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News from the J. Joseph Moakley Center for Technological Applications

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The first of our reports on the J. Joseph Moakley Center for Technological Applications, which will be built on the campus of Bridgewater State College, described possible designs for the electronic classrooms it will house. This report will focus on plans for the electronic communication network, a new technological application with the potential to revolutionize the way we work with information, and with one another.

Electronic networking is the connection of computers, work stations and a variety of other equipment locally and over wide distances. In the story of the advance of human knowledge this does not sound exciting when compared, for example, with the discoveries of great thinkers like Charles Darwin, Marie Curie or Albert Einstein. But it can really stir your imagination once the scale of the potential impact of the technology becomes clear.

Imagine a world in which there is a great deal of knowledge about why things work as they do, but each bit of this knowledge is held by a different person, they do not know one another, and they are scattered all over the world. In addition, these people account for less than one percent of the population and they speak different languages. Clearly, this knowledge is worth a small fraction of what it would be if those who knew things were able to easily share information with one another and with the rest of the world. In short, disorganized knowledge is relatively worthless.

The first major advance in the organization of written information was the library. Today it is hardly an exciting concept. However, in the last three centuries B.C. it formed the core of the Hellenistic era, when, for the first time in Western history, a large scale attempt was made to collect in the libraries of Alexandria the recorded knowledge of the time. By modern standards access to the information was neither democratic nor widespread (for one thing, there was so little literacy), and the scale of the collection was small, but it fed the growth of a community of thought and creativity, which is still seen as a great leap in our intellectual and aesthetic history.

In the intervening two thousand years we have, of course, accumulated vast amounts of information in countless libraries, but the core of the collections is still paper volumes that we must travel to central sites to read. Since the early development of libraries and the invention of printing more than 500 years ago, our advances in the areas of organization of and access to knowledge have been of degree, not of kind. It looks like that is about to change with the development of the equivalent of one electronic, multi-media library. It will require no travel and, ideally, will be connected in the network so that any user will have access to any information in the system in any of a range of forms.

The development of electronic media, such as magnetic recording tape, video, computer storage on disk or tape, CD ROM and a host of others still being invented and perfected, has changed the way information is stored and transmitted. Virtually all newly acquired information in modern culture is produced in electronic form, and our accumulated knowledge is being translated into electronic form at a staggering rate. At first this merely meant that access to the information was easier for the small percentage of people who used the new technologies. But these technologies have now spread through the population so broadly that their mass application to the organization of information is imminent. Here is a sketch of how the system will operate on the network that is provided by the Moakley Center funding.

The Structure of the Electronic Network

Electronic equipment of three types will be linked in the Moakley Center and eventually across the campus: 1) voice, including telephone and cable lines, 2) video, including cameras, monitors and satellite communications and 3) data, including personal computers, large mainframe computers and network interconnections between them.

These connections range from the local (such as telephones and computers on the campus) to global (such as voice, video and data services physically housed, for example, in Japan). Because the connections are electronic, the physical location of the information is irrelevant and connections will be made by either Internet or satellite telecommunications. What matters is that the connections between the sources be made, and that the form in which the information is stored be accessible to the end user.

The system will be designed to connect the campus to essentially all the information networks anywhere in the world such as NEARNET (The New England Academic Research Network), Internet (connecting other networks run by various levels of government and companies such as IBM and Digital Corporation, and by other countries), the National Science Foundation network, NASA's networks, the John Von Neumann Supercomputer network and so on. You get the idea. Once you are connected, you are connected.

An imagined example of how the network might be used

A Bridgewater State College faculty member sits in her office before a computer screen and keyboard. She wants to do some research and writing that will enable her to present a paper at a conference on the relationship between levels of education and crime and to teach a class on the same subject. She connects her computer to the network via fiber optic lines installed on the campus with funds from the Moakley Center grant. First she uses the data network.

Using terms common to various computer systems, she looks through a menu of choices and selects a data service run by the University of Chicago, which contains current information on educational levels around the world. The data is stored in computers, the location of which she need never know. She types in plain language requests for the average levels of education in twenty selected countries and downloads (brings from the source to her computer) the specified information to a file she starts for the final paper. (With the eventual installation of voice-capable equipment and programs on her computer, she will be able to make these requests by talking to the screen.) Next she connects to another data service, this one dealing with crime statistics, and imports data (such as rates of murder, assault, larceny and so on) for the same twenty countries.

Looking at the data for education and crime on the same screen now, she thinks she notices geographic and economic grouping in the information. It appears that the

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Illustrations by Jason Rallis

closer the country is to England, the stronger the relationship between the levels of education and crime. (She finds lower levels of education to be associated with higher rates of crime.) So to examine this possibility further, she imports a graphic display of the globe from another data base and requests that the relationships she has calculated be placed on the map so that the stronger the relationship, the darker the shading of the country. Her guess is confirmed. The graphic display shows a clear pattern. But why should this be?

Now she begins to search the literature to discover if anyone else has found this relationship. Searches by subject, title and author are done on the screen, no walking to card catalogs or journal indexes. Among the references is one to a series of pictures from a visual presentation on the subject (what we used to call a film) dramatizing elements of her topic. She imports these images to her computer and integrates the pictures in her building report. She takes notes in her local text file on the sections of the presentation that she wishes to have put in digital form so it can be included in her paper and lecture materials.

Lastly, she sends messages by E-mail (an electronic form of communication over computer networks, like mailing a letter, only instantaneous) to a scholar at the United Nations who is working on a related issue. He sends back an E-mail message that afternoon along with a series of digital, high-resolution pictures recording both educational levels and rates of murder for every country in the world, yearly since 1950. These and the data she has generated are marked for reproduction as slides to be used in class and professional lectures.

Of course, these capabilities have many applications other than the one described here. For example, student advising, course selection and a range of other administrative tasks would become paperless and greatly simplified. At course selection time, a student could use any of the computer stations on campus to call up his or her record and the courses available and select the courses needed. The selections would appear on the screen when a faculty advisor called up the student's file.

Using the satellite communications of the system, televised conferences could be held on campus which involve faculty members, students, administrators, businesses, government agencies and so on. Any of the information available via the networks could be prepared for presentation at the conference, or even generated by request of participants during the event.

As with any new technology, the ability of individuals to understand its use or potential is limited at first. It takes years to be assimilated into everyday life. While the experts involved in the planning and design of the Moakley Center know a great deal more about how the new technologies can be used, even they cannot imagine the uses to which networks like these will eventually be put. What is clear, however, is that past limitations on the organization of information and access to it are about to be hugely reduced.

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