DOCUMENT RESUME

ED 450 770 IR 058 026

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TITLE Technological Discontinuities in the Library: Digital Projects That Illustrate New Opportunities for the Librarian and the Library.
PUB DATE 2000-08-00
NOTE 8p.; In: IFLA Council and General Conference: Conference Proceedings (66th, Jerusalem, Israel, August 13-18, 2000); see IR 057 981.
AVAILABLE FROM For full text: http://www.ifla.org/IV/ifla66/papers/006-120e.htm.
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Libraries; Access to Information; Competition; *Electronic Libraries; Higher Education; *Information Technology; Innovation; *Library Services; World Wide Web
IDENTIFIERS *Partnerships in Library Services; Rutgers the State University NJ; *Technology Utilization

ABSTRACT

This paper suggests that libraries are losing market share and can address external threats from competition through unique partnerships and technological innovation. The concepts of competition, technological discontinuities, and innovation are discussed. The following four projects at the Scholarly Communication Center (SCC) of the Rutgers University Libraries (New Jersey) are described: (1) the Medieval and Early Modern Data Bank; (2) GIS (Geographic Information Systems) in the Social Sciences; (3) access to New Jersey public opinion data via the World Wide Web, provided in collaboration with the Eagleton Institute; and (4) the Alcohol Studies Database. The "e" connections (e.g., e-library, e-journal, e-book) as addressed, noting that these areas represent potential technological discontinuities for the library. It is concluded that the SCC projects demonstrate that: prototyping is an effective tool to understand potential new services; reusable platforms reduce time to market; new technologies in combination with traditional librarian competencies offer the opportunity for new services; and platforms offer ways to encapsulate knowledge so that we don't lose it. (Contains 12 references.) (MES)

IFLANET Search Contacts
International Federation of Library Associations and Institutions
Annual Conference

66th IFLA Council and General Conference

Jerusalem, Israel, 13-18 August

Conference Proceedings

Code Number: 006-120-E
Division Number: VI
Professional Group: Management and Marketing
Joint Meeting with: Information Technology and Social Sciences Libraries
Meeting Number: 120
Simultaneous Interpretation: *Yes*

Technological Discontinuities in the Library: Digital Projects that Illustrate New Opportunities for the Librarian and the Library

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Abstract

Our library profession is changing dramatically, largely due to the forces unleashed by major advances in computing, networking, and storage technology. We are at a juncture where the library and librarian must ask how they will embrace and use these new technologies. From a business perspective, we know that the three interrelated concepts of competition, technological discontinuities, and innovation are having more and more relevance for the library. This paper suggests that libraries are losing market share and that we can address external threats from competition through unique partnerships and technological innovation.

Paper

Introduction

The concepts of competition, technological discontinuities, and innovation are typically found in a business environment, however these concepts can also be very useful in examining libraries' current practices and establishing new

directions and opportunities. Although my framework here is the university and research library, I believe that these concepts will become relevant for all libraries.

Competition

What does competition mean for the library and does the library have competitors? Typically, another institution, business, or person is a competitor if they are taking part of your market share. One measure of a library's market is the number of reference questions dealt with at the reference desk or through electronic reference. We have experience at Rutgers University which indicates that we have handled 23% fewer reference questions in the 98/99 academic year than we did in 96/97 academic year (Boyle, 1999). There are many ways to deal with this problem and, as one approach, reference librarians are pursuing improved methods for delivering reference service (Lipow, 1999). What we are faced with is a competitive threat. In some respects, the threat is very amorphous and difficult to identify and is represented by the millions of Web "publishers" who distribute information on the Internet. Our library users and patrons are finding this information and using it in lieu of the scholarly information available to them in the research library. In other cases, the threat is more clearly and easily identified. What would we do if Amazon.com decided to enter the book lending business? Alternatively, InfoRocket (www.inforocket.com) is a new company which offers reference services through a Web auctioning process similar to eBay. In effect, anyone on the Internet could become an amateur reference librarian. Perhaps closer to home is the assertion by Dr. Michael Kurtz, an astrophysicist at Harvard University. He flatly states that "librarians could not have helped us" to organize and make available the most important research resources to others in the field (Marcum, 1998). The point of these examples is that we do have competition and we need to recognize that there are serious threats not only to the library as an institution, but perhaps more importantly to the users of a library and the quality of information that they are obtaining.

Technological Discontinuities

A technological discontinuity is represented in a new technology or in the re-packaging of a set of existing technologies that results in quickly obsoleting a product or service. An example from the 1960s is the introduction of the electronic calculator. In a very short time, slide rules and mechanical calculators disappeared and, in some cases, the companies that made these products disappeared when they could not adapt to or find ways to use the new technology. Another more recent example is that of using the Internet and the tcp/ip protocol to transport voice calls. This application of the Internet represents a technological discontinuity for traditional telephone companies and provides an opportunity for small entrepreneurs to enter the telephone business with relatively little investment. In general, the Internet and the Web represent technological discontinuities for the library and thus both an opportunity and a threat for the future. As just one example, as we train our reference librarians to do Internet reference using search engines, portals, and web research guides we are finding less use of the Library of Congress classification system, a system which most students find obscure and confusing.

Innovation

Librarians pride themselves on being able to understand user needs, organize information, and provide effective access to information. These skills represent

the traditional competencies that are part of what makes a library a success. However, the opportunity that technology offers and the threat of technological discontinuities suggests that we are entering a new era in which it is "more important to know what we don't know than to know what we know" (Berghel, 1999). One way to respond to these threats is by creating an innovative environment within the library that will harness the power of new technology by generating new services. Innovation is an intriguing part of human behavior and it has mysterious and desirable aspects such as creativity. Library administrators should foster more innovation in their institutions, however they may find this human behavior difficult to stimulate and even more difficult to do well. Zairi (1992) provides an excellent definition of technological innovation that helps set the framework and context for this paper: *"Technological innovation is the process by which industry generates new and improved products and production processes. It includes activities ranging from the generation of an idea, research, development and commercialization to the diffusion throughout the economy of new and improved products, processes, and services."*

How does one do innovation? For many years, the concept of "skunkworks" has been a very successful and interesting innovation process within corporations (Bennis & Biederman, 1999). Frequently a *"skunkworks"* operation can be a very innovative process because of the empowered environment, lack of formal processes and the abscence of bureaucracy. Business consultants (Hamel & Prahalad, 1994) have long urged innovators to examine the *"white space"* or the *"cracks"* between traditional markets to find opportunities for new products and services. As introduced in the next section, the Scholarly Communication Center is examining these *"cracks"* within the context of library needs and competencies in order to prototype and trial new products and services. As in most library endeavors, partnerships are essential.

Projects and Partnerships

At Rutgers University Libraries (RUL), we have established a center in which new technology can be evaluated with the objective of enhancing library services or creating new products and services. The Scholarly Communication Center (SCC) (Collins, Fabiano, et al, 1999) within RUL was officially launched in October, 1997 and has pursued initiatives in teaching, scholarly communications and electronic publishing. Our efforts in the SCC are a catalyst to bring together experts in subject content, technology, and library services in order to forge new partnerships and prototype new services. The SCC has provided a unique opportunity to experiment and innovate and this section will briefly describe four projects which highlight the partnerships, the technology and the lessons learned from our experience.

Medieval Early Modern Data Bank

In the Spring of 1998, the SCC joined with Rudolph Bell, Professor of History at Rutgers, to develop a website (Bell, Jantz, & Khanna, 1999) for finding and retrieving data from the Medieval and Early Modern Data Bank (Research Libraries Group, 1996). The Medieval and Early Modern Data Bank (MEMDB) is a project established at Rutgers University and originally cosponsored by the Research Libraries Group (RLG), Inc. MEMDB is co-directed by Prof. Rudolph M. Bell of Rutgers University and Prof. Martha C. Howell of Columbia University and has an objective to provide scholars with an expanding library of information in electronic format on the medieval and early modern periods of European history, circa 800-1815 C.E. MEMDB contains

five large data sets, three pertaining to currency exchanges and two pertaining to prices from the medieval period. Scholars can use this data source in many different ways. For example, by examining prices of commodities from the medieval period, a researcher can show a correlation between prices and major events such as ship wrecks or epidemics. Through this partnership between librarians and teaching faculty, MEMDB is now available world-wide to scholars, students of history and others who will find unique ways to utilize this valuable source of data.

GIS in the Social Sciences

Geographic Information Systems (GIS) tools provide powerful digital mapping capability and can be used in almost any academic discipline. GIS offers social scientists a new tool for conducting and presenting research, yet GIS remains the province of the more traditional geospatially oriented departments such as geography and urban planning. For a state university like Rutgers, there are many researchers who want to develop and analyze data to demonstrate trends, support a developing theory, or to use the technology for instructional purposes in the classroom. The project discussed here demonstrates how the SCC has extended this powerful GIS technology to other departments within the university. In this role, a librarian brings together technology, data, tools and training within a library setting. In this specific project, we discuss a collaboration with one of the political science professors at Rutgers University in order to provide a course entitled "community organization" which focuses on specific cultural, health, and business issues relative to a small urban area in New Brunswick, New Jersey. The political science course referenced here presented quite a challenge as articulated by Professor Michael Shafer. The objective was to teach junior-senior level students to use a powerful GIS tool to map census data about certain urban areas in New Jersey. Four of the course lectures were dedicated to this aspect of the course in which the RUL data librarian presented the essential elements of the mapping tool and how to import and map census data. This experiment in using GIS in a political science course highlighted the difficulties of using sophisticated computer tools in a classroom environment and the delicate balance between the pedagogical aspects of the course and the practical application of technology.

Eagleton Public Opinion Data

Research data is an under-utilized resource in academic settings primarily because of the difficulty in accessing the data and the tools required for effective manipulation of the data. In collaboration with the state premier polling agency, the Eagleton Institute, RUL and the SCC have provided access to New Jersey public opinion data via the Web. To address some of the data complexity issues, the website (Jantz, 1998) has provided the following capabilities:

- Search and browsing the poll database by title, date and keyword.
- Viewing the questionnaires online
- Examining specific question results
- Downloading data files in a file format that can be directly imported into SPSS

Standard web publishing technologies and the statistical tool SPSS were used to generate the question results from the raw data and to present this data on the Web. This feature is especially noteworthy since it enables users who are not familiar with tools like SPSS to actually view and use the data. In addition to

providing public access to this valuable set of research data, the Eagleton website was recently used in an undergraduate political science course to introduce students to quantitative methods.

Alcohol Studies Database

This last example represents a collaboration within Rutgers University Libraries and illustrates a new genre of information sources that are delivered through the Web, are subject specific, and continuously evolve as new material becomes available. For some time, a sizable research reference database including journal articles, books and book chapters has been available at the Center for Alcohol Studies at Rutgers University. As in MEMDB and the Eagleton Polls, this database represented a significant research resource that was accessible only through librarians at the Center for Alcohol Studies. The database of over 50,000 citations is now available through the Web (Page, Jantz, and Mead, 2000). The search interface presents thesaurus terms in three categories of physiological aspects, social aspects, and drug terms in order to provide a standard vocabulary and effective searching to the user. Sophisticated boolean operations can be easily constructed using pick-lists and the search can be limited by special categories such as populations or audience.To publish this database on the Web, we have used standard database technology and a database publishing tool called ColdFusion (Allaire, 1999). In order to streamline this publishing process, we have also developed a reusable platform that consists of the software technology above and a repeatable process that uses a website template and a standard bibliographic database definition. The database definition and website template can be quickly customized to highlight the specific content and unique characteristics of the specific database.

The "e" Connections

We are continuing to explore new and exciting possibilities that we believe will help the Library discover innovative and valuable services. Although we are inundated with the commercial jargon that prefixes many of our products and services with the notation "e-" (e-library, e-journal, e-encyclopedia, e-book), these areas all represent potential technological discontinuities for the library. In another emerging project with Professor Rudy Bell, we are contributing organization, design, and technology enablers as part of a new history honors course on medical advice in the medieval period. Students will search, find, and download to a local SCC archive electronic books (e-books) from a vendor's site. Since the books are from the medieval period the text cannot be easily character recognized and thus the books are represented as digital images. As part of this course, the students will have an opportunity to use e-book appliances for the book images rather than print a copy of the book. The e-book is a perfect example of the "cracks" between traditional library services and it represents a potential discontinuity for the library. Here is a book with no permanent content so how does one catalog such a product. One can easily imagine library servers that enable users to download books to their portable reading devices, yet there is at present no institutional framework to handle a device such as an e-book. And, as one might expect, there are a variety of vendors offering e-book products, some of them clearly thinking about the library market as a potential source of revenue. Through this technological innovation, we stand to lose another part of our traditional product base or we can aggressively pursue approaches to using this technology in the library.

There are many other opportunities that are emerging for the librarian and which also represent potential discontinuities. Internet reference offers the

capability to deliver reference service "anytime, anyplace" and is a service that our users are demanding. With technologies such as voice on the Internet and streaming video, we can imagine sophisticated and effective internet reference. As indicated in the introduction, commercial vendors are already entering into this arena by auctioning reference service and producing web-based research guides.

Conclusion

This paper has described several endeavors in the Scholarly Communication Center that illustrate how librarians can undertake technology oriented projects that benefit both research and the classroom and which illustrate how we can address the threats from technological discontinuities. The projects demonstrate that:

- Prototyping is an effective tool to understand potential new services.
- Reusable platforms reduce time to market.
- New technologies in combination with traditional librarian competencies offer the opportunity for new services.
- Platforms offer ways to encapsulate knowledge so we don't lose it.

As learning and education are transformed by the digital revolution, we can expect a further dissolution of the traditional structures of the library. The research library must transform itself to keep pace with this revolution and to fully utilize the innovations in network and computing technology. In undertaking this transformation, as Lynch points out (1999), "we've chosen to emphasize extrapolation rather than identify and understand emerging discontinuity." We will no longer be able to provide effective service by using analogies to what we have done with our print resources. Librarians can deal with the impending technological discontinuities by learning about and becoming experts in the competencies of innovation and partnership. Innovation suggests that we look for totally new paradigms to provide information service and that understanding what we don't know might be more important than relying on what we know. Partnership competencies suggest that we strive to understand how the professionals in our respective subject areas conduct their research and teaching and how we can become part of their team. Bringing together special competencies and new technology in an innovative environment can result in new products and services in the library that will provide tremendous benefits to our users.

Some time ago in a reference to the challenges of innovation, Steele (1983) described the "gauntlet of innovation" as a process that has many barriers. To successfully negotiate the technological revolution in libraries, we need not only new ideas and a stimulating environment in which they can grow, but we also need people who believe in new products and who will undertake the difficult tasks of building them. These people are the champions of new ideas and they will need lots of support to flourish in an environment steeped in tradition. Innovations will be lost without these champions.

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Latest Revision: *May 8, 2000*

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