

The Libray and the computing service

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I was once told by a Frenchman that English people suffer from an excessive tendency to think in images. He said that because we think in images we often mislead ourselves. We get confused between the image and the reality it is meant to represent and we are tempted by the image to pursue a line of thought further than we would do if we limited ourselves to thinking about reality. He contrasted this with his claim that the French are more ready to think without the use of images and hence do not suffer in the same way. I thought of that Frenchman when I chose the title of this paper. Yet, as a famous Irish writer, Oscar Wilde, once said: "I can resist anything except temptation". I hope you will agree by the end of this paper that the image I am going to use is helpful and illuminating.

I must admit that I was also intrigued by the idea of an Englishman coming to address an audience of Brazilians and talking about a love affair, the English have the reputation with many nations of being a cold unemotional people, while in England Brazil is regarded as the home of dramatic passion. Perhaps you will feel, by the end, that we english understand a little more about the implications of an emotional relationship than you thought we did.

You may also notice that, as compared with the title I originally chose, I have substituted "Computing Service" for "Information Technology". I am not pretending that the two terms mean the same thing; they clearly do not. But the argument I want to put will be the same, and my new title summarises it better than the old one did. Also, my paper derives mainly from my knowledge of the University setting, where the Computing Service conventionally sets the pace in the application of information technology. If you wish to join with me in thinking about this image, you may like to consider which is the male partner in this story of a romance, the Library or the Computing Service. It sounds like one of those

tests psychologists subject us to in order to reveal things to us about ourselves which we would much rather not know. For me, the 1980's are a time of equality of the sexes, and 1988, a leap year, especially so... The two suitors are equally entitled to take the initiative.

I want to begin by inviting you to join with me in looking analytically, first at the Library and then at the Computing Service, to see whether we can understand better the forces of attraction which are bringing them together.

At first sight, the Library is old to be an ardent lover. We have had libraries for over three thousand years. The invention of printing from movable type was an outstanding rejuvenating factor, but then the aging process set in once again, and by the mid-nineteenth century, the expectations people had of libraries had still not expanded greatly since the late Middle Ages. Then libraries became caught up in the process of the spread of democracy, of literacy and of popular education. It was soon realised that knowledge and information were the keys to this process. The great public and academic libraries are really mostly a creation of the last hundred years, and can be seen, even more precisely, as a particularly twentieth century phenomenon.

The courtship of computing by the library is an even more recent development and we can trace it back only as far as the 1960's, when computers themselves were relatively in their infancy. The probability is that the first approaches were made by computing service managers, who had turned the initial computing applications of finance and the payroll from exciting development into routine procedure. They had spare capacity on their machines and were anxious to find new applications. Not surprisingly, they were looking for the kinds of tasks they knew they were good at, data processing, file management, that kind of thing. So, in the United States, the most rapid progress was made initially in the field of catalogue compilation, because the consequences of the large acquisitions programmes of the major libraries were proving difficult to contain. In my own country, by contrast, circulation was initially more favoured, though there were some early cataloguing applications too.

For the library's users, these first approaches did not produce much if anything by way of an improvement of the service. Of course, they were enthusiastic about the greater efficiency with which books held for too long on loan by other users could be recalled for their own use. But then they regretted it when the tables were turned and they suffered from the more systematic discipline imposed by the machine. At first, in the United States, catalogues usually remained unchanged, as in the United States. Although the computer made it easier for libraries to interchange records, the output

was still a printed 5 by 3 card. Later on card catalogues were closed and a second catalogue sequence was established on microfiche, something which not many users found convenient. (We had to do research to prove that microfiche was really more popular than the traditional card catalogue. I believe that research but I think that microfiche still excites more extreme reactions of dislike and of enthusiasm than the card catalogue ever did). For the library managers, the benefits appeared in the form of greater control of the stock, for example through the elimination of cataloguing arrears, and in some instances staff economies became possible through the sharing of bibliographic records. The legend of "empty cataloguing rooms" was rampant in the late 1970's. Later still, it began to be appreciated that well-designed automated circulation systems could tell staff a great deal about the use and the non-use of their stock. This information could be fed back into the acquisitions process and libraries found themselves able to make some kind of response to queries about the cost effectiveness of that major area of their expenditure at the precise time when cost-effectiveness was the recurrent demand of the funding bodies.

It was the next stage of development which helped the users more. In this next stage, computers became more powerful in their ability to support on line access to increasingly large files by increasingly large numbers of simultaneous users, working at vdu screens. The effects of this were first seen in the creation of on-line computerised information retrieval services. The most outstanding examples are provided by the Medlars system of the United States National Library of Medicine and by the numerous data-bases mounted and supported by the Lockheed Dialog system. Library users began to grow accustomed to the idea that detailed searching of bibliographic files according to the processes of Boolean logic could be applied on an increasingly wide spread basis. They became almost blasé about the new uses to which the public switched telephone network was being put. (It had after all been designed to carry analog signals and it is to my mind remarkable that it supported digital communications so well before the introduction of packet-switching – and indeed still does).

The second illustration of the growth of on-line access is the on-line public-access catalogue. In many libraries, they still have serious limitations, for among the really large libraries many have so far not completed retrospective conversion of their catalogues. As a result, users still have the inconvenience of interrupted sequences and they must endure the added frustration of finding that the library's older material cannot be accessed with anything like the same flexibility as the newer material. For the great research libraries, which rightly attach such importance to their historic stock, this is a serious drawback. Additionally, some library managers, conscious of the power, albeit sometimes unexploited of the new technologies, are beginning to question whether those capabilities should

not be used much more widely. It is indeed remarkable that while periodical articles are indexed and abstracted to such a fine level of detail by the well-know on-line services, even though an article may be no more than five or ten pages long, a three hundred page book may be accessed by even fewer subject retrieval points, in a standard MARC bibliographic record. Expanded descriptions of monographs are being called for, perhaps based on information supplied by publishers and based on the publicity material about the books they publish.

Like a lover, therefore, the library is being re-invigorated by interaction with the special gifts of this new object of its affections. The computing service's twin technologies of local manipulation of digital data and long range transmission of it over telecommunication or radio links (as required by the use of satellites) seem to have inexhaustible capabilities. The unit cost of computing power, the cost of supporting simultaneous user access, the cost of on-line data storage, all are falling so fast that the rising demand and the rising expectations of the using community seem capable of being met without, what would otherwise seem the threat of inevitable bankruptcy.

In the latest phase of development, libraries seem at last to be forsaking the hidebound idea that the authentic form of information is print on paper, from which all other forms must be derived and to which they must be subservient in terms of authority. New databases are being created all the time, no longer of bibliographic records, but of "hard" information. Law, statistics, financial information, biochemical structures, toxic substances, drugs and their uses, the list is growing at an extraordinary pace, much faster now I think than the list of databases concerned with bibliographica information. In addition, the twin technologies are increasingly being used in an attack on the problem of document delivery from remote locations. No doubt, the consignment of photocopied periodical articles to traditional hard print mail will continue for many years to come. But facsimile transmission is making increasing inroads into this activity. That process will accelerate with the next generation of machines which will use digital data transmission techniques rather than the present analog network of the public switched telephone service. But even that process is still dependent on a hard copy original. The future clearly lies with the transmission of data which is held in digital form by the distributing centre, as for example with the British Library's Project Adonis.

Developments as dramatic as these inevitably have implications for traditional modes of activity. The whole publishing industry is organised round a number of assumptions which the development of technology is throwing into question. Publishers rely on a priting industry to create the

original copies, and they rely on a bookselling industry to market them to buyers, whether individual buyers or libraries. There is no obvious reason why that structure ought to survive in the really long term, even though its break up is not at present imminent. Furthermore, the use of machine readable data tends to be charged for on each occasion it is used, whereas a printed book or periodical is bought as a capital item and can then be used without further charges as often as it is wanted. There are signs that some "electronic publishers" would like to maintain the relatively static marketing procedure of the conventionally printed product, where their income is derived from the sales of a product rather than from its use. Hence some data base providers prefer to sell package deals allowing a certain amount of use of their product rather than to impose a tariff covering each individual use. Information is an unusual commodity; however often it is used, it is never consumed. So it may be reasonable to look for unusual charging structures. My own view is that in the face of technological advance (and I include easy and cheap photocopying as well as the digitisation of text) publishers have not yet consolidated their view as to how their income ought to be generated in future, by payment for each use, or by a non-recurrent payment for indefinite rights of access; or perhaps they are saying they would like the best of both options, and who can blame them if that is the case, and they can persuade their customers to go along with it?

I have called into question the future of the printing and bookselling industries, but I think it is fair to say that technological development must be placing a question mark in front of the future of libraries themselves. If every person, in home or office, can access banks of data through a vdu terminal, what is the future of our own profession and of the libraries, great and small, which are its monument? In a word, uncertain. Recent decades have seen the emphasis in librarianship and documentation shift from the support of the archival function to the support of the access function. There will certainly be a need for people who can take an overview of the total information picture and help specialists in individual fields to meet their numerous information requirements especially when they stray beyond the strict confines of their own discipline. And traditional libraries of books and periodicals on shelves will be with us for many years to come, I am sure. But in the really long term, it is quite possible in my view, that that ancient and long-lived institution, the library, may cease to exist in any form we would recognise today.

At this stage, I would like to applaud the concern of the Associação de Bibliotecários do Distrito Federal for the interaction between libraries and society as a whole, as indicated in the themes of this conference. One of my great fears is that technological development may produce a divide between the information rich and the information poor. The divide may

some between nations, with the developed world steadily increasing its lead over the developing world because of its control of information. Or it may occur within a nation where the poor who cannot afford the technology will become (or remain) subservient to those who can afford it. In that scenario, the noble campaign of the library in helping to promote an educated democracy will end in defeat. But it may not be so. Technology is one means of making the information wealth of the advanced nations more readily available to countries which have not got the resources to build up the massive infrastructure of libraries which we have laboured so long and so successfully to create. And communications technology can be a cheaper way of overcoming the natural barriers of mountains and rain forests, and the artificial boundaries of ideology which currently restrict the flow of information. As a profession, we are warned. Our own future and what we make of it is highly relevant to the kind of society we shall hand on to successor generations.

So I summarise my description of the library's attitude to computing. Computing is an enabling technology presenting us with major new opportunities and not surprisingly with major challenges to re-interpret our fundamental role. And now let me turn to our other suitor, the Computing Service.

You probably know that one of the major factors originally leading to the development of computers was the allied powers' need for technological help in breaking German communication codes in the 1939-45 war. Despite its initial links with cryptography, the early peace time uses of computers were heavily biased towards large scale and rapid calculations, what we call in English "number crunching". This traditional function has proved very resilient. It is often hard to convince scientists and engineers that computers do not belong exclusively to them. As the power of the computer has increased, so have the demands imposed upon them by the number crunchers. The very largest computers are so powerful that it is impossible to justify having them in large numbers. In the United Kingdom, there are two university computer centres at London and Manchester capable of performing the largest tasks and all other users elsewhere who need the capabilities of such a large machine need to access them over communication links. The whole set-up really works very well in the national interest.

In my comments about libraries, I have inevitably also referred quite extensively to some of the outstanding features of the development of computers. So this part of my paper will consequently be shorter than the part in which I dealt with the development of libraries – and not solely because it is libraries (being a librarian) that I know the most about. But there are still some important points to which I want to draw attention.

The first point is to comment on the rapidly broadening range of computing applications. Computers are now used in such varied contexts as computer aided design, data analysis, economic modelling, text manipulation and word processing, and text searching, to name just a selection. Indeed, the process of broadening the range of applications is going on at such a rate that the more significant question is: are there any problems to which the computer cannot be applied? And instances which are quoted to illustrate that there are have a habit of illustrating the opposite in a disconcertingly short time scale. Computing professionals have been active in encouraging this trend, in developing new applications for the technology. Those with other specialisms are undoubtedly often grateful for the new capabilities brought, by computers to their working environment, but perhaps they are sometimes anxious too that their own specialism will end up consumed or drastically diminished. In my image, the computing service is, at the same time, an ardent and a promiscuous lover.

The second point to comment on is the broadening of the range of the technology. A computer can now be anything from a machine which goes into your briefcase or even your pocket, to a room-full of gently humming cabinets, pampered by ventilation and cooling systems dependent on water circulation. Without mimicing the problems of interfacing which now exist, many of these massively varied machines can "speak" with one another, exchanging data and/or programmes through appropriate links. The industry itself has now been convinced that interconnection is the essential goal and so a substantial industry wide effort is being invested in the technological progress required to support "Open Systems Interconnections" (OSI). It is also certain that this process will continue into the indefinite future. Every latest development is obsolete as soon as it is introduced with premature rumours of the next and superseding development accompanying each newly announced product into the market place.

Sometimes the technology of the computer is so pervasive that it changes the nature of what it engulfs and then absorbs it into its total operating pattern. At one time telephone exchanges consisted of physical switches manipulated by human operators to connect every caller to the required destination. In a modern system, the links are computer controlled; the facilities which can be delivered by the exchange are defined by the capabilities of the computer, itself a factor of the software used. And so, the telephone exchange in a university may cease to be a free-standing piece of technology and become merely another aspect of the computer service. Other examples of this process can be identified, some not yet completed. Telex and facsimile transmission similarly were once stand-alone services, but increasingly their future development route is so

bound up with the development of the capabilities of the computer that they too are ripe for take over by the voracious computing service.

In completing my initial analysis of the position of the Library, I said that the Library saw the computer as an enabling technology but one which did not basically invalidate the fundamental purpose of the Library itself. Supposing that we say that the Library has the message and that the computer provides the medium. Marshall McLuhan, as we all know, said that the medium is the message. We can certainly see signs that the technologies of computing and telecommunications are themselves defining new frontiers between what is possible and what is not. To that extent, the medium is well on the way to defining the message in many areas of activity.

Any piece which speculates about the likely future role of the computer is liable to become rather breathless and over-excited in tone, and I therefore think it is salutary to break off here, and to introduce a third party into my romance.

When Marshall McLuhan spoke about the medium and the message, he was impressed at the time by the impact of television, by the way it could transmit a uniform pattern of culture to all quarters of the earth and thereby alter each nation's perception of itself and of its place in the world. Television itself has been a powerful educational medium for many years, capable of conveying certain messages with unparalleled force. Defenders of the book often said that television had at least one major drawback; you couldn't stop the frame or rewind the sequence in the way that you can transfer rapidly between the various pages of a book, checking the content and making sure that the author is not using the sequential presentation of material to deceive you into accepting a message which on analysis you would contest. Video recorders made major inroads into that. With the use of a video recorder, you can stop the film; you can review a particular sequence in order to subject it to closer scrutiny; you can run sequences through more slowly so that detail which would otherwise be concealed is brought to light. The potential of video has been increased by an order of magnitude through the application of the computer to indexing of content and to the control of access. CD-ROM technology is still in its infancy and there are still those who say that like so many technological advances it will rapidly be overtaken by another new development. But the entertainment industry is investing heavily in compact disk technology, and this is most significant in my view for its likely staying quality as a medium for machine readable data. Libraries themselves alone can barely justify the cost of advanced technology on the basis of their own needs. But once the entertainment industry has adopted a technology, large amounts of investment are at stake, and the chances that the technology will endure are

much increased. So visual images are likely to be just as well supported in this new environment as alphanumeric data.

This triangular relationship of libraries, computing services and electronic media is already producing bastard offspring. Their antecedents are clear enough. But they do pose urgently the question of how they will be handled and managed in the future. Here are just a few examples.

First, there is a need for interactive computing to be projected by video lecture theatres. At present the expertise in inter-active computing lies with the Computing Service while the responsibility for the exploitation of video in the lecture theatres is more likely to lie with a Media Department. Specialists in these two areas of expertise must have the maximum encouragement to work together on new developments. Those responsible for administration and for finance must be encouraged to put the proper arrangements in place to secure the future of new developments, not only in the planning stage but also when they are fully operational.

Second, there is a need to provide access to information (for example, about materials) for engineering students working in computer aided design workshops. Some of this material is available in printed form, some in microfiche, some as an on-line data-base, and soon no doubt some will be available on CD-ROM, if it is not already available in that format. We need to clear our minds on a number of questions. For example, is this a laboratory or workshop facility or is it really a library facility? Will we want to access the machine readable data bases using on-line searching over PSS and IPSS in the mode now well-established in the library or will we want to buy the data-base in? If we buy the data-base, do we have any technical preference as between CD-ROM (probably available in the Library or the department) and mounting the data-base on the University mainframe? There is clearly a substantial risk of providing a moddled and unervently developed service with varied rules and methods of access and possibly a varied financial framework. (There is a well-established tradition of charging for on-line services but not for the use of the mainframe or the library's own stock.) An integrated service may be better able to give a fully coherent response.

Third, by exploiting the flexibility of computer-controlled inter-active video, there is great potential for the development of personal learning materials in the form of multi-faceted and multi-level packages. At present, there are very few instances world wide of packages which fully exploit the coope of the technologies (There is a proposal for one on the Brazilian artist, Portinari, but I do not know whether it has been implemented.) They are bound to become more common in the future even though at present the capital investment required for their creation looks formidable. who Will

take responsibility for such services, the library with its long tradition of supporting personal self-motivated learning, the Computing Service with its high expertise in computer applications, or the Media Department with its deep knowledge of the uses of video in education?

Given the ardour with which the two (or three) services are leaping to embrace each other, their maternal institutions, the Universities, have got to be concerned for the future. Not surprisingly, it is in the United States that the most outstanding examples of emerging trends must be looked for. Some institutions seem to have decided that the technology must be in the driving seat. They have placed the emphasis on establishing an ultra-modern data-communications network, and on ensuring that end users have sufficient access to intelligent terminals to ensure that their every reasonable need for computer-based information is met. At the Georgia Institute of Technology for example, an increasing number of computerised data-bases which in other libraries can only be searched over remote telecommunications links are mounted internally on the University mainframe computer. As a result the restraints which have to be imposed in a pay-as-you-use environment can be removed. The result has been an astonishing growth in use of these services, with 27,000 searches reported registered in one week in October 1987, a level of use that could never be supported in a pay-as-you-use environment. Carnegie-Mellon University too is acquiring the status of a pilgrimage centre for those interested in these developments. The emphasis is always on getting the tools of technological advance into the hands of the students. The thrust of development is so strong that it seems reasonable to fear that traditional library use will be crowded out because, whatever the appetite for it, the demand for investment in the technology will override and prevail.

In other institutions, it is the organisational aspect which gets attention first. The cardinal United States example of this is Columbia University in the City of New York with its concept of the Scholarly Information Center. This concept takes as its starting point the idea that information is what users of the services are seeking and that their demand for information ought to be met by a single coordinated service which provides a coherent pattern of facilities, and operates a coherent charging philosophy. There are ideas for the reorganisation of existing patterns of responsibility and provision, a reorganisation which will eventually produce the end of the traditional library and the traditional computing service but will repartition the services for which they are responsible along lines which correspond more closely with present day realities.

Possibly for want of sufficient investment in the technology, it is the organisational aspect which is currently getting the most attention in the United Kingdom. There is a small but growing number of instances where

the retirement of a service chief is followed by an organisational restructuring. At the University of Salford, for example, the University Librarian is now also Director of the University Computing Service. At the University of Aston, the University Librarian has been temporarily promoted to the status of a Deputy to the head of the University, the Vice-Chancellor, with responsibility for the development of the University information policy.

My own University too has embarked on an important new development. We too regard the vdu screen as the crucial future interface between the teacher or student and the information content of the educational experience. But we also reckon that there is still plenty of life left in the traditional services of the Library, the Computing Service and the Media Service. I have therefore been given the title of Co-ordinator of Information Services. My task starts with the recognition that the manipulation of information is the most crucial activity in the University and my job is to foster an environment in which the manipulation of Information can go ahead with maximum flexibility and ease. I have a five year remit, and we hope that by 1993 we will have decided whether this really is the shape of things to come.

One of the interesting things about those developments is that librarians are so often taking the lead despite the apparent vitality of the computing service's technology. I cannot give a ready explanation for this unless it springs from the often noted fact that it is the man who feels threatened most who reacts with greatest forcefulness in any given situation. Are we actually fighting for our own survival? In the United Kingdom, there are even some signs that Directors of Computing Services are becoming anxious at seeing the services which they regarded as their special domain swallowed up (to all appearances) by the apparently old fashioned and traditional, but usually much larger library. They feel threatened. I think, and believe they must do more to defend specialism.

It is also interesting to note that the situation at Columbia University, New York is now rather uncertain following the decision of the former University Librarian, Patricia Battin, to leave the University for a job in Washington. What is the lesson from this? Are we to conclude that developments are extremely dependent on individuals and that when they leave the scene the future development path may not be at all obvious? If that is so, it seems to me to imply that fundamentally the marriage of the Library and the Computing Service is a fragile and temporary thing and one which does not serve the long term interests of either party but rather the immediate ambitions of the matchmaker. And I say that in the full awareness that in the case of my own University, if there is any one who must be seen as the match maker it is myself. Or perhaps it means that this

important emerging new service is actually running ahead of the ability of the existing staff, because their particular training and their particular traditions are not suited to the managing of it. In that case, what we need is a new breed of people. It is certainly true to say that librarianship has changed immeasurably as a profession in the last quarter of a century. For demographic reasons, the leaders of the profession in the United Kingdom now must be sought most probably in the generation who were trained before the middle of the 1960's. Updating of skills, attendance at courses, reading of the professional literature, these are all very well and important, but a profession which has changed so much in such a short time may well have attracted the wrong people twenty five years ago as well as given them the wrong preparation for their future professional role. It will take time to put right and in the meantime, the supply of adequate people for those major new management tasks will inevitably be insufficient to meet the demand.

It is interesting to speculate as to the lines along which a new and integrated combined service may be organised. The communications infrastructure will be a crucial element and is likely to require a team of its own, for the maintenance of existing facilities and the planning of future developments. There will also be a team looking after computing facilities as such. But in that context, the library's own computing needs will just be even as when among many. Serious thought about whether a library really needs its own computing facilities or whether it can satisfactorily share those of a general purpose centre has been strongly influenced in the past by the ambitions and empire building tendencies of service directors, both library service directors and computing service directors. It would be good to think that there was no element of self-aggrandisement in the purchase of large stand-alone library computer systems. At present, I suspect that element does intrude in some instances.

Acquisition of materials will remain an important task but the attitude to materials will have to change and to become more flexible. In many cases, the user will want access to information and in many cases it may not be necessary to bring the information physically to his work place. The emphasis for the service will therefore be entirely on access rather than ownership. Access will frequently be provided by communications technology rather than by provision of a physical copy of a document.

A wide spectrum of skills will be needed by the staff of the service. There will still be the Library's traditional emphasis on knowledge of the literature of each subject as the key to the service of the user. But in the Computing Service the emphasis tends to be placed more on the technical demands of the particular form of information processing, be it calculations, statistical material, data base handling or word processing. There will need

to be a matrix of service support so that the response to a user enquiry can be composed of the right mix of skills. The community could be extremely dependent on the skills deployed by the service, unless immediate user access to information services (without the mediation of the information staff) becomes the norm.

I now want to try to pull together the main features of the argument of my paper, and in particular to emphasise the important implications they have for one of the central themes of your conference, the social implications of the changes in the way information is handled and accessed.

The engagement of the Library and the Computing Service is a very modern affair; the couple have been getting closer for some years, and there are some obvious signs that they are already living together anyway. In some specialised subject areas, they already have offspring, new forms of information service appropriate to the subject area, combining the best elements of the new technology with the old forms of provision. The question that naturally arises is: should the relationship be regularised? Is there any need for that? I can think of two immediate possible reasons. The first concerns the uncertainty and confusion which characterises the present informal relationship. People need to know, and are entitled to know what is the truth or the situation. The second concerns the long term future. If the relationship seems to have enduring qualities then the best thing is to formalise it so that we all know where we stand and can plan for the future accordingly. What we don't know yet is how far each of the parties is going to change. Partners who go into a marriage expecting a change in the other partner are likely to have their aspirations rudely disabused. Offspring there may be but the old parents seem to have plenty of life left in them yet.

But the Associação de Bibliotecários do Distrito Federal is right to imply that society has a strong interest in this liaison. It's not just a private affair. The marriage of the Library and the Computing Service will have very far reaching consequences, some of which are already emerging. Major enterprise sectors will disappear or be radically transformed and new ones will grow before our very eyes. This may well be hard to bear for those used to traditional frameworks of employment. But the impact spreads much wider than that. The printed word is very crucial to the political processes of a modern society. Literacy is one of the most revolutionary weapons you can put into any man's hands. Any development which markedly changes the way information is accessed and transferred needs to be watched very closely for its social and political implications. There are serious possibilities that this marriage will threaten freedoms and social and political positions. But the process is very complex and there is no way that I can see of guiding it in advance to ensure that adverse effects do not

emerge. Who will decide what is adverse and what isn't anyway?

When printing from movable type was introduced into Western Europe, it spelled the end of the medieval monastic scriptorium. But it also turned out to be a very important factor in the immense religious and social changes which swept sixteenth and seventeenth century Europe, and, by some measures, are still affecting it today. The changes we are now seeing are just as fundamental and their effects will be just as far reaching and, in some respects, just as unpredictable.