, engaged intellectual discourse, and a tranquil setting. But his speech was set in the context of the college’s plea for better facilities and equipment. Is the intimate relationship between mentor and student sufficient? Or do we need technology?
The debate continues today. In a 2002 article, Michael S. McPherson and Morton Owen Schapiro, in their role as college presidents, contemplated the question in its contemporary form: “Is a log enough? Or do we need ‘log-ons’?”

The question, of course, was rhetorical. Students demand fast networks, high bandwidth, wireless access points across campus, technology-rich classrooms and labs . . . and they are getting them. There is only one problem: the idyllic, labor-intensive educational environment represented by the on-log discourse between mentor and learner and the logged-on technological environment for teaching and learning are both costly. Further, NITLE’s recent discussions with presidents about IT have centered on escalating costs driven by ever-increasing demand for bandwidth, support, and updating of administrative, academic, and student services systems.

A Business Week special report, “Colleges in Crisis,” listed rising costs, tuition hikes, the arms race, endowment erosion, and reduced public and private support as some of the challenges we face. It also spotlighted Williams College, where Hopkins taught and served as its president, with a catchy title: “The elite get eliter.” Williams, which according to the report has a $1.1 billion endowment, charges $38,000 per student but expends $80,000 per student each year. It is an expensive enterprise. The question at hand is, Can small, residential liberal arts colleges evolve smoothly to maintain excellence, contain costs, and expand their sphere of intellectual influence so that this sector not only survives but thrives?

Liberal arts colleges first came into being in response to lo-
cal needs for preachers and teachers and drew students from their own geographically defined communities. Today, increasingly, they recruit students and faculty on a national and international scale, broadening their sphere of influence and in turn becoming more culturally, socially, and economically diverse. Despite this broadening of their vistas, however, undergraduate residential colleges are limited by their on-site capacity. Although an increasing number of colleges are experimenting with virtual offerings to alumni, this sector has stayed away from distance learning on any significant scale. As we stand at the gateway of the 21st century and look toward the future, we are compelled to contemplate the imponderables. Will these colleges produce the “British Roadster” of education—polished, rare, sought after, and affordable only by a few? Will they go the way of the American family farm, full of virtue and good intentions but unable to sustain themselves in the face of market realities? In any case, what will be the criteria by which liberal arts colleges are judged for success or failure?

Academic excellence is certainly one of the criteria. It is something every institution claims to have and want, but is hard-pressed to define. Traditionally, we have relied on student retention rates, student and alumni satisfaction survey results, graduate employment rates, and graduate school acceptance rates as some of the indicators of quality. But these seem to be indirect means of assessment at best.

Some 75 years ago, the philosopher Alfred North Whitehead had harsh words about American education. His remarks were
directed towards precollegiate education then, but they could just as well have been directed to higher education today:

There is only one subject-matter for education, and that is Life in all its manifestations. Instead of this single unity, we offer children—Algebra, from which nothing follows; Geometry, from which nothing follows; History, from which nothing follows; a Couple of Languages, never mastered; and lastly, most dreary of all, Literature, represented by plays of Shakespeare, with philological notes and short analyses of plot and character to be in substance committed to memory. Can such a list be said to represent life, as it is known in the midst of the living of it?

Our life today, “as it is known in the midst of the living of it,” is complex, multisensory, hypermediated, fast-moving, and driven by mobile devices that enable and encourage multitasking. We are asked to make decisions not only on issues of personal well-being, but also on ethical and existential issues involving our global society and human destiny—from the protection of the environment, to the clash of civilizations, to decisions about who should live and who should be left to die, to the contemplation of posthumanism. How can we make education relevant and useful for the future citizens of such a world?

Increasingly, students in liberal arts colleges (who are well versed in the “art of schooling”) express the sentiment that they are in college because of the status it confers, the connections they make with their peers, the institution’s natural as
well as intellectual environment—and not merely because of the particular set of academic programs offered to them. These students are tolerant of the curricular menu set before them when they come to campus, but the formal academic plan is only part of their chosen experience. They are well equipped to explore, experiment, and connect with those outside the ivy-clad walls. They are constantly e-mailing, instant messaging, and mobile blogging, and for these activities they expect a rich technological environment and robust communications system. In return, they offer their colleges enthusiastic long-term loyalty, good will, and support.

Because of the large number of NITLE-affiliated colleges, we have had the good fortune of working closely with large numbers of faculty, undergraduate students, librarians, and information technology specialists. Over the past two years, we have mounted 135 programs with more than 2,500 attendees. Our observations, therefore, are not limited to the specific culture of one campus, but are representative to a large degree.

The following sampling of actual experiences sheds light on realities within our institutions—on learners and mentors and on their thought processes as well as their actions.

Vignette One (Faculty):
"They Are Not Listening to Me!"

Professor X is a dynamic language teacher. She enjoys teaching and interacting with her students, enlivens her classes with multimedia materials, asks provocative questions, manages the
flow of class discussion, and receives great evaluations from her students.

Because she is adventurous and always ready to experiment with new teaching techniques, she decided, with the assistance of a NITLE pedagogy specialist, to experiment with online chat in Spanish. The day came. Her students were all sitting in front of computers with the assignment to engage in synchronous chat on an assigned topic. The classroom was quiet except for the clicking of keys as students and professor alike entered the chat room and began to “converse” electronically. After a few minutes, the professor jumped up from her station and ran toward her NITLE expert. “They are not listening to me!” she hissed, looking frustrated, if not panicked. While she understood that the point of the exercise was for the students to use their target language to engage in real-time communication with their counterparts, they were in charge of that process, not her. The sudden loss of control and “stage presence” was a shock and a revelation to her. In subsequent discussions and experimentations, she was able to accept that for her students, her inspiring presence as mentor and the opportunity to take charge of their own learning are equally important.

The melding of a faculty-controlled classroom (large lectures, faculty-directed seminars and discussions, faculty-conducted drills and labs) and a student-centered, technology-mediated learning process is still a challenge. It involves rethinking the respective roles of faculty and students, re-
designing the curriculum and course content, and reconfiguring the physical space in which learning activities take place.

**Vignette Two (Undergraduate):**

*“This Project Is Its Own Reward!”*

At one college, a video production contest was held to encourage students' acquisition of new media literacy and give them a chance to showcase their creativity. The winners of the contest gathered for a presentation and discussion with a group of 25 instructional technologists from a dozen colleges. After viewing the videos, the instructional technologists' first questions centered on the effort it takes to produce high production quality work like theirs: “How did you manage to put in so much work in such a short time and produce such good results?” The students shrugged and said that sleep was quite dispensable. Then the instructional technologists pressed further, wanting to know whether there was any reward attached to the work, whether it came with academic credit. At this a student snapped, “This project is its own reward! Plus, it doesn’t carry the stigma of a class assignment.”

Everyone in the room laughed, but an important truth had been spoken, and bluntly. Our students are experts in navigating whatever academic maze we lay before them, but it is only part of their game of life. They play other games as well, quite seriously. In this case, creativity, individual expression, and recognition by peers were powerful incentives.
Vignette Three (Undergraduate): “Why Have Something Static When You Can Have Something Dynamic?”

For the past two summers, NITLE has offered advanced student technology programs. For more than a month, select groups of students gather at regional technology centers and work on projects using technology not commonly available on their campuses, with many faculty and instructional technologists as “guides on the side.”

Many interesting student projects emerge from these programs, ranging from purely personal expressions to pragmatic utilities. One student designed a system that allows for user contribution of short videos to a collection, to be randomly and creatively juxtaposed in the tradition of the “exquisite corpse.” Another student aspired to combine the functions of instant messaging, e-mail, chat, and blogs into one system, with an “ego monkey” at the system’s main control, exploring the “darknet” concept. A third student presented a prototype query system for domain-specific information. It used a front end with natural language processing capabilities to produce human-like conversational interactions with the user, combining this query system with links to Web resources. Other, more artistic projects included a “video gallery” of undersea motifs insinuating various moods and psychological states, and a study of the disconnect between the physical and the cerebral via a collage of visual studies of feet and their owners. A group of students from one institution implemented a chemistry lab tutorial complete with a video lab manual and animated exper-
iments. These students designed the look and feel of the Web site to be “cool and inviting” for their peers.

Without exception, the students showed little enthusiasm for staid college home pages, text-dominant Web content, and static presentational styles. They designed innovative ways to interact with peers, friends, interest groups, and family. One student summarized the projects succinctly: “Why would you want to have something that’s static when you can have something that’s dynamic?” Why, indeed?

Lessons of Experience

These experiences illustrate the palpable tension between tradition and change in our institutions. On the most forward-looking campuses, this tension is capitalized on to redefine cultures and relationships.

First and foremost, it is clear that traditional roles are changing for faculty, students, librarians, and IT staff. These are subtle but important changes; the small size of liberal arts colleges not only enables such changes, but also allows them to have great impact on the institutions. On a 1,500-student campus, a series of small experiments and successes can change the ethos of the place. More and more, for example, we see librarians spending time in classrooms working with faculty and students directly. Technologists, too, are increasingly disciplinary experts participating in student learning.

It is always a moving experience to hear a senior faculty member say, “After so long, I’m learning again, and I’m learn-
ing from my students.” More and more faculty members tell us they no longer feel they have to play the role of the grand giver of knowledge, but are happy to be collaborating with their students. Students no longer feel they are passive receptacles of their professors’ teaching. They have genuine respect for faculty members who are willing to admit they don’t know everything and are happy to be their partners in learning. In many ways—though not in all—faculty members in these undergraduate institutions are relating to their young students on an intellectual level as if they were graduate students. Students have room to play within and beyond the curriculum. They explore many real and virtual paths in learning, and their explorations in turn enrich their institutions. After graduation, many students decide to work for a liberal arts college even though they would earn more in the open market. Many alumni donate their time and share their expertise with their alma mater in addition to giving their financial support.

The changing roles and relationships in these small learning communities go hand-in-hand with the expanding contemporary definition of being liberally educated. For years, liberal arts colleges have wrestled with what to do with the increasing pressure to provide students with a curriculum that is practically oriented. Of course, this tension is not new. The Greco-Roman tradition, *ars libre*, described the arts for free men who didn’t have to worry about earning a living, whereas the practical or servile arts were for the slaves who had to toil all their lives. But the realm of the liberal arts has consistently expanded to include new sciences and disciplines that have ap-
plied aspects. Newton and Galileo were members of the academy, but they also belonged to the guilds that ground lenses for telescopes. When John von Neumann proposed the building of a computer at the Institute for Advanced Study, his colleagues were worried that the institute’s tradition of purely theoretical research in mathematics and philosophy was being challenged by the introduction of the applied sciences. Throughout human intellectual history, we have always benefited from the enabling tools that make theoretical breakthroughs possible.

Today, the bar for a liberally educated person is set particularly high. A college graduate is meant to be a well-informed citizen able to deal with complex and critical issues such as whether to ban human cloning and whether genetic manipulation of our food sources is a good thing, as well as being capable of appreciating Shakespeare, Mozart, and Leonardo da Vinci. Yet the educational institutions meant to “produce” such citizenry typically move at a slow pace in establishing new disciplines and the management of new information. Bioinformatics, for instance, for all the hype and influx of funding, is still struggling to define itself in research universities. Small private colleges are left waiting for what little trickle-down effect may reach their campuses. How, then, can we ensure that our higher education institutions lead, rather than follow, in the environment of fast-developing experiments and discoveries enabled by technology?

The best liberal arts colleges today realize that single institutions can’t do everything for everyone—but institutions do want to offer their students the opportunities they seek and need in
an environment that fosters interaction and open communication. One of the ways for these colleges to provide such opportunities is through collaborative efforts within a network of institutions. Some of these opportunities are created by NITLE, including the use of tools and data sets (such as geographic information systems), new disciplines (Middle Eastern studies, bioinformatics), and student-centric programs (the Advanced Student Technology Programs described earlier). Equally important, it is the liberal learning community, actual and virtual, on one campus and across campuses, that provides the environment in which students form ethical judgments, contemplate the meaning of truth and trust, forge lifelong friendships, and hone critical thinking skills. The combination of Hopkins's log and today's Internet log-on provides the best opportunity to achieve a contemporary definition of liberal learning.

Social Revolution and the Democratization of Knowledge

Among the most profound statements of the National Research Council’s report on information technology and the future of the research university is this: “It is no great exaggeration to say that information technology is fundamentally changing the relationship between people and knowledge.”

How is that relationship changing?

Howard Rheingold's book, Smart Mobs: The Next Social Revolution, cited the overthrow of Estrada’s presidency in the
Philippines, the anti–World Trade Organization “Battle of Seattle” protests, and mass gatherings at celebrity sightings as examples of spontaneously converging mobs that act as socially networked groups, enabled by mobile devices and ubiquitous Internet access.

Another example of networked groups affecting change occurred in late 2002, when U.S. Senator Trent Lott, the Mississippi Republican, was forced to give up his post as senate majority leader because of his nostalgic statements about the nation’s racist past. Initially, his public speech was largely ignored by the major media, but incensed Web loggers hammered away on Lott and took the national press to task for failing to hold him to account. Eventually the story was picked up again by national media, which ultimately generated so much negative publicity that Lott was forced to step down.9

The ruling by the Federal Communications Commission (FCC) to relax media ownership (to allow companies such as Viacom and News Corp. to own TV stations that reach 45 percent of the national audience, up from 35 percent) met with the opposition of an unlikely coalition of organizations including the Consumers Union, the National Organization of Women, the National Rifle Association, and dozens of others. “In all, there were an estimated 2.3 million e-mails, phone calls, and letters opposing the FCC’s move, not to mention public protests.”10 As a result of this forceful convergence of political opposition against “media gigantism,” the House of Representatives essentially voted to overturn the ruling.

One final example is that of Howard Dean, the ex-governor
of Vermont and Democratic presidential candidate, who was little known outside his small New England state when his campaign started. His visibility and popularity rose with astonishing speed, such that Dean was featured on the cover of *Time* and *Newsweek* in the same week—a rare occurrence. According to journalist Dan Gillmor, Dean’s campaign really understood the power of the Net:

More than a quarter of a million self-announced supporters later, it seems that people are listening, communicating, and participating, using a variety of online tools, from Weblogs to chat boards, to help move the former Vermont governor from an asterisk to a leader. . . . His campaign has used the tools of communications and collaboration to assist more human contact, bringing together people who have a cause and want to take it to others.11

In these and many more such cases, we seem to be witnessing real-life events validating Reed’s Law, which is based on Internet pioneer David Reed’s assertion that the Net’s value comes from its enabling of groups, not just of individual-to-individual connections. According to Reed, the power of a network, especially one that enhances social networks, multiplies rapidly. This power is represented by $2^N$, with $N$ being the number of different human groups that use the network. Reed’s Law is an extension of a law named after another technology pioneer, Robert Metcalfe. Metcalfe’s Law states that the usefulness of a network grows in proportion to the number
of members in the network (that is, $N^2$, where $N$ is the number of members in the network).\textsuperscript{12}

We are clearly still at the early stages of comprehending, let alone harnessing, the power of networked communities, but we can be sure that new network architectures and tools will continue to facilitate and enhance group-forming processes and social network activities. The ultimate democratization is that of ideas and knowledge, which is precisely why it is vital for higher education to pay attention to the changing landscape of Net-enabled social networks and the activities pulsing through them.

A few contextual elements within which to contemplate the positioning of higher education in the new knowledge ecology, including personal knowledge publishing, Web logs, the globalization of learning opportunities, and the mobility of expertise, are considered below.

*Personal Publishing and Blogs*

Personal publishing is as old as Web pages, and sometimes its readership is astonishingly large. David Weinberger, in his *Small Pieces Loosely Joined*,\textsuperscript{13} reported that more than half a million people accessed Danny Yee’s home page for a total of 1,350,000 hits in 2000 to read Yee’s book reviews. Danny admits to holding no special credentials as a book reviewer. He simply writes them and posts them, and people flock to his site. In comparison, according to Weinberger, the New York Review of Books had a circulation of 115,000 at the time.\textsuperscript{14}
Arguably, the most impressive personal publishing phenomenon to date remains the emergence and evolution of Web logs. The term “Web log,” or “blog,” refers to a freely accessible “log on the Web,” the content of which is displayed in reverse chronological order and reflects the personality or interests of the editor (though visitors may post comments). The editor posts frequent updates and typically provides links to referenced materials outside the site. Many “bloggers” create and participate in evolving and shifting communities of interest, through internal blog discussions and links to other blogs.

As of late 2003, the NITLE “BlogCensus” had indexed more than 1.5 million blogs. Of these, approximately two-thirds are active. Roughly half are personal diaries; many bloggers interact with small groups of family and friends, but they are mostly introspective, without extensive links to other sites. Among these personal bloggers, the majority are students in their teens and preteens, but there is little evidence that their blogging activities are linked to formal education. Although a few blogs are “assigned” as part of these young people’s school work, they are exceptions. Clearly, the blog phenomenon in this age group is not directed or influenced by parents or teachers. Students at a younger and younger age are carving out their public spaces on the Net, where they control their own creating and publishing.

The rest of the blogs NITLE has indexed tend to focus on interest areas. Businesses increasingly use blogs to replace newsletters and to provide an area for interacting with clients.
and client groups. Many blogs aggregate links related to some special topic on a daily basis, usually with short comments. There are many such special-interest blogs, including political blogs, tech blogs, tax-lawyer blogs, diet blogs, wedding blogs, pregnancy blogs, travel blogs, and so on. Media-rich blogs (such as photo and video blogs) are beginning to emerge. Mobile blogs, or Moblogs, where posting is done through handheld devices, are also gaining popularity. The blog phenomenon is a global one, and it can spread rapidly. For instance, in two years, Polish bloggers have populated the Net with more than 100,000 blogs. Blogs apparently also cause some governments to worry: Iran and China have cracked down on blogs, presumably because they can be politically or sexually charged.

NITLE is particularly interested in tracking the persistence of content aggregation and the emergence of quality content in an environment where preordained and credentialed central controls are absent. Our observation is that the chronological format of the blog drives dynamic content, and the blog community not only fuels content generation but also keeps blogs honest. The specificity of the topics, real-time interactivity, and the sophistication of the blogger community combine to create a kind of ad hoc reputation system. Simply put, bloggers are good at fact checking. The common reliance on primary sources also helps in building trust. The postpublication review process serves quite well for quality control, as good contributions are read and linked while content of lesser quality drops off.
The ultimate reason for tracking blogs is that NITLE wants to understand how the group-forming capacity of the Net is being used and to see if we can find validating evidence of Reed’s Law, especially in the knowledge blogosphere. NITLE would also like to track the emergence of knowledge centers to observe the aggregation and dissemination of specialized knowledge. Since the phenomenon is still fairly new, and persistence is not tested, we don’t yet have data that can be used to predict the long-term picture. For instance, if we could answer the question, “What’s the underlying growth rate?” then we would be better situated to speculate on the future of blogs. As teenage bloggers mature, will they want improved tools? Will they want to integrate e-mail, instant messaging, blogging, and voice/video functions, or will they want to keep them separate? Will the “flash mob” phenomenon mature into something more than spontaneous “happenings” of random and short-lived human congregation? If knowledge on the Web is increasingly imbedded in social Web activities, how will future knowledge creation, aggregation, and dissemination be affected? Will intellectual activities in higher education change as well, or will they remain attached to professional associations? If instances of various knowledge commons begin to appear, will there be gatekeepers other than the communities themselves? Will future researchers and scholars form virtual groups with total disregard for institutional affiliations? All these, and many more, are intriguing and increasingly relevant questions for us to ponder.
Globalization of Learning Opportunities

We have some glimpses of the future. Traditional knowledge institutions are vying for prominence and market share, but in untraditional manners. The September 2003 issue of *Wired* magazine contained a report entitled “MIT Everyware,” which vividly described how one of the most popular offerings of MIT’s OpenCourseWare (OCW) initiative, “Laboratory in Software Engineering,” aka 6.170, was accessed by a Vietnamese student in Ho Chi Minh City and a software developer in Nashville to supplement their learning, and how “in Karachi, Pakistan, a group of 100 students and professionals met weekly to study 6.170. . . .”

In late 2003, iCarnegie, the Carnegie Mellon University affiliate for global education, announced its new international partners: the Universidad del Valle de Mexico, Temple University of Japan, AMA Education System (with 42 campuses in the Philippines and one in Bahrain), Rangsit University of Thailand, INFOGROUP Consulting S.A. of Greece, and TEC de Monterrey (Mexico). These institutions will offer iCarnegie courses in computer programming and software systems development to their learners.

Mobile Expertise

The increasing availability of learning modules, courses, and certificate programs from institutions such as MIT and
Carnegie Mellon is but one of the harbingers of the future global knowledge market. Another interesting trend is the outsourcing of “knowledge work” offshore. Not only are manufacturing jobs going to China and call centers being set up in India, but white-collar work such as financial analysis and business consulting are also going overseas, where knowledge workers are plentiful and relatively inexpensive to employ. Indeed, the business process outsourcing (BPO) plans of many industries involve offshoring jobs. A further example of the “eBaying” of knowledge and expertise can be found in an Eli Lilly–funded start-up, rather unabashedly called InnoCentive. In 2001, Lilly founded InnoCentive to link up freelance researchers with companies interested in outsourcing research and development projects. As of September 2003, 25,000 “solvers” from 125 countries had registered on its Web site, where each week 80 to 100 new problems were posted, with rewards given to the researchers (or research organizations) that came up with the best solutions. Dow Chemical, Procter & Gamble, and BASF are all InnoCentive clients.18

**Mining Unstructured Data**

If we were forced to solve numerical problems by hand today, most of us would not be able to go beyond simple mathematical calculations. Happily, we now have sophisticated computers to do large and complex number-crunching tasks for us at great speed and little cost. Likewise, with large amounts of un-
marked data (let’s just use text as an example), what is needed is a tool for dealing with large numbers of documents automatically, economically, and speedily. One such tool is an automated semantic search engine.

Every day, Google processes 200 million queries, speeding through its index of 3 billion Web pages to present search results, yet what we get back from our queries is too much information—too much useless information. Digital repositories exist in every scholarly field, yet because of the nonstandardization, or nonexistence, of metadata structures, these materials cannot be easily accessed, searched, or manipulated. Faculty and student researchers in higher education institutions, as well as individual researchers, must grapple with digitized print materials, Web logs, online journals, and curricular materials that continue to grow in size and scope at increasing markup, yet are full of useful information. What are we to do with the mind-boggling amounts of data?

One problem seeking solution on InnoCentive’s Web site could very well be, “We need a search engine that can say to unstructured data, ‘Organize thyself!’ and then present the results in a friendly graphic interface, provide the user with a tool set for analyzing the results and interacting with the data, and incorporate that human input in the system to improve its performance for the user.” That is exactly what the NITLE Semantic Engine (NSE) is intended to do.

Over the past two years, a team of computer scientists and programmers at NITLE has developed a prototype of the NSE.
This prototype was designed to address the universal problem of accessing and organizing large amounts of unstructured digital text and to enable scholars and educators to manage the ever-increasing volume of data they encounter in every field of inquiry. Using mathematical algorithms to index the semantic content of documents, the prototype engine has been demonstrated to drastically reduce, if not eliminate, the need for expensive and time-consuming metadata tagging and to produce results superior to keyword searches. In addition, NITLE is developing a set of tools to enable researchers to quickly search large data sets that may be distributed across multiple databases, to interact with the engine to refine the search, and to contribute their knowledge to the collection. NITLE is also writing a set of visualization and archiving tools for researchers to use to facilitate the organization of the search results. Another experiment is under way to distribute the computation among networked commodity hardware, to anticipate increasing load and increasing computational complexities.

With the conversion of much of human knowledge into digital form, in addition to the “born digital” resources, we now have glimpses of possibilities for future scholars and learners to increase the depth and breadth of their research, to scale previously insurmountable barriers of disciplines, and to deal elegantly with the mixing of media (text, images, moving images) by cross-searching the resource databases. This is a challenging but immensely exciting research and development effort.
Research and Development on Higher Education

Since its inception, NITLE has been envisioned as a research and development project on higher education. As a joint venture of higher educational institutions and philanthropy; a networked virtual organization with more than 80 institutional partners; and an organization that facilitates collaboration at institutional, regional, and national levels and for all sectors (IT, library, academic curriculum, information management), NITLE is an unprecedented experiment. Thanks to the Mellon Foundation and the colleges it works with, NITLE has been given a great measure of freedom to adapt to the rapidly changing technological environment in developing its services and products and in contemplating its own destiny. Will NITLE become an agent for incremental change or disruptive revolution? Will it have an impact only on the liberal arts college sector, or will the lessons learned be applicable to others? These are questions that will be answered in time, if we can keep up with rapidly advancing technology and not lose sight of the metaknowledge that is accumulating.

One of the unintended consequences of NITLE’s many-layered activities, however, is that NITLE is itself becoming a knowledge center. The NITLE “Arab Culture and Civilization” Web site, for instance, originally designed as a curricular resource site for small institutions with limited resources, has become a mainstay resource for several large research universities boasting top Middle Eastern studies programs. It was
also named the Yahoo “Pick of the Day” site.\textsuperscript{21} The Blog Cen-
sus and the NSE have drawn not only inbound links, but also
inbound colleagues from the University of Virginia, Columbia,
MIT, and many other universities and organizations.

NITLE is keeping its finger on the pulse of the changing
network landscape—its emerging tools and architectures, as
well as social activities on the Net. It is evident that colleges
realize that they cannot possibly provide everything that every
student needs and wants, and they are letting the students take
the lead where individual exploration is concerned. Colleges
provide their students with opportunities to interact with oth-
ers, face-to-face or virtually, inside their institutions and across
institutional boundaries, with respect to the content of the
curriculum as well as to learning opportunities offered outside
their formal academic programs.

In the best possible world, the log, the log-on, and the logs
on the Web all work together to provide our undergraduates
with intimate mentoring, peer group collaboration, and other
social and knowledge networks for a fulfilling intellectual life.
In addition to the copious opportunities for access, explo-
ration, manipulation, and analysis of information, liberal arts
colleges adhere to their centuries-old tradition of instilling in
students the habits of the curious and critical mind and the
demands of rigorous logic as well as intuition and imagination.
The proximity and ready access to faculty members, who have
devoted their lives to their thirst for knowledge, and the inti-
mate environment from which trust and lifelong friendships
spring, contribute to a well-rounded experience that prepares students to deal with the complexities of our future society and for the difficult task of preserving the virtues of democracy.

Indeed, to unite the basic virtues of democracy and education, we needn’t go farther than John Dewey, perhaps America’s most influential educator-philosopher. Louis Menand summarized Dewey’s views most succinctly in his essay, “Re-imagining Liberal Learning,” as follows:

Dewey’s idea of the connection [between education and democracy] was more profound; for he conceived of the educational process as itself democratic. He thought education could prepare people for a life in a democracy only if the educational experience were also democratic, only if learning mimicked the processes of living socially in a democracy.22

As democracy is being redefined via the powers vested in emerging social networks enabled by information technology, so too will education and educational institutions themselves be redefined. NITLE, by working with a large number of institutions to experiment with collaboration, will try to find ways to liberalize learning, play a significant role in scholarly communication, and shed light on the new knowledge ecology as it evolves. A networked virtual organization may very well be the catalyst for change that can mediate between a disruptive revolution and an evolutionary process that’s too often burdened with structural inertia.
ENDNOTES

2. Ibid., p. 48.
13. Ibid., p. 121.
19. The full description of the engine can be found at <http://www.nitle.org/tr_ast.php> (accessed June 9, 2004). I consulted extensively with the engine’s lead developer, Maciej Ceglowski, for the discussions in this section and in the section on Web logs. I wish to acknowledge his most helpful contribution to this work.

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