

INFORMATION TECHNOLOGY

The evolving technologies for delivering medicines information

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The prospect of wading through massive volumes of printed matter for medicines information daunts even the most committed professional. What are the options?

There has been a rapid growth in technological developments in most spheres of daily life. The impact of these developments on the delivery of information has gradually led to the development of *de facto* standards for structure and presentation. Much of this development was driven by commercial or competitive pressure in the entertainment and retail business sectors, but has subsequently benefited other areas, including the health sector.

The publishing of textual information has been rather slower in reacting to the emerging technologies. This is almost certainly due to the culture surrounding the use of such information and the difficulty of standardising the structure of the information into a format which is easily written, edited, stored and most importantly, retrieved. In the past few years, however, there has been a rapid change towards the use of established and leading edge technologies to deliver information, which was previously available only on paper. As opportunities for employing electronic dissemination of information were recognised, a number of issues arose which continued to limit the pace of development. Perhaps the most difficult issue is the maintenance of copyright and the mechanism for ensuring continued income once the information is in a readily reproducible form.

This article will briefly review some of the technologies as they have emerged and attempt to highlight the issues and advantages in the use of information technologies.

■ BOOKS

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About 20 years ago, all reference information was contained in textbooks. The user was required to devote a substantial amount of space to the storage of paper and had to develop mechanisms to facilitate the easy retrieval of information required.

Numerous indexing systems were developed to assist the user in finding the relevant information, but these required constant updating. New information had to be added by continually revising the books and supplements over varying cycles, ranging from monthly to five-yearly. It was difficult to be sure that one had found the full information on the subject matter or that one had the latest information. Space and cost became an increasingly serious problem since these references were bulky and expensive. Rationalisation of resources into information centres followed, which required

unusual queries to be directed to regional or even national centres who were able to hold and control the plethora of references required to cover the wide scope needed. Inevitably, there were delays in relaying the information to the point of use.

New technology alleviated the space problem by compressing the reference volumes into a microfiche. This provided access to a wide range of references without the need for large rooms full of books. However, indexing was still a problem. As the range of information grew, it became more difficult to find the information required and to be sure that one had all the relevant information. In addition, since not all references were transferred to microfiche, there was the need to search the books as well. This duplicated effort was inefficient. Each time new information was added, the set of microfiches had to be updated completely, since information could not be slotted into the correct place in the reference. This was an expensive process. Lastly, special equipment was required to read the microfiches, which precluded their use in places other than a library environment. It was necessary to transcribe information in order to deliver it to the point of use, which introduced opportunities for error, lack of reliability and time delays.

■ ELECTRONIC PUBLISHING

During the time that these traditional technologies were being developed, several far-sighted publishers started producing electronic versions of their references. Initially, these were just computer files of the written text, with little added functionality or indexing. A major issue with the electronic publishing of such information was the protection of copyright. Increasingly, the original reference texts were being pro-

duced electronically, using standard word processing systems. If the publisher was to sell or license word-processed versions of their reference material, it would be difficult to prevent unlawful reproduction and subsequent loss of revenue.

Sophisticated mechanisms were developed to overcome this copyright problem. The most common mechanism was to encrypt or code the information in such a way that the user required the proprietary "reader" to be able to access the information. These readers could themselves be software-protected, preventing access to the information unless the appropriate licence fee had been paid. These protection mechanisms carried over to more modern delivery mechanisms and, as we shall see, still present a problem to publishers, who are concerned with protecting their intellectual property and ensuring the flow of income, while widening the scope of users and increasing the ease of access to the information.

Once the information was available electronically, it was possible to develop more sophisticated indexing and searching systems. Database search "engines" became available for each range of references, enabling efficient searching. Unfortunately, because of the proprietary nature of the coded information, each search engine tended to be specific to that publisher's material. While electronic searching was undoubtedly much more efficient than previous methods, the scope of searches was severely hampered by the fact that only some resources were published electronically, requiring book and microfiche searches in order to complete a full search. In addition, the user required several search engines, one for each of the different publishers of information. It was virtually impossible to integrate the results of searches to give the end user the complete information required other than by transcription, with its inherent problems.

Two delivery methods were developed, almost in parallel, for the distribution of these electronic information sources. The availability of CD-ROMs, holding up to 650Mb of non-writeable data (information that could not be altered or erased), offered publishers a secure mechanism to distribute their information in a way which was reliable and could protect their copyright and quality.

In parallel, online, dial-up services had been increasingly used to provide business statistics and other information. The use of online electronic libraries for drug information was a natural progression.

— CD-ROM

Let us consider CD-ROMs. Initially, the large capacity of 650Mb allowed major references to be encoded on to one disc. However, as time went on, the information,

especially databases such as subject extracts, spread over more than a single disc. A complete search was required to gain access to all discs in the set. Initially, this was done by sequentially loading each disc. This soon proved to be inefficient.

The development, by the computer industry, of mechanisms to facilitate computers' simultaneous access to several peripheral devices (known as a small computer series interface) allowed the development of "towers" of CD-ROM drives. CD-ROM towers enabled simultaneous access to a number of CD-ROMs. Towers could hold six or more discs which could be accessed in parallel. The scope and number of discs required increased to the point where even several towers could not provide the coverage required. Again, as with all other electronic data, the protection of the copyright precluded the use of any standard search routines across different publishers. In practice, one had to load the set of discs for the reference required, load the searching software, carry out the search and then change both discs and searching software to do a search on another reference. This difficulty increased the pressure for publishers to amalgamate their publications in a consortium in order to use the same search and viewing software. Of late, most information has been available through one of only several publishers, using a standard searching or viewing system such as WinSpirs (Silver Platter).

— ONLINE SERVICES

The online services adopted a different approach. By standardising the material into a form searchable only by their proprietary searching system, only those who had access to the search engine were able to make use of the information. By locating the search engine at the remote host site and not at the user end, searches were only possible by those who had paid the necessary subscription and been issued with valid user IDs and passwords. The searching software was proprietary. Many problems were reported after hours of searching, using the now infamous "dot searches" (the description given since each coded search instruction was prefaced by a full stop). Because of the limited speed available over the telephone system (I can remember operating at speeds of 9600 baud, which today would be laughable), the searches were too slow. Each search result incurred a charge if printed or downloaded and so extensive searches were expensive and time consuming. Two types of resources emerged. They were:

- extract resources, which allowed extensive searches across a wide range of publications but only returned a short extract and details of the full reference. This required the end user to then

resort to a library in order to capture the full reference

- "full text" resources, which not only allowed searching but enabled the full reference to be viewed

— THE INTERNET

Over the same period, the internet had been developing quite rapidly. Initially only used by enthusiasts, some commercial organisations had seen the opportunity offered by pushing information to users in a way that did not require them to have developed skills in information retrieval or searching.

When the World Wide Web was initially developed, it was designed to present information in a way that could be read by any connected computer. By coding the information with additional markers (or "tags"), the presentation of the information could be controlled at the user end. This meant that the underlying information could be easily written, edited and maintained, thus allowing the format and presentation to be separated. It also meant that the "viewers", or browsers, as they became known, could be standardised. Several companies developed browsers, including Mosaic, Netscape and Microsoft. Microsoft has captured more than 70 per cent of the browser market, with versions of the Internet Explorer browser. Since the browsers have the same basic functionality, developers of information are able to produce their information in a standard format. Hence, it is now possible to view all resources using a single user interface. Or maybe not: there is still the issue of copyright. How can the income streams of the publishers be maintained if the resources are freely available on the internet? In this regard, a distinction must be made between the *internet* and *internet technologies*. The use of mark-up languages to present information in a standard way does not restrict the distribution to the internet *per se*. Instead, the use of closed internet systems (intranets) or controllable gateways to the internet (portals), can allow the use of internet technologies without the associated risks and loss of copyright income. In addition to a standard presentation interface, the emergence of internet technologies has allowed powerful searching systems to be developed. As consumers seek access to more and more information via the internet, the sophistication and efficiency of the search mechanisms have developed further. These search systems provide extremely fast searching over an almost limitless scope of information.

— INTRANETS

Hospital intranets have developed in leaps and bounds during the past two years. Many trusts see their intranet as providing the perfect "one-stop shop" for local

and bought-in resources. All essential information, including department-specific guidelines and protocols, can be made available at the touch of a button. The need to provide updated information to all staff means that the intranet is fast becoming the vehicle for locally controlled information access.

The article on hospital intranets by Tugwell, which follows (p158) provides a good example of how, with the necessary support and enthusiasm from within the pharmacy department, it is possible to create a useful resource from which all staff can benefit. Of course, an intranet can be a network within a department, a hospital, a trust or in the case of Wales, an entire nation.

HOWIS The NHS in Wales has developed and maintains a fully featured intranet service, Health of Wales Information Service (HOWIS) that offers web, discussion board, mail and search facilities to all NHS staff in Wales.

HOWIS was developed and is supported by Health Solutions Wales (HSW), which is the NHS Wales Information and IT service supplier. An important part of the HOWIS service is the provision of clinical and pharmaceutical information services.

In particular, HOWIS now hosts a number of established clinical knowledge databases, including Medline, Cinahl, PsycINFO, EMBASE, EBMR, Assia, and the Cochrane Library. In addition, a number of pharmaceutical knowledge databases, including WeBNF and a range of Micromedex databases have recently been added to the knowledge base portfolio.

The National Assembly for Wales has recognised the importance of delivering clinical and pharmaceutical information to NHS staff in an effective, consistent, and cost-effective way. Direct funding to further support and develop such services is provided to HSW by the National Assembly for Wales.

There are currently 15 NHS trusts and five health authorities in Wales, and each of them is connected to HOWIS. There are also a number of health libraries, approximately 2,000 general practitioners, a number of other community care professionals and NHS directorate staff based at the National Assembly for Wales who have access to some or all of the services provided by HOWIS.

— PORTALS

As with all information resources, the information is only useful if it is kept up to date. The rapid growth of internet technologies promises that this will be a key area in the future as more use is made of portal opportunities.

The development of portals offers considerable advantages for the publisher, the intermediaries and the end user. The end

user can have access to a “one-stop shop”, requiring, for example, only one subscription service or access number in order to gain access to a wide range of resources. The publisher can contract with the portal owner to provide their references to the portal subscribers on a volume basis. Then the publisher only has to regularly update one resource each time, in order for all users of that portal service to have access to the latest information. The portal developer can recover costs by negotiation of suitable subscription rates with end users and gain the benefit of a higher profile.

— THE FUTURE

Many will say that the future is already here — but that there are a few obstacles to be encountered along the way. The funding of the necessary infrastructure (networked terminals) is a major issue, together with the licensing costs of external resources. Of course, all of these require a vast investment of time and effort to establish and maintain. Unless an intranet or internet portal is kept up to date, it will inevitably pale into insignificance and the number of users will gradually decline.

A growing number of hospitals are

wholeheartedly embracing modern technology and experimenting with the best way to communicate information. Perhaps it is getting closer to the time when personal digital assistants (PDAs), like the Palm and Handspring devices, will become the norm. With these, local and external information can be accessed over a wireless network. It would simply be a case of picking up one from the recharging rack, typing in a password and accessing the local formulary, linking to a specific British National Formulary monograph, viewing the latest local pharmacy information and even checking the lunch menu in the staff restaurant.

ACKNOWLEDGMENT Thanks to Steve Finn, web business manager, Health Solutions Wales, for the information on HOWIS and Peter Goacher, electronic sales executive, The Pharmaceutical Press.