Technologies, Transformations, and Responses

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[Abstract]

Technological innovations have played significant roles in improving human conditions in the history of civilization. The quality of life is expected to improve further as a result of the evolving technologies. Libraries have benefited by the many advantages offered through technology. Positive responses to new technological breakthroughs will enable libraries to provide improved and value-added services in our rapidly changing environment.

Historical Perspectives

We are witnessing an exciting time in human history. This is a time of rapid growth and development in new technology and telecommunications. The history of civilization has proved that each advance made through technical inventions in one way or the other greatly improved human conditions. For example, the invention of printing made letters and scholarship widely available to the general public. Printing technologies preserved knowledge and enabled such knowledge to be passed on to future generations. Therefore, print is possibly the most important technological innovation in the history of civilization. The invention of movable type could produce multiple copies of manuscripts by mechanical means. This innovation made mass distribution of recorded knowledge possible. The introduction of paper provided a new medium to preserve the human record.

For a long time there has been a debate about the origins of various inventions. Nevertheless, the original places of early inventions were well documented. The ancient China, India, Egypt, and medieval European countries all made their contributions to the progress of human inventions and technology. Human inventions and technologies changed the appearance and condition of the entire world. Francis Bacon was convinced that from these inventions sprang innumerable changes so that no empire, sect, or star appeared to have exercised a great power and influence on human affairs than these mechanical matters.
In addition to advancing human conditions, technical innovations attracted attention in a way that had never been before. Historically, people from diverse regions, ethnic groups, and classes responded differently to new inventions and technology. In Europe, in the early nineteenth century, the organized bands of Luddites rioted and destroyed the textile machinery that was displacing them. Their followers opposed the new mechanical instruments of production and broke machines that were introduced for mass production. Workers strategically destroyed the machinery that they saw as responsible for their redundant assembly line work. During that period, some literary figures also expressed opposition to technology brought forth by the emerging industrial order. As Hard and Jamison reveal, Blake linked mechanization to the devil; Keats and Byron escaped from the mechanical world to carve out an aesthetic world, to counter the machine with beauty; and Mary Shelley imagined the industrial paradigm in the form of the monster constructed by her mad Dr. Frankenstein in her literary experiment.

On the other hand, the people from North America and the New World held different views toward technology. American culture has long been in favor of technological progress. The earliest colonists brought useful knowledge and technical improvements with them from England in the seventeenth century. Such technical knowledge was necessary for them to survive in the New World.

As it is seen on every dollar bill today, the founding fathers of this country embodied the phrase, “Novus ordo Seclorum,” meaning “a new cycle of the ages.” “While the Agricultural Age and the Industrial Age were marked by technological advancements, the United States approached the twentieth century as a young nation moving rapidly toward becoming a world power. After World War II, the U.S. emerged as an international leader in technology and commerce. During this same period, technology became an integral part of everyday life. The key inventors of modern technology (for example, Thomas Edison, Henry Ford, Graham Bell, and the Wright brothers) were all Americans. The twentieth century was to be the American century. Jamison acknowledges that with the growth of powerful industrial empires in steel, oil, chemicals, telephones, electricity, transportation, weaponry, and machinery, the United States defined the very meaning of technological progress, having taken the poor and dispossessed immigrants from Europe and created a dynamic, productive nation.”

It should be recognized that technological development has not only broadened the scope of individuals’ potential and expanded man’s sense of power, but has also shaped future physical and social orders. Bell states that, “technological change could mean both new opportunities and new threats, even in such infrastructural areas as transportation and communication. Here we must confront large technological systems that combine to tie societies together, internally and across national boundaries.” The impact of technology is far reaching. It not only enables people to do things in new ways, but also provides new ways of thinking and approaching problems.

**Libraries Are in Transformation**

For centuries, the library as an institution of organizing and preserving recorded knowledge and providing service changed slowly. Shera
believes that because social innovation is rooted in and evolves from the body of practice and belief that comprise the culture of which it is a part, every major change in the social ideal has produced an alteration in the library (6). For decades, many people were convinced that the library was the last institution in a particular social setting that ever adequately responded to such social changes. However, this concept no longer fits into current library reality. While each period of history was marked by progress of its time for library technologies, libraries are now being influenced by the fastest growth and development in telecommunications technology in the history of civilization. Driven by emerging technologies rather than by social innovations, the applications of technology have enabled the library to provide improved service to its users. Technological advancements provide libraries with a vast range of opportunities to add value to user services. The rapidity of the rate of change occurring in libraries is happening at an unprecedented level. A popular term, “Information Age,” is often used to differentiate the modern library from its past. Crawford defines the Information Age as “the concept that the principal driving force in the creation of new wealth is now information, rather than industry or agriculture (7).” As the world is entering the Information Age, libraries will certainly play an even more important role in acquiring, preserving, customizing, and disseminating information.

In the past decades, libraries responded positively to available technologies. Libraries are normally always ahead of their users regarding in-house technology. The Library of Congress provided leadership in developing machine-readable cataloging (MARC). This progress realized the potential for providing instant availability of standardized cataloging coupled with the location of specific copies of texts, and made networking possible. The development of OCLC enabled library resource sharing nationwide and internationally. The development of CD-ROMs, multimedia, Internet, and the World Wide Web provided more options in accessing information. In the 1990s, network technology has enabled libraries to distribute digital documents worldwide.

Library services have been greatly impacted by new technologies. Card catalogues were replaced by automated online catalogues that provide users with more current and relevant information. Availability of information in electronic format has assisted the global spread of information. The ease of electronic communication made dialogues for a common ground among countries much easier. Digital networks such as Internet can reproduce and distribute texts around the globe almost instantly and for little incremental cost. The World Wide Web has made it possible for users to access library and information resources beyond the library building and at anytime anywhere. Technology has a substantial impact on breaking down many barriers in communications, access to information, interlibrary loan transactions, and document delivery. It has enabled people to communicate rapidly and effectively around the world.

Along with emerging technologies, users’ expectations continue to increase. Libraries are facing challenges from generations who cut their teeth on videos and were brought up using computers instead of books. Libraries also provide services to life-long (adult) learners. Users want libraries to accelerate their pace to enter the digi-
tal age and to produce and acquire digitized resources to which they can access information anytime anywhere. Thus, these expectations require librarians to deal with more complex issues such as intellectual property, licensing, remote access, communications, etc. Librarians must expand their area of expertise and improve their performance. Librarians must change as fast as the expectations of their users change.

In dealing with such rapid changes, it is imperative to examine the library's mission in the context of a technology-driven environment. Shera states that for librarianship, despite its increasing utilization of sciences and its affiliation with the social sciences, it remains in essence humanistic. It is humanistic because it is basically concerned with that elusive and subtle relationship between the human mind and the record of the great adventure. At a recent international academic library conference in Beijing, China, discussions around the library’s mission echoed Shera’s statement. One of the elements of a library’s mission is to provide service to the user community. The conclusion from the conference was that the mission of the library will remain essentially unchanged; however, the way the mission will be achieved will vary from institution to institution. In the digital environment, the library will add a new face to the mission: providing users with information from broad arrays. The fundamental change in America’s higher education such as the pedagogical movement from teaching to collaborative learning has also created new demands on the library. They require the library to provide new services that are technologically based. Looking toward the future, Crawford predicts that “tomorrow’s libraries will combine collections, extend collections, and provide electronic access in complex ways that can be disorienting. Effective reference work for the future will require new kinds of orientation, helping users to find their way and to know where they are.”

Librarians’ Responses

When Crawford expresses his vision of libraries, he states that the future means print and electronic communication, linear and hypertext, mediation by librarians and direct access, collections and access, and the library as an edifice and an interface. While it is not the scope of this paper to discuss the merit of this prediction, the penetration and influence of technology in library operations are inevitable. Unlike other tangible assets such as equipment, buildings, furniture, and the like, technology is intangible intellectual property that needs greater attention to evaluation, protection, use, and management. Technology enables the record of human knowledge to be transformed from print media to bits and bytes.

While our culture clearly favors new technologies, we have to realize that technological changes include costs as well as benefits. The changes that are brought forth by technology are often unanticipated and not predictable. Some librarians fear that libraries are moving too fast in embracing an electronic world, and some believe libraries are not moving fast enough in this regard. Shrinking budgets, sky-rocketing costs of acquisitions, reduced staffs, and increasing user demands and expectations are posing tremendous challenges for libraries. How do we respond to the challenges imposed by technology? Neal outlines some possible responses:

Naive -- to deny the importance of and fun-
damental transformation that technology is producing:

Situational -- to deal with technology only on a case by case basis;

Strategic -- to look for opportunities for fundamental change and advancement, and to develop flexible but aggressive plans for action;

Collaborative -- to be partners with other organizations, both within and outside the library community to advance the creative application of technology;

Entrepreneurial -- to look to technology to produce new markets; and

Administrative -- to allow technology and changes to be imposed from outside, from top down ①.

Clearly, we must adopt strategic planning for every aspect of management (e.g., organizational changes, budgeting, recruitment, staff training, user services). We must set our goals and maintain flexibility and creativity. Leadership must be in place that is compelling, encouraging, nurturing, inspiring, and defining. We must find new ways to improve user services. We have to create an environment in which teamwork, motivation, communication, and innovation are being cultivated.

We have to be more collaborative. We need to cultivate an enduring relationship with other units in the university community and with other libraries. Therefore, we should strive toward realizing goals of resource sharing among libraries at the global, national, regional, state level, and local consortia. The results will certainly be beneficial for all participants. In such a collaborative environment, staff expertise can be shared. We also need to work with commercial sectors and government agencies. For the purpose of information sharing, we will need to develop trust, constantly looking at new ideas both within and outside the library, and to encourage collaborative inquiry.

We have to adopt an entrepreneurial approach to ensure our user focused services and our uncompromising commitment to quality. We must be willing to take risks, willing to give up past successes and step outside the comfort zone, willing to test and implement breakthrough ideas, and willing to embark upon a systematic program of development. Thus, we will be able to secure additional financial support from donors and other sources beyond the library’s traditional financial base. We must clearly articulate the library’s vision and values and cultivate understanding and support to gain additional resources.

Conclusion

Stoffle argues that “libraries must build new paradigms and frames of analysis, including new languages. They must accept that they are educators and knowledge managers first and foremost ②.” Librarians are becoming more important members of communities, campuses, and the corporate world. As knowledge navigators, librarians will increasingly become more recognized as people who can navigate, screen, select, and customize information for their respective users. Technology is enabling librarians to retrieve information from throughout the world. Despite the constant changes, librarians are encouraged to take advantage of evolving technology and develop action plans for improving user services.
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