Technology and Occupation: Contemporary Viewpoints

Research Over the Next Century: Impact of Technology

Technology will radically influence occupational therapy research in future decades. Virtually every step of preparing for and performing research will depend more on technology. Furthermore, besides changing the mechanics of performing research, technology will increasingly influence what research we choose to do and why we do it.

Technology’s Influence on Performing Research

Performing Literature Reviews

The Information Age has made an incomprehensible quantity of information available to us, including information related to occupational therapy. Fortunately, information searching systems have advanced substantially. We now are capable of performing extensive literature reviews from our desk, customizing and automating reference searches to our individual interests, searching literally around the world with Web search engines, and using e-mail extensively for communications among researchers. These capabilities have created an environment of prolific information exchange. This expansion will not stop. In the future, we will see the quantity of research information expand dramatically. To make the information accessible, search engines will become even more user friendly, and inquiries will become increasingly adept at crossing more and more domains of information.

We are already beginning to see three types of advanced search software. First is the development of the integrated search engine. For example, Sherlock II from Apple Computer brings hard drive, server, and Web searching all under one search interface. A second technology advance emerges from the development of expert artificial intelligence search systems. Askjeeves.com already demonstrates a successful attempt at using free text English questions to formulate searches—just type in your question and the computer will mount a Web search. Lastly, our searches will become customized and automatically delivered to our desks when we need it. We can already see this service with Amazon.com or Yahoo. For example, after an initial search with Amazon.com, the Amazon.com search engine creates a profile of you in order to provide updated lists of titles and items that you will be interested in seeing at your next visit. The Community of Science (http://www.cos.com) provides an automatic search delivery service for researchers.

Data Collection

In the 1990s, we saw data collection depend more on technology. Bio-dynamic investigators began examining six-dimensional electromagnetic movement and position variables. For technology–human interface studies, researchers have collected data on numerous computer performance variables. Technologically based data collection for research, however, is not new (Schneider, Champoux, & Beiert, 1987; Smith, 1993).

In the future, digital cameras, the Internet, Internet II, telemetry, cell phones, and faster, less expensive microchip technology will continue to accelerate the usefulness of technology for data collection. Transducers embedded within our skin and internal organs will collect data 24 hours a day. Tele-rehabilitation is already developing remote diagnostic assessment for therapies and rehabilitation-related services. Mobile technology will also allow us to collect data in the natural environment and from subjective perspectives. Perhaps one of the most significant influences of technology on data collection will be wireless computer linkages to the Internet that use technology similar to that which brought us cell phones. Researchers will have immediate access to data from virtually anywhere. Plus, automated telephone calls can generate and record the responses of a telephone survey, precluding the need for human contact.

Data reduction. We know that technology and electronic data acquisition generates much more frequent sampling than old-style observational data collection. The result is that enormous data sets need to be consolidated, similar to what is experienced in qualitative research. Technology will increasingly allow the integration of expert thinking and some fundamental artificial intelligence to sort through data and compile the essence of the data. Computers will display complex data sets as clear two-dimensional or three-dimensional for-
mats where researchers can physically manipulate the data views to inspect new perspectives. We already see this potential in today's data-graphing programs. Graphs can be presented in various formats and spun around for viewing from various angles. Data waveforms can be compressed or expanded; multiple variables can be plotted simultaneously; and, through slider controls, data views can be easily manipulated.

In the future, artificial intelligence agents will become much more sophisticated. The human–computer interface will give an investigator the most salient information. Our dependence on data management will increasingly require information engineers to be collaborators on research teams. Technical data display terms like RMS (root mean squares), sensitivity analysis, and ROC (receiver operator characteristic curves) will become more commonplace in occupational therapy research discussions.

Data analysis. Statistical packages will continue to increase in capability. The click of a button on the computer screen will result in instantaneous, comprehensive, yet targeted, statistical conclusions. Computer software will be able to do much of the thinking and interviewing that a statistician does to determine the appropriateness of a statistical analysis procedure. The computer will ask a series of questions and pose suggestions in the analyses, providing a helpful statistical “wizard.” After confirming the strategy, the computer will run the analysis. Statisticians will worry because such programs will not only erode the viability of their jobs, but also make it much easier for researchers to administer inappropriate analyses.

Research anticipation and evidence-based practice. Via the Web, computers not only are bringing more information right to our offices and homes, but also will drive the integration of research information in the future. Today, for example, meta-analyses require deliberate step-by-step reviews of the literature and careful study selection (and disposal) on the basis of various statistical and content criteria. To create a confident meta-analysis tomorrow, all research investigations will be previously coded and the meta-analysis will be instantaneous. A practitioner will be able to ask what evidence is available related to an intervention with a specific population under specific conditions. A computer interpretation of the question will be virtually immediate after culling through the relevant research. The computer might ask the practitioner about a number of search parameters to refine the analysis and generate a sound interpretation to optimize the robustness of the evidence-based conclusions.

Technology as a Research Topic
Occupational therapy research will increasingly target technology-related topics. In the 1980s, we saw computers grow into a primary category of attention in the occupational therapy literature (Angelo & Smith, 1993). Today, children spend a substantial number of waking hours interacting with technology through television, telephones, or computers, including accessing the Internet (National School Boards Foundation, 1999). About 30% of the U.S. population is carrying cell phones today (Maney, 2000). If occupation relates to how people spend their time, then we will see an increasing number of important research questions related to occupational therapy and health.

The Relationship in Research and Technology
Research in the fields of occupational therapy and occupational science will become more interdependent on technology. Even today, any researcher would be hard-pressed to imagine performing and publishing his or her research without the use of technology. It is also impossible to ignore the importance of technology on human occupation. Our daily lives are facilitated by integrated circuits, radio frequencies, computer-aided manufacturing, telecommunications, and electronic financial transactions. Even the Amish and Old Mennonite communities find it almost impossible to completely separate their lifestyle from the pervasiveness of technology. Today, most staples and household goods they obtain at the market are created by technology-driven industry. For example, where once grains were all grown organically and fabric was spun manually, today mechatronics assist with all of these products. Technology has virtually taken hold of every aspect of our living experience. Almost no minute in our daily living would be the same without technology.

Professional and Research Education
The impact of technology on society has changed the responsibility of professional education. For students to understand occupational therapy in today's and tomorrow's environments they will need to understand the implications of how technology affects how human beings use their time. This will be true for American culture and throughout the world. The relationships of technology, occupation, and therapy will be increasingly interesting. Furthermore, as researchers use more technology tools during all stages of the research process, students learning research will need to learn the technology in order to learn the research process.

As we embrace research and expand our contributions to science and discovery, our research embraces technology. In turn, researchers and research educators must teach to a higher level of technology competency. How actively we adopt this charge is up to us. We control the technology we use for our research, and we control the technology we teach. Our next generation of researchers depends on us.▲

References


