Education for Information 25 (2007) 63–72
IOS Press

Technological advances and information education 1982–2007: Some perspectives

Fred Guy
EDINA, University of Edinburgh, Causewayside House, 158–162 Causewayside, Edinburgh EH9 1PR
E-mail: f.guy@ed.ac.uk

Received 13 February 2007

The paper considers technological advances in relation to information education over the 25 years of existence of the journal, *Education for Information.* Some key developments before 1980 such as the appearance of MARC and library co-operatives are mentioned along with key post-1980 developments including networking, the World Wide Web, and digital image capturing. The introduction of these developments into the National Library of Scotland is briefly described. Reference is made to publications on activities arising from the sponsorship of research in information studies by the (then) British Library Research and Development Department in the late 1970s and early 1980s. Relevant articles in *Education for Information* are mentioned and particular reference made to the thematic issue on the Internet published in 1995. It is suggested that the editors should consider creating thematic issues on digital libraries and future online catalogues.

1. Introduction

Education for Information was launched in 1983 at a time when financial pressures on the main purchasers of journals, libraries, were immense, and sustaining existing journals through declining subscriptions, let alone establishing new ones, was a challenging task for publishers. As was pointed out in an Editorial in *Education for Information*, the journal's establishment was assisted by a number of happy coincidences [1]. Technological developments had led to a greater interest in matters to do with information handling and North-Holland publishers, at the time a division of Elsevier, wished to establish a small portfolio of journals in the information field. The *Journal of Information Science* and *Information Services and Use* were already published by North Holland and the proposed new journal, to be called *Education for Information*, seemed to complement them very well.

A reasonable subscription base was established in the early days of the journal but its future was placed in question in the late 1980s when the publishers announced to subscribers that the journal would be ceasing publication. Very fortunately the journal was taken over by a small publishing house, IOS Press, in 1991 and has continued to appear under their imprint ever since.

The quarter of a century since the establishment of the journal has seen immense changes, with libraries now reliant on the application of technology and the publishing world being forced to adapt to technology and to new publishing models. No longer

can even the most prestigious commercial publishers expect authors invariably to submit articles for publication nor for libraries routinely to subscribe. The open access movement has forced major rethinking.

Despite this upheaval and ever changing scenario, *Education for information* continues to be published on a commercial basis. The marketplace for publications related to educational issues concerned with information management is relatively specialised but, perhaps, that is a reason for its continued survival. As one of the two founding editors of the journal it gives me great pleasure to acknowledge its continued existence and to have the opportunity of helping to mark this auspicious occasion. My paper will present a personal view on technology and information education.

2. Context

This paper is written within the context of helping to found *Education for Information* and being joint editor from 1983 until 2000. The journal was founded whilst I was employed as a lecturer at the College of Librarianship Wales, a position I held until 1984. After that my career took me into the broad area of the management of information and communication technologies in libraries. There was a training element within this work but association with information education matters was maintained by two periods of external examining at the Robert Gordon University, Aberdeen, Scotland (1996–2000) and Manchester Metropolitan University, England (2000–2004).

3. Technological developments and libraries

A review of the last 25 years shows clearly that libraries and their staff have been avid consumers of technological advances. The modern library is very dependent upon computers for providing access to information sources, including the catalogue or catalogues of the library's physical holdings and electronic subscriptions. All the activities associated with lending of stock will normally be dependent on computers and the activities associated with administration, including purchasing of materials, will require computers; most staff will use computers in some way or another in their daily work. E-mail communication with colleagues within the same institution and throughout the world is an essential component of modern working practice. At the heart of the library management activities will be an integrated library management system, in most cases using commercially available software. The hardware infrastructure within libraries will be extensive and, of course, will include connexion to high speed networks providing access to colleagues, databases and information sources throughout the world. Most libraries, too, have websites providing information about the services provided for users as well as access to them.

3.1. Pre-1980

What emerged from the 1980s onwards was dependent on what had happened before. A key development, which still has a major effect on libraries today, was the creation of the Machine Readable Cataloguing format (MARC). The thinking behind the development of the standard was that if different libraries used the standard, record exchange would be straightforward. That what, in fact, emerged were a number of flavours of the standard does not deflect from the thinking behind it. The application of the standard to work with the library management software which emerged in later years was a highly significant development. It is interesting looking back to see how, after 30 years of the development of different versions of MARC, usually based on perceived needs of different countries, there is a tendency today to employ what has become the *de facto* standard, MARC 21.

In the UK in this period many libraries were introduced to the use of computers by joining library co-operatives. The co-operatives purchased mainframe hardware solely for the purpose of running systems for library activities. Examples of library co-operatives in the UK were the Birmingham Libraries Co-operative Mechanisation Project (BLCMP), the South West Academic Libraries Co-operative Automation Project (SWALCAP) and the Scottish Libraries Co-operative Automation Project (SCOLCAP). Individual libraries could not afford to purchase the central hardware which was available at the time and the only alternative path to automation other than cooperation was to use the parent institution's shared facility and to commission the development of appropriate software.

Towards the end of the 1970s more affordable computers in the form of minicomputers began to become available and with them emerged companies who spotted that there was now an opportunity to develop library management software to run on the new machines. Such systems were referred to as turnkey, standalone systems. In 1983 the companies in the library systems marketplace in the US included SIRSI, OCLC (LS200); Notis, Ex Libris; DRA; CLSI, Geac, Innovative and VTLS [2]. Notis, DRA and CLSI were taken over by other companies but the others remain in existence. In the UK the three co-operatives – BLCMP, SWALCAP and SCOLCAP – were operational as was the British Library LOcal CAtaloguing Service (LOCAS) but none of these exist today although BLCMP metamorphosed into Talis with many of the original BLCMP members still taking services from the company.

Throughout the 1980s minicomputers improved dramatically in performance and the companies, in competing for market share, regularly improved the functionality of the software. Acquiring such a system for library management became essential for all libraries of a reasonable size.

3.2. Networks

The emergence of the Internet was a very significant development in technological advance for libraries. The Internet arose out of the US Advanced Research Projects

Agency NETwork (ARPANET) which initially had been developed for military purposes but subsequently became available for non-military use. ARPANET was eventually connected to the Computer Science network (CSNET) and the protocol, TCP/IP was implemented on it in 1983.

A development which had a significant effect upon UK libraries was the emergence of a national network allowing computers in different locations to be linked. The Joint Academic NETwork (JANET) developed out of a series of local and research networks and went live in April 1983 with 50 UK sites connected. JANET then created connexions to networks in other counties, becoming a critical element in the emerging Internet. Since 1983 there has been substantial and continued investment and by October 2006 SuperJANET5 had been created. It provides a unifying resource for education and research, accommodating as it does the needs of research institutes, universities, further education colleges, and primary and secondary schools.

3.3. Other developments

One significant improvement to library management software which was able to take advantage of the network developments was the creation of the Online Public Access Catalogue (OPAC). Library catalogues began to be accessible to users remote from the hosting system.

In the 1990s there was a major step forward with the emergence of the World Wide Web (WWW). In contrast to the Internet, which is usually defined as a network of networks, the World Wide Web, created by Tim Berners Lee in 1991, refers to a collection of interconnected documents and resources linked by hyperlinks and Uniform Resource Locators (URLs). Again, librarians eagerly embraced the WWW, developing local web sites providing information about services on offer and directing users to resources available in remote locations.

Another key development in the period was that of the microcomputer (later termed "personal computer"). The Apple II emerged in the late 1970s but microcomputers started to take off in a significant way with the release of the IBM PC in 1981.

Word processing software had initially been developed during the 1970s to run specialised programs on mainframe computers but as personal computers became more widespread the software was developed to run on them.

The result of these developments, as far as libraries were concerned, was that the specialised terminals used with the early library management systems were replaced by microcomputers. Since microcomputers were multifunctional they could be used for backroom activities (word processing, spreadsheets etc.) as well as for connection to networks.

E-mail which today is a ubiquitous mode of communication in libraries, is not, as might be thought, a development of the 1990s. Rather, it can be traced back to 1965 when multiple users of a time-sharing machine were able to communicate with each other. The widespread usage of e-mail, though, required first of all the development

of networks to provide for transmission of messages and the emergence of standards to ensure secure and reliable interchanges between senders and recipients.

In the late 1990s a most important development was use of digital technology to capture images of all kinds of material and create digital libraries. Libraries were able to provide users throughout the world with access to resources such as maps and manuscripts. Previously the only way such resources could have been examined was by making a visit to the holding institution.

4. Technological advances in an organisation

It is interesting to consider technological advances in terms of their application within an organisation. Such implementation has been described for the National Library of Scotland (NLS) [3].

Four phases of library automation are described. They are as follows:

Phase 1 (1978–1985)

Phase 2 (1985–1987)

Phase 3 (1988–1999)

Phase 3 (1999–)

In Phase 1 NLS was a member of LOCAS, operated by the British Library. This was a batch-processed system with the catalogue produced on microfiche. The second phase was a short one and covered the ill-fated SCOLCAP system. SCOLCAP was planned as an online cataloguing co-operative but the software failed to meet requirements. In Phase 3 NLS implemented, very successfully, the VTLS integrated library system. Phase 4 saw NLS implement the Voyager library management system in co-operation with the University of Edinburgh [4]. The hardware/software configuration used within each of the phases demonstrates the evolution of the technology. Phase 1 was batch processed. Phase 2 used proprietary hardware with dedicated terminals. Phase 3 embraced the use of terminals initially and then saw the introduction of personal computers as end-user devices. Boolean searching on the NLS library OPAC was first introduced in 1989 and the OPAC became available on the World Wide Web in 1997. The first NLS web site was created in 1996. In 1990 access to JANET was established and the first PCs were acquired in 1991. In 1994 the first departmental Local Area Network (LAN) was created.

One important acquisition was that of a Kontron digital camera in 1995. This provided NLS with the capacity to capture high-quality digital images. The first major project involved capturing images of the earliest surviving maps of Scotland prepared by Timothy Pont in the late sixteenth century.

5. Publications

The implementation of technology in libraries had a major impact upon teaching and research in what used to be termed library schools. Staff in library schools

both taught about how technology was being used in libraries and used appropriate technology in teaching. There was much enthusiasm about the use of technology in the early 1980s and quite a number of articles were published. The US National Online Meeting proceedings of 1981, for example, included 3 papers [5]. They were respectively entitled:

- *A computer assisted instruction program for end users of an automated information retrieval system;*
- *Microcomputer simulations of online bibliographic systems for teaching purposes*
- *Survey of online searching instruction in schools of library and information science.*

The 7th International Online Information Meeting held in the UK in 1983 [6] included:

- *The teaching of online searching in UK schools of librarianship and information science – some facts and figures;*
- *Promote, educate or train;*
- *Computer software for education and training: developments in UK schools of librarianship and information science;*
- *Training aids for online instruction: an analysis;*
- *Education and training for online bibliographic information retrieval in South Africa.*

Whilst there were, no doubt, many reasons for such a flurry of publishing activity a key element was the role of the British Library Research and Development Department. Day and Tedd have stated that:

> *It is part of British Library policy to stimulate understanding and use of modern information systems and so it was realised that the next generation of librarians and information specialists should be familiar with and able to promote online search systems. The BLR&DD, in a letter to all library and information schools in 1974 indicated its intent to encourage the schools to explore ways of using online methods in their teaching to study the effect on future curricula and invited the schools to suggest proposals for work in this area [7].*

This initiative resulted in staff in all UK library and information schools carrying out a wide range of projects and was an excellent example of the creativity which can emerge with relatively limited amounts of money.

The development of technology in libraries has, not surprisingly, had an effect upon library jobs, with information technology knowledge and skills required in even the least demanding of jobs. Andrews and Ellis provide a very interesting analysis of job adverts at 4 points in time: 1971/3, 1981, 1991, and 2001 [8]. They looked at job advertisments in terms of library as opposed to information work and concluded that:

> *"In terms of skills, both have witnessed a notable rise in the importance attached to IT skills. . . "*
> *"With regard to duties and tasks, both fields have also seen a rise in the amount of IT-related work. . . "*

Education for information has published a number of articles dealing with technology and information education over the years but, with one notable exception discussed below, the coverage has been relatively spasmodic.

An interesting paper which brings back memories of the early days of teaching online searching was published in 2002 [9] whilst a very pertinent paper on the use of WebCT at Manchester Metropolitan University was published in 2001 [10]. In 2000 an interesting article on the use of email was published [11] and a curriculum-based article appeared in 1999 [12].

A highly significant development in *Education for Information*'s evolution, however, was the publication in 1995 of a complete issue devoted to Internet matters . In the editorial the guest editor, Tom Wilson, wrote that:

> *Progress is such that we can now expect that any student in any department of information studies that has access to the internet will be taught about what it is and what it does. Certainly, in the UK, a recent study showed that all of the schools and departments of library and information studies were "network aware' and, by the end of 1995, all were delivering training in this area [13].*

The other articles in this special issue were:

- *Internet and academic teaching in Australia;*
- *Computer-mediated communication in the information curriculum: an initiative in computer-supported collaborative learning;*
- *Wired in the ivory tower: access and copyright issues surrounding the Internet and higher education in North America;*
- *Educating for the internet in an academic library: the Scholar's Centre at the university of Western Australia;*
- *The process of introducing Internet-based classroom projects and the role of school librarians.*

Education for information has also played an important role in bringing to the attention of its readers the current state of developments in developing countries. Examples of such articles are a recent one dealing with Kenya [14] and a more general one on Africa [15]. In 2002 an article on a network for information science research in South Africa was published [16]. An earlier article covered developments in Indonesia [17].

Theme-based issues have been a relatively rare occurrence in *Education for Information* but it is hoped that the opportunity will be taken to have more in the next 25 years. It certainly makes the job of a reader easier when material on a particular topic is helpfully collated within a single unit. Perhaps, though, this is a reflection on the use of print resources. The existence of an electronic version does provide the

possibility of a reader creating a personal issue of material which has been published in different issues. It is also worth mentioning that an invitation to prepare a submission can often stimulate writing which otherwise may not have happened. This is usually only successful where it is known that a particular author has been involved in developments related to the theme under consideration.

One topic which would merit a special issue is to do with digital libraries and the treatment of that topic in an educational context. In a very quick search of WWW resources two recent articles on digital library education were located but both had been published in the *D-Lib Magazine* [18,19]. Another article on this topic appeared in the conference proceedings of the American Society for Information Science and Technology [20]. Interestingly one of the authors, Tefko Saracevic, was a previous member of the Editorial Board of *Education for information.*

Another topic which is currently occupying the attention of library thinkers and developers is that of the library catalogue. Lorcan Dempsey, in his Weblog, has recently discussed the future role of the catalogue stating that it does not need to be tied to the inventory management systems [21]. He makes reference to the North Carolina State University catalogue which takes the data held in the integrated library system and makes it work much harder in a richer user interface.

The current technology which is available has opened up all sorts of possibilities for the creation and delivery of services in libraries and there are, therefore, great challenges for educators in preparing their students both to be able to take advantage of technological developments and provide knowledge and leadership on taking them forward. *Education for Information* could and, indeed, should play a major role in reporting on such educational advances.

6. Summary

The 25 years of *Education for Information* have been challenging ones for the journal. This quarter of a century has been one of considerable technological developments and the implementation of technology within libraries. As libraries implemented integrated library systems, introduced microcomputers for a wide range of activities and telecommunication links were established throughout the world, educators in library and information schools eagerly embraced technology both as methods of teaching and for preparing students to use and exploit the technology in working environments.

The developments within library and information schools have been reported in the published literature. Around the start of the period, in particular, there was quite a lot written about developments, stimulated in the UK, to a great degree, by the British Library Research and Development Department.

Education for information has published a number of papers dealing with various aspects of technology and information education. It was particularly noted that it has

provided a particularly useful outlet for papers on the situation within the developing world.

Education for information has been successful in establishing an important niche in journal publishing and certainly a sound base for the future has been created. Undoubtedly there will be major challenges ahead and I would like to end by taking the opportunity to wish the current editors and publisher every success in the years to come.

References

[1] R.F. Guy, Looking back along a long and winding road: twenty years of involvement with a journal, *Education for Information* **18** (2000), 269–271.

[2] http://www.librarytechnology.org/automationhistory.pl.

[3] Fred Guy, Developing services in an evolving technological and political era, *The Electronic Library* **21** (2003), 538–545.

[4] S. Cannell and F. Guy, Cross sectoral collaboration in the choice and implementation of a library management system: the experience of the University of Edinburgh and the National Library of Scotland, *Program* **35** (2001), 135–156.

[5] Martha Williams and Thomas Hogan, *Proceedings of the National Online Meeting, New York, March 24–26, 1981*, New York: Learned Information, 1981.

[6] 7th *International Online Information Meeting, London, 6–8 December 1983*, Oxford: Learned Information. 1983.

[7] J.M. Day and L.A. Tedd, Computer software for education and training: developments in UK schools of librarianship and information science, 7th *International Online Information Meeting, London 6–8 December 1983*, Oxford: Learned Information, 198, 471–481.

[8] Anne M Andrews and David Ellis, The changing nature of work in library and information services in the UK: an analysis, *Education for Information* **23** (2005), 57–77.

[9] K. Horton et al., Internet simulations for teaching, learning and research: An investigation of e-commerce interactions and practice in the Virtual Economy, *Education for Information* **20** (2002), 237–252.

[10] Margaret Kendall, Teaching online to campus-based students: the experience of using WebCT for the community information module at Manchester Metropolitan University, *Education for Information* **19** (2001), 325–346.

[11] Laurel A. Clyde and Jane E. Klobas, Shared reflection by email: its role in new information technology education and training, *Education for Information* **18** (2000), 273–287.

[12] Philippa Alemna, An example of Internet-based continuing professional development: perspectives on course design and participation, *Education for Information* **17** (1999), 45–58.

[13] Tom Wilson, Guest Editorial, *Education for Information* **13** (1995) 171–175.

[14] Mabel K. Minishi-Majanja and Dennis Ocholla, Information and communication technologies in library and information science education in Kenya, *Education for Information* **21** (2003), 243–262.

[15] Mapping and auditing information and communication technologies in library and information science education in Africa: A review of the literature, *Education for Information* **21** (2003), 159–179.

[16] Irene Wormell, Theo J.D. Bothma and Rocky M.D. Ralebipi, DISSAnet: Development of an information science research network in the Republic of South Africa 1998–2000, *Education for Information* **20** (2002), 45–56.

[17] L. Sulistyo-Basuki, Short communication: Information technology and library education in Indonesia: recent developments in the curriculum, *Education for Information* **17** (1999), 353–361.

[18] Amanda Spink. Education for digital libraries, *D-Lib Magazine* **5** (1999), http://www.dlib.org/dlib/may99/05spink.html.

[19] Jeffrey Pomerantz et al., The CORE. Digital library education in library and information science programs *D-Lib Magazine* **12** (2006). http://www.dlib.org/dlib/november06/pomerantz/11pomerantz.html.
[20] Tefko Saracevic and Marija Dalbello, A survey of digital library education, In *Proceedings of the American Society for Information Science and Technology* **38** (2001), 209–223.
[21] http://orweblog.oclc.org/archives/000919.html.