The Market for Digital Access in Europe

A paper by

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1 Origins of the Digital Market

Traditional Print Publishing

The Renaissance (c. 1450 - 1600 AD) is directly associated with the invention of paper and arrival of the printed word. During this period the feudalism of the Dark Ages was dissolved by enlightenment in a Western civilisation invigorated by science and learning and a growing awareness and knowledge of the geography of the world.

Although the Chinese are generally credited with the invention of typographic composition in the 11th century, it was Johann Gutenberg, a goldsmith born in the late 1390s in Mainz, Germany, who provided the basis for modern typographic composition when he invented movable metal type at some time during the 1440s and 1450s. The famous 42-line Gutenberg bible, consisting of two volumes of 324 and 318 leaves, and based on a single fount of type, was completed in August 1456. This was followed by the *Latin Psalter*, published on 14 August 1457, this being the first dated book ever printed in the West.

Improvements in the mechanisation of first generation mechanical typesetting operations gradually followed in the several hundred years after Gutenberg, culminating in the arrival of the *Linotype* and *Monotype* machines which were invented in the late 19th century by Mergenthaler and Lanston respectively. The next major advance was the development of second generation photocomposition machines in the 1940s when the Intertype Corporation launched the first commercially available phototypesetting machine, the *Fotosetter* in 1947. This was followed in quick succession by the *Photon,* the *Monophoto* and many others all of which had composition speeds in the region of 3-20 characters per second. By the 1960s, machines such as the *Photon 900* (*GRACE - Graphic Arts Composing Equipment*), first introduced and delivered to the National Library of Medicine in 1964 for the composition of *Index Medicus*, were driven by magnetic, rather than paper tape, affording more impressive speeds of 300-500 characters per second.

Correlations have been drawn between the expansion of publishing in the late 19th century and the growth of literacy and the rise of the middle class. The industrial revolution and the growth of commerce also served as a catalyst for an expanding printing industry in the developed world. Paperbound books began to appear in Europe in the 19th century, notably in Germany and France where they became well established. In the United States the paperback flourished for a time in the early 19th century (c.1830 - 1840s) and again as the dime novel in the 1870s only to disappear again by the turn of the century. Its initial rise was due to the arrival of mechanised printing presses and cheap paper, a general lack of copyright protection in America for foreign titles, together with attractive postal rates. Its demise was precipitated by market saturation, rising costs, a fall in the popularity of fiction and was finally copperfastened by the 1891 US Copyright Act (the British Copyright Act had been introduced in 1710) and the arrival of cheap buckram cloth binding which revived the hardback.

Michael Twyman[1], in his history of printing in England and its effects on community life from 1770-1970, tells us that books were the preserve of the educated, well to do male during the late 18th and early 19th centuries. Other members of the community, even those who were able to read, were unlikely to be able to afford to buy books which were relatively expensive at the time. The common literate man was more likely to be exposed to the printed word in the form of proclamations and other public notices, popular penny journals and, of course, the bible. The rise and growing popularity of the subscription libraries in the 19th century also served to improve public access to the printed word.

New methods of distribution helped the rise of the book in the 20th century, for example, the sale of Allen Lane's penguin books through the Woolworth chain in Britain from 1935. The post world war 2 period witnessed rapid industrial growth, significant improvements in mobility, education, income levels, leisure time and birth-rates all leading to a growing demand for the printed word. The shift from industrial manufacturing to service industries in

the 1960s and 1970s, together with exponential expansion in full-time education, also promoted a growing demand for printed works. Primary academic journal publishing exhibited exponential growth from as early as the 19th century and a secondary literature of indexes and abstracts was introduced to cope with the growing mass of research papers throughout the 20th century.

In the closing decades of the 20th century, Europe, with centuries of strong and diverse literary tradition, boasted a flourishing publishing industry which was unmatched anywhere in the world. However, explosive growth in publishing output, fuelled by a surge of activity in research, education, commerce and public administration quickly precipitated problems in the provision of efficient and effective access to all forms of information. The access problem had become particularly acute by the 1960s when it became evident that the academic publishing industry was struggling in its attempts to meet the communications needs of research communities because of the time consuming, cumbersome and inflexible processes employed in traditional print production.

Digital Technologies

Two technologies were to come to the rescue – first, information technology in the form of computer hardware and software and second, communications technology. Alan Turing is generally associated with the introduction of the first computing machine when he invented the "Bomb" as a response to the German "Enigma" code making machine early in the second world war. The first programmable computer is claimed by the British to have been the "Colossus", also designed by Turing and commissioned in "Station X" in Bletchley Park, near London, in March 1943. It was built as a response to the more sophisticated "Lorenze" code making machine introduced by the Germans mid-way through the war as an improvement on the original "Enigma" code maker. Information on both of these machines was allegedly suppressed by the then British Prime Minister, Churchill, on the disbandment of "Station X".

It was the Americans who introduced the first publicly available programmable computer - the ENIAC, an all electronic machine built by Eckert and Mauchley in 1946 at the Engineering School of the University of Pennsylvania, Philadelphia. This machine, which was bigger than Colossus, contained some 18,000 valves and consumed 150 kilowatts to operate. It was initially used mainly to calculate shell trajectories. Magnetic tape was first introduced by IBM in 1952 and the arrival of the IBM 701 heralded the company's domination of the world's computer industry. By 1955, IBM had introduced 5 megabyte disc storage devices, removable disc packs and a wide range of printers until finally the system 360 computer arrived in 1965.

Communications technologies developed from Samuel Morse's first telegraph message in 1844 to Alexander Graham Bell's first telephone message in 1876, followed by Gugliemo Marconi's first radio message in 1895. The 20th century witnessed the rapid expansion of analogue based public switched telephone networks (PSTN) in most developed countries. The next major milestone was to come in the early 1960s with the design and implementation of ARPANET, the first digital communications network and the precursor of the Internet. Satellite communications were also introduced in the 1960s, following the launch of the Russian Sputnik in 1957, closely followed by a myriad of American satellites. The progressive and combined applications of these new information and communications technologies (ICTs) have served to launch the developed world into the digital age and to create a new Information Society.

Publishing and the New Technologies

The 1960s witnessed the dynamic interaction and, to a limited extent, the coalescence of two cultures - the long standing traditions associated over several centuries with the printed word and the newly emerging processes and technologies associated with computer based information storage, processing and retrieval. It was gradually becoming evident that a high degree of fusion between the mechanically and electronically based disciplines would be

necessary to meet both the rapidly expanding volume of scientific data and the growing and increasingly urgent information needs and demands of a burgeoning scientific community.

The impact of computer technology on scientific journal publishing, described in a seminal work by Barnett[2], began to emerge in the mid to late 1960s when initial keyboarding at the manuscript stage permitted the composition of the final journal article. Computer technology also facilitated, from the single electronic store of primary data represented by the journal article, the automated production of secondary products such as printed indexes, abstracts and bibliographies and eventually led to the production of fully mechanised information storage and retrieval systems alongside the traditional printed products.

By the mid 1960s, mainly with the financial support of the US National Science Foundation, many professional societies in America were exploring new computer based techniques for the production, indexing, abstracting and publication of scientific journals. By the end of 1967 there were over 400 computerised typesetting installations in the US and Canada. However, it is significant to note that computerised composition was being used mainly for setting indexes, abstracts, bibliographies and directories and its application in primary journal publishing was almost non-existent.

Batch and Online Information Retrieval Services

The first large-scale computer-photocomposed scientific publishing installation appears to have been MEDLARS (*Medical Literature Analysis and Retrieval System*), the computer generated version of *Index Medicus*, introduced in 1964**.** A *Photon 900* (*GRACE*) computer phototypesetter was used to compose the August 1964 issue of *Index Medicus* comprising some 600 pages (approximately 2 million words, 9 million characters) at a speed of 300-500 characters per second over a period of sixteen hours. In the same year, MEDLARS was launched by NLM as a computerised batch information retrieval service in parallel with the printed Index Medicus. This was soon followed by other American computer based batch retrieval services from the American Chemical Society (CAS – *Chemical Abstracts Service*), the Biosciences Information Service (BIOSIS – *Biological Abstracts*), COMPENDEX (*Engineering Index*) and many others. These services were extended under licence to Europe within a year of their introduction in the United States.

The next significant breakthrough in digital access was brought about by applying communications technologies to link users with digital databases. In 1967 the American Lockheed company launched DIALOG, the first publicly accessible online service on aeronautical and space technology. This was soon followed by NASA's RECON service, also on space technology, and NLM's MEDLINE, an online version of the batch service MEDLARS, in October 1971.

Online services were introduced to Europe in 1972 with the launch of the European Space Agency's (ESA) RECON service, based largely on the NASA system, but with some European literature included. In the same year the British Library launched BLAISE MEDLINE, in co-operation with the NLM but, like the ESA system, with European medical literature included.

Changes in Information Access

Online databases represented a new era in information access. At the early stages of digitisation, automated systems were used predominantly in the context of scientific, technical and medical (STM) publishing and the main users were academics, engineers, technologists and medical researchers. Digital access was provided almost exclusively to secondary, bibliographical information (metadata) and served only to identify possible primary sources of information. Although the technology was clumsy, expensive and unreliable it offered significant advantages over the printed format. With higher levels of indexing and cumulation of large volumes of metadata on automated databases compared to printed editions, the

secondary literature could be searched relatively quickly and efficiently on a remote host computer. Search formulations found to be effective and efficient could be saved and reapplied for current awareness purposes and search results could be printed off on a local printer or forwarded to the user by post.

Because these services offered only secondary access, the user was still faced with the problem of locating the printed primary resources identified in a computerised search. This highlighted another vital element of information access – document supply and the main burden of this task was to fall on libraries. Digital access to secondary literature quickly placed increasing strain on traditional print distribution systems and led to a new era of inter-library co-operation. Document supply services such as those of the British Library Document Supply Centre attempted to meet this new and formidable challenge. Library co-operatives such as OCLC (Online Computer Library Center) were established to exploit the new technologies for cataloguing purposes, leading to the establishment of standardised systems such as MARC (machine readable catalogue) to promote the sharing of records, thereby improving bibliographical control and access to information. OCLC is a leading global non-profit membership organisation serving almost 40,000 libraries in 76 countries and offers, among other services, the WORLDCAT database comprising over 46 million catalogue records including almost 800 million location listings.

Digital access was to change dramatically during the 1980s and 1990s. The introduction of the personal computer in 1976 was to significantly enhance user empowerment; full-text databases in the 1980s would shift digital access up a gear to direct primary, rather than secondary information retrieval; optical disc storage in the mid 1980s would revolutionise desktop access to large volume databases and, in the same period, the evolution of multimedia would significantly enrich information content; and, finally, the emergence of the Internet in 1993 would lead to the most profound economic and social revolution yet experienced by mankind.

2 The pre-Internet European Information Market

A survey by Frost and Sullivan[3] of the European information market estimated that in 1982 there were approximately 1000 electronic databases produced by 500 electronic publishers world-wide and these were available on 170 online services. The global industry was showing a phenomenal 25% annual growth rate and was mainly technology rather than market driven. Europe accounted for about 25% of the world database market with 264 databases and a turnover of $757 million. Total European revenues for scientific, business and professional publishing amounted to $30 billion, reflecting the minuscule contribution of the electronic database sector to the industry as a whole. A dramatic shift in database content had occurred in the previous decade from science, technology and medicine (STM) to the more lucrative topics of marketing, financial and credit information and news (see table 1)

Table 1: European Electronic Database Revenues 1982

Sector	Revenue ($million)	% Market Revenue
Marketing	275	36.3
Financial	216	28.5
Credit	102	13.5
News	43	5.7
Economics	28	3.7
Science & Technology	22	2.9
Legal and patents	26	3.4
Industry (9 sub-sectors)	45	5.9
Total	**757**	**100**

Source: Frost and Sullivan[3] (1983)

Three modes of database delivery to end-users were identified i.e. online, batch mode and database printouts. Not surprisingly, financial information was delivered mainly online while marketing information and credit information were delivered predominantly in batch and print modes respectively. The study also provided some interesting revelations on the mosaic of the European electronic information market. The UK and West Germany together accounted for more than half of total European revenues (UK 31%, West Germany 23%), while France and Italy generated 19% and 7% respectively. The remainder of member states collectively accounted for 19% of revenues. This demonstrated a marked polarisation in the European market, with developed countries dramatically out-performing the less developed economies (LDEs) in the Community. The state of progress of the electronic information market in the LDEs of Europe was reviewed by this author (Casey[4]) just under a decade after the publication of the Frost and Sullivan report and it was found that these countries had continued to feature relatively poorly in the market. The main problems related to low information awareness and computer literacy on the part of potential users who were predominantly small enterprises, critical mass and venture capital problems in information supply, poor telecommunications infrastructure for service delivery and generally depressed economies.

The market was continuously monitored on a regular basis throughout the 1980s and 1990s. by European Commission agencies such as the Information Market Observatory (IMO), the European Telematics Horizontal Observatory Service (ETHOS) and, more recently, the European Survey of the Information Society (ESIS). Other industry agencies active in market monitoring and analysis include the European Information Industry Association (EIIA) and the European Information Technology Observatory (EITO). More recently, companies such as Forrester Research[5] and Nua Internet surveys[6] are actively engaged in electronic industry evaluation, in particular, Internet based services.

The next study I have chosen is the European Commission sponsored member state study (MSStudy)[7] which illustrated the state of the electronic publishing industry in Europe in 1994, when the Internet had yet to make a significant impact on the market. This study covered the European Economic Area (EEA) i.e. the EU, Norway and Iceland and focused on electronic information services used for professional purposes only. It excluded free services and mass market (consumer) services. Total EEA industry revenues were estimated at about 6.5 billion ecu (becu) as exports together with approximately 4 becu generated in the home market (i.e. a total of 10.5 becu compared with the Frost & Sullivan estimate of $757 million for 1982). For comparative purposes, it is worth noting that other sources calculated the total EU print publishing revenues in 1994 (newspapers, books, magazines) at about 80-90 becu (IMO[8], EITO[9]).

The MSStudy[7] findings on the make up of the European market differed little from those of the Frost & Sullivan[3] study undertaken twelve years earlier. Within the EEA, the UK, France and Germany feature as market leaders with a total 0f 61% of total EEA generated revenues (see table 2).

Table 2: EEA Industry Market Revenues in EEA 1994

Country	Revenue (mecu)	% Market Revenue
UK	1,174.0	28.4
France	763.7	18.5
Germany	594.5	14.4
Italy	353.4	8.5
Netherlands	259.5	6.3
Scandinavia (S,D,N,F)	582.7	14.1
Rest of EEA	407.0	9.8
Total	**4,134.8**	**100**

Source: MSStudy[8] 1995

On the export front, the UK continued to lead the market with a staggering 63% of total European revenue and together with France and Germany accounted for more than 80% of export revenues (see table 3).

Table 3: EEA Industry Market Revenues Worldwide 1994

Country	Revenue (mecu)	% Market Revenue
UK	4,080.9	63.5
France	731.3	11.4
Germany	367.4	5.7
Netherlands	277.6	4.3
Italy	264.5	4.1
Scandinavia (S,D,N,F)	454.1	7.1
Rest of EEA	247.8	3.9
Total	**6,423.6**	**100**

Source: MSStudy[8] 1995

Financial information, company profiles and credit information continued to feature as the main revenue generators, collectively accounting for almost 60% of total earnings. These were followed by government/political information at 16% with STM exhibiting a meagre 6%. The main user groups paying for services were financial services and other business and corporate users (80% revenues). Government users paid 11% and academics, researchers and education and training users provided 4% of revenues. Real-time was the most popular delivery mode (45% revenue) and this is compatible with the leading usage role of financial services. Looking specifically to the less developed economies (LDEs), EEA market revenue summaries in table 4 show the very limited performances of these countries.

Table 4: EEA Market Revenues 1994: Less Developed Economies (LDEs)

Country/Region	Revenue (mecu)	% Market Revenue
Total EEA	**4,134.8**	**100**
Spain	74.7	1.8
Portugal	72.6	1.8
Greece	40.9	1.0
Ireland	31.0	0.7
Total LDE	**219.2**	**5.3**

Source: MSStudy[8] 1995

The MSStudy concluded that Europe was behind North America in electronic information provision but was exhibiting a higher growth rate. The report highlighted market differentiation in Europe and explained it in terms of wide economic, social, linguistic and cultural differences across the Union. There was also a tendency, with the exception of the UK, to focus on indigenous markets which led to problems of critical mass. It was also noted that the private sector was the main generator of revenue and that there was relatively low expenditure by the public sector (c.15%). The relative strength of the UK performance was attributed to the London based real time financial information services provider, Reuters and to the special importance of London as a global financial services centre. The dominance of the English language in the industry and the strong information research base of the UK, together with fluid mobility of expertise between Britain and North America were also identified as contributing factors.

3.   The Internet as an Access Platform

The Internet came to prominence during the mid to late 1990s as a global digital access platform. In many ways, it has served to democratise access to information and has dramatically extended the digital information user community beyond the vertical markets represented by professional, technological, academic and other specialist users of the 1980s and early 1990s. There were, of course, experiments in the late 1970s and early 1980s, aimed at providing electronic information access to mass consumer (or horizontal) markets. These emerged in the form of interactive videotex, notably the British Prestel and the French Minitel systems. However, it is generally accepted that videotex was a failure on the consumer market, perhaps with the exception of the heavily subsidised French Minitel which, at its zenith, accounted for over 90% of European traffic. It has been argued that videotex was a technology in search of a market and, with little content of relevance or interest to an uninitiated potential user community, it was doomed from the outset. It has taken more than two decades since the introduction of videotex to attract the interest of the mass market in the digital world and to develop the rudimentary skills necessary to exploit it.

By the end of 2000 it was estimated that there were more than 400 million Internet users and 100 million hosts worldwide (Nua Internet surveys[10]). North America (USA and Canada) accounted for the majority of users (167 million or 41%) followed by Europe with 113 million (28%) and Asia/Pacific, mainly China and Japan, with 105 million (26%). Latin America boasted 16 million users while Africa and the Middle East were estimated to have 3 million and 2.4 million users respectively. Looking to Europe, the highest Internet usage densities (Internet users as a percentage of population) at various stages during the year 2000 were found in Scandinavian countries and the Netherlands with ranges of 41% – 56% of population. Spain, Greece and Portugal performed lowest with densities ranging from 0.7% (Portugal) to 5.5% (Spain). These estimates of Internet penetration are extremely volatile, for example, the world Internet population grew from approximately 150 million in early 2000 to over 400 million by the end of the year. This is expected to grow to well over one billion over the next two to three years, driven by increased penetration in Asia, Latin America and Europe, the latter overtaking North America in the short term future. An increasing proportion of users (up to 70% of total users) is expected to use wireless devices to go online. An example of the rapid rise in Internet penetration is demonstrated by comparing the most recent 2001 estimates with those of last year. Levels in Portugal have risen from an estimated 0.7% in July 2000 to 14.5% in October 2000 and to 20% in February 2001, while in Ireland the figure has increased from 27% in November 2000 to 40% in March of this year (Europemedia[11] and Marktest[12], cited in Nua Internet Surveys[6]).

The Internet is emerging as the underlying driver of the Information Economy and of the wider Information Society. It is providing unprecedented access by a rapidly expanding user community to a growing, globally based reservoir of information content. It is an instantaneous publishing medium with few constraints and endless possibilities. It serves as an electronic postal and communications system for academics, professionals, business people and ordinary citizens and consumers. It offers an increasing range of services in news, entertainment, job hunting and recruitment, health and medicine, residential property sales, motor sales, banking, stock trading, wholesaling and retailing. It is supporting a steady improvement in electronic government and public services and is promoting improved links between governments and citizens and between governments and enterprises. There has never before been so much access by so many people to so much information (and misinformation).

Recent developments and trends in areas of traditional print publishing, such as books, newspapers, magazines and academic journals, provides us with a benchmark for examining changes in access to information content. In general, books of reference, such as encyclopaedias, directories, indexes and abstracts, are moving inexorably to digital format and digital access. Encyclopaedias like Britannica have ceased publishing in print and most indexes and abstracts are now accessed on disc or online. However, the novel continues to

survive in print and although dramatically improved devices have been introduced for easy reading of the electronic book, the market is showing stalwart resistance to change.

Newspapers and magazines are maintaining a dual existence in both print and digital format, reflecting the publishing industry's policy of addressing both traditional print and newly emerging digital markets. Academic journal publishing is in the throes of a revolution and it is probably fair to say that print is gradually losing out to digital. Severe limitations of the print format in terms of unacceptable publishing delays and its inability to cope with the influx of publications from an expanding academic research community are persuading academics to shift to electronic publishing. The shift to digital is also aided by significant improvements in quality standards in electronic publishing and there is an obvious commitment on the part of the specialist academic publishing industry to move to digital. New generation, computer literate researchers currently see e-journals as offering the same advantages of priority of discovery, peer recognition and quality control as printed journals with the additional advantage of speedy and efficient publication.

Many examples of electronic journals are in evidence and a fairly comprehensive list is to be found in the American Research Libraries (ARL) directory[13] of scholarly electronic journals and academic discussion lists. In 1991 the first edition identified only seven peer-reviewed online journals. This had increased to more than 1000 by 1997 and the latest edition lists just under 4000 peer reviewed e-journals. There are several other useful guides to e-journals including lists by Jones[14], Klemperer[15] , Bailey[16], Harrassowitz[17], Colorado Alliance of Research Libraries[18], New Jour[19] and others. ARIADNE[20] and Information Research[21] are examples of e-journals targeted principally at information science professionals in academia. Other examples of e-journals include Elesvier's Science Direct[22], providing access to the full text of more than 1200 Elsevier journals on life, medical, technical and social sciences; Blackwell-Science's Synergy service, offering full text access to 276 journals on health, nursing, biology and other subjects and ISI's Web of Science[23], covering ISI's citation databases on the sciences, social sciences, arts and humanities and supporting navigation to selected full text electronic journals. JSTOR[24] is an archive of more than 100 scholarly journals of which the most current issues are 3-5 years old.

Major inroads have also been made on the popular magazine front. Thousands of e-magazines are to be found on Infojump[25] and Online Zines[26]. These cover almost every conceivable topic including animals and pets, golf, home and garden, hobbies, fashion, parenting, photography and travel.

Multimedia resources are also on the increase, particularly with the growth of disc storage products such as CD-ROM and, more recently, DVD. These media provide access to rich content information and offer very significant advantages over textual materials. They have made significant inroads in the music, computer games, video and other entertainment industries and are widely applied in education, training and other areas such as geographical information systems. There is an increasing array of multimedia resources available on the Internet and this, together with increasing traffic and delays in infrastructural development is exerting considerable strain on access.

Digital interactive television is also emerging as an access platform. This medium promises to support Internet access to the consumer market and is likely to pick up the non-pc consumer sector – the couch potatoes. However, due to market nerves, investment in digital TV is slowing down and is not progressing as quickly as anticipated. Recent studies by the Yankee Group[27], Forrester Research[28] and Strategy Analytics[29] estimated that the 35 million homes worldwide connected to digital TV in 1999 had grown to 56 million by 2000. Europe was reckoned to have between 7 and 14 million homes connected in 2000 and this figure is expected to grow to 24 million in 2001 and 80 million by 2005. Worldwide penetration is predicted to be 625 million by 2005.

There are many problems with the Internet as an access platform. The sheer volume of information and a growing level of multimedia content are exceeding the capacity of the network to function. Despite a multiplicity of search engines and hyperlinks, information retrieval is considerably less than satisfactory even for those who are equipped with good information skills. Google is probably one of the more effective engines and yet it is incapable of covering more than 20% of the several billion web pages on the system. Even if it were realistic to provide 100% recall, how would one cope with the output and at what expense would it be to precision, an inverse parameter of recall? Regulation and quality control standards are poor because of the totally anarchic nature of the Net and the volume of offensive and pornographic material is growing daily. The volatility and ephemeral nature of much of the content, reflected in the relatively short lifespan of many URLs, is also an issue of concern which raises the question of archiving. What is, or is not, to be archived and where archiving is to be undertaken, how should it be done and by whom? The prospect of preserving the total content of the Internet for posterity is almost inconceivable and even in areas that were traditionally afforded a comprehensive service, such as academic publishing, the problem has yet to be seriously addressed in the long term. Intellectual property rights is also a major issue of concern and shows little evidence of being satisfactorily resolved in the near term future.

Although the Internet is potentially an instrument of open democratic access to a global information resource, the reality is different. Internet penetration statistics clearly point to the fact that it is a retrieval tool of the developed world and its content is likewise generated by, and designed for, the developed world. Even within the developed world, it is being exploited by relatively privileged sectors of society – the educated middle classes, the computer literate and the economically secure. For the socially, economically and educationally deprived segments of the community it is another world and yet another means of promoting the social and economic divide. It is a major threat to individual privacy and security and serves as a breeding ground for all forms of crime, terrorism and anarchy.

On the positive side, the Net is serving as a global platform for research and technological communities, for national and international commerce, for public administration and government and for citizens, consumers and community groups. It offers wider choices, lower prices and improved services for consumers and there is some evidence that it is restoring a sense of community in local areas that have taken it on board.

4.   Some Recent European Market Indicators

The diffusion of electronically based information, database, transactional and wider e-commerce services across the Internet platform has masked the traditional benchmarking parameters used in pre-Internet studies on the European information market. Services aimed at specialist vertical markets such as high quality real-time financial services and horizontal mass markets such as online retailing of books from the likes of Amazon.com operate side by side on an ever expanding global communications infrastructure. Explosive and erratic growth rates in information products and services make it extremely difficult to monitor the market on a reliable, consistent basis. The recent plummeting of Nasdaq share prices, the dramatic collapse of dot.com companies and current retrenchment in the telecommunications sector are evident examples of sudden turnarounds in a highly volatile market. A recent Pricewaterhouse Coopers[30] study of the top 150 publicly quoted European companies showed that the European Internet sector lost half of its value in the last quarter of 2000 and ended the year with a total market capitalisation of €100 billion. Nevertheless, despite recent setbacks in the industry, it can be seen that liberalisation of telecommunications and of other information service industries over recent years in Europe has promoted unprecedented private investment and competition in industries that were traditionally monopolised by state agencies.

The MSStudy I report, referred to above, has recently been updated by MSSTUDY II[31] which offers a useful assessment of the status of European electronic information service

provision to professional users. The report is rich in detail and too complex to analyse in depth in this paper. It benchmarks the industry in the period 1997/998 and predicts general trends in Europe up to 2003. It contains no surprises – financial, credit and company information and news continue to be the front runners in revenue generation, real time is the most popular delivery mode, developed countries dominate the market and the less developed economies of Portugal, Spain and Greece continue to lag behind. There are some interesting revelations on the use of electronic services both at home and at work. These are categorised as communications services (e-mail, bulletin boards); electronic services (subjects of interest, newspapers, public bodies, other online databases and information services); transactional services (e-banking, real-time financial information, e-shopping, software downloading, ticket reservations); entertainment services and education services. Taking average usage rates for each type of service over 11 European countries, it was found that greater use of e-banking and entertainment services is made at home, but otherwise usage patterns are similar at home and at work. There are, of course significant differences in behaviour patterns between individual countries which will not be explored here. E-mail is by far the most commonly used service (55-58% users). Electronic services are used at levels varying from 22-41%, transactional service usage varies from 5-30% and educational services feature at 17%. The study predicted an annual growth rate of 10-25% in the professional information service market to 2003. The consumer market, however, is expected to show unprecedented growth and will exceed professional market revenues by 2003.

The use of the Internet for commercial purposes, or e-commerce, is exhibiting clearly discernible upward trends in both the business and consumer sectors. Notable among these is the rapid growth of business to business (B2B) e-commerce comprising all interactions between enterprises, usually over the Internet, including electronic ordering, invoicing, payment, advertising, marketing and customer support. B2B currently accounts for about 90% of the global e-commerce market valued at $422 billion (€448 billion) last year and is expected to grow to $8.5 trillion (€9 trillion) by 2005. The global B2B market is concentrated mainly in North America and European B2B industry revenues for 2000 have been estimated at somewhere between €200 million and €500 million with anticipated growth to €1 - €1.8 billion by 2004/5 (Jupiter Media Metrix[32], Forrester Research[33]). The value of goods and services purchased by e-trading in Europe for the year 2000 was an estimated €29.7 billion and it is not surprising to find that the UK and Germany were the main players accounting for 60% of e-trading revenues. Scandinavia was a distant second at 14% followed by Switzerland (6%), the Netherlands (6%), France (5%), Italy (5%), Spain (2%) and Belgium (1%) (Pro-Active[34]).

In tandem with the emerging B2B market we also have a complementary form of e-commerce – business to consumer (B2C), which accounted for e-traded goods and services in Europe involving 200 million purchases to the value of about €23.3 billion last year, representing an increase of just over 100% on 1999. B2C is essentially online retailing or online shopping over the Internet involving consumer purchases of mainly books, CDs, groceries, travel and tourism products and computer products. The UK and Germany also dominated this market in 2000 covering 66% of the value of e-traded goods and services followed by Scandinavia and other European countries in a pattern similar to that observed for B2B trading. Online shopping from local supermarket stores is rapidly gaining ground in most European countries and a recent study on Portugal by Europemedia[11] and Marktest[12] indicated that regular Internet users cited online shopping as the main reason for their use of the Internet. However, 65% of users complained that host sites were too slow, taking as long as 20 seconds to download. Sapo was most popular site, followed by Yahoo and Altavista. Market statistics clearly indicate that the divide continues to exist between developed and less developed economies in Europe. Portugal, Spain, Italy and Greece lag significantly behind other EU countries in B2C. The main reasons appear to be lower levels of Internet penetration compared to other European member states, less experienced web users, a highly fragmented retail market and a lack of venture capital for dot.com companies.

5.   Conclusion

The 20th century had yielded many revolutions in human society – beginning with the industrial revolution inherited from the closing stages of the last century, progressing to a services driven world economy and finally to a global information economy and a wider information society. Digital storage and processing technologies, coupled with fixed and mobile communications have served to create a vast global information resource which would have been unthinkable less than two decades ago. The growth of a global communications infrastructure in the form of the Internet has added considerable value to this information resource, because data without access has no value. The fundamental problems of growth in publishing output and access to content experienced in the world of traditional print continue to apply in the digital world, although the problems facing us in the 21st century are considerably more complex and challenging.

Libraries and other information agencies have always been at the interface of information resources and the end-user. Although this fundamental role has presumably remained unchanged, the problem, or challenge, is the fact that a revolution has occurred in the information resource universe and there have also been significant changes in the information user. The global information and communications infrastructure is radically different from that of the traditional printed information supply chain in the manner of its creation, organisation, delivery, accessibility and control. The 21st century user is more confident even arrogant, more educated, more information conscious, more computer literate, more independent and considerably more demanding.

Library managers must address the need to secure more flexible, highly trained staff to meet these new challenges. More resources are required to cope with an expanding and increasingly complex information resource pool and to cater for an increasing number of users with complex needs and demands. In collection management, access rather than ownership appears to be the key and this policy operates on well organised, cooperative and collaborative activities by libraries. Information Society policies at national and international levels have clearly identified libraries as critical nodes in national and global infrastructures and their contribution as intermediaries in the information chain is being quickly recognised outside the profession. Libraries should take the challenge on board and address the issue of digital access with the same energy and commitment applied in the 20th century in the world of print. Otherwise there is a danger that libraries will be excluded from the electronic revolution and relegated to preserving a shrinking reservoir of printed materials.

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Abbreviations

ARL	American Research Libraries
B2B	Business to business
B2C	Business to consumer
Becu	1 billion ecus
BIOSIS	Biosciences Information Service
BLAISE	British Library Automated Information Service
CAS	Chemical Abstracts Service
CD-ROM	Compact Disc – Read Only Memory
COMPENDEX	Computerised Engineering Index
DVD	Digital Versatile Disc
€	Euro (European currency unit)
Ecu	European currency unit (pre-Euro)
e-banking	electronic banking
e-commerce	electronic commerce
EEA	European Economic Area
e-journal	electronic journal
EITO	European Information Technology Observatory
e-magazine	electronic magazine
ESA	European Space Agency
ESIS	European Survey of the Information Society
e-shopping	electronic shopping
ETHOS	European Telematics Horizontal Observatory Service
e-trading	electronic trading
EU	European Union
ICT	information and communications technologies
IMO	Information Market Observatory
JSTOR	Journal Storage – and electronic archive
LDE	Less developed economy
MARC	Machine Readable Catalogue

Mecu	1 million ecus
MEDLARS	Medical Literature Analysis and Retrieval System
MSStudy	Member State Study
NASA	National Aeronautical and Space Administration
Net	Internet
NLM	National Library of Medicine, Washington
OCLC	Online Computer Library Center
PSTN	public switched telephone network
STM	Science technology and medicine
UK	United Kingdom
URL	Uniform Resource Locator