

THE INFORMATION SOCIETY

WILLIAM J. MARTIN



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First published in 1988
by Aslib, the Association for Information Management
Information House
26-27 Boswell Street
London WC1N 3JZ

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British Library Cataloguing in Publication Data

Martin, William J. (William John), 1938-

The information society.

1. Society. Effects of technological
development in information systems

I. Title

303.4'83

ISBN 0-85142-219-5

Phototypeset in 10/12 point Ehrhardt and printed and bound in
Great Britain by The Eastern Press Ltd, London and Reading

Abbreviations

ACARD	Advisory Council for Applied Research and Development (UK)
ADI	Agence de l'Informatique (France)
AI	Artificial intelligence
AT&T	American Telephone & Telegraph Company
BABT	British Approvals Board for Telecommunications
BLR&DD	British Library Research and Development Department
BOC	Bell Operating Company
BRS	Bibliographic Retrieval Services, Inc.
CAPRE	Coordinating Committee on Data Processing Activities (Brazil)
CCITT	International Telephone and Telegraph Consultative Committee
CDC	Control Data Corporation, Inc.
CET	Council for Educational Technology (UK)
CEPT	Conference of European Post & Telecommunications Administrations
CICI	Confederation of Information Communication Industries (UK)
CIDST	Committee for Information and Documentation in Science & Technology (EEC)
COCOM	Coordinating Committee on Export Controls (NATO)
CPE	Customer premises equipment
DBS	Direct broadcast satellite
DES	Department of Education and Science (England and Wales)
DTI	Department of Trade and Industry (Great Britain)
EEC	European Economic Community
EFT	Electronic funds transfer

EPROM	Erased programmable read only memory
ESPRIT	European Strategic Research Programme for Information Technology
ESRC	Economic and Social Research Council (UK)
EURIPA	European Information Providers Association
FAST	Forecasting and Assessment in Science and Technology (EEC)
FCC	Federal Communications Commission (USA)
FDLIS	Future Development of Library and Information Services (UK)
FOI	Freedom of information
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
GNP	Gross national product
IBI	Intergovernmental Bureau of Informatics
IBM	International Business Machines, Inc.
IEEE	Institute of Electrical and Electronics Engineering (USA)
IFRB	International Frequency Registration Board
IIA	Information Industry Association (USA)
IIS	Integrated information supplier
IKBS	Intelligent knowledge-based systems
INTUG	International Telecommunications Users Group
ISDN	Integrated services digital network
ISO	International Standards Organisation
IT	Information technology
ITAP	Information Technology Advisory Panel (UK)
ITU	International Telecommunications Union
KDD	Kokusai Denshin Denwa (Japan)
LDC	Least developed country
LISC	Library and Information Services Council (UK)
MIDIST	Mission Interministerielle d'Information Scientifique et Technique (France)
MIS	Management information systems

MMI	Man-machine interface
MNC	Multinational corporation
NATIS	National Information Systems Programme (Unesco)
NATO	North Atlantic Treaty Organisation
NCLIS	National Commission on Libraries & Information Science (USA)
NIC	Newly industrialised country
NWICO	New World Information and Communication Order
OAL	Office of Arts and Libraries (UK)
OCR	Optical character recognition
ODD	Optical digital disk
OECD	Organisation for Economic Cooperation and Development
OfTel	Office of Telecommunications
OSI	Open systems interconnection
OVD	Optical videodisk
PGI	General Information Programme (Unesco)
PIS	Primary Information Sector
PSE	Packet Switching Exchange
PTT	Postal and telecommunications administration
RACE	Research in Advanced Communications in Europe
RAM	Random access memory
SDC	Systems Development Corporation, Inc.
SEI	Special Informatics Agency (Brazil)
SIS	Secondary Information Sector
SNA	System network architecture
SPIN	World Conference on Strategies and Policies for Information
SWIFT	Society for World Interbank Financial Transactions
TCC	Technical Change Centre (UK)
TNC	Transnational corporation
Unesco	United Nations Educational, Scientific and Cultural Organisation
UNISIST	World Science Information System (Unesco)

VDU	Visual display unit
VLSI	Very large-scale integration
WARC	World Administrative Radio Conference

Preface

The purpose of this book is to examine a series of social and economic developments which together have come to be known as the information society. Starting from an information science perspective it nevertheless attempts to place information in a much wider social context. This means that in this volume 'information' is interpreted in the widest possible sense, as reflects the interdisciplinary nature of the subject in hand. It is both product and process; a means to diverse ends, and an end in itself. Most important, however, is the projection of information as a phenomenon whose time has come, and whose interaction with social, cultural, economic and technological forces is producing changes of the order of those which occurred during the Industrial Revolution.

The book is the product of several years' study and teaching in the subject, both at Queen's University, Belfast and elsewhere. It seeks to put across a different way of looking at society and at contemporary events, particularly those in the socioeconomic sphere. It is intended for both undergraduate and graduate students in a wide range of disciplines or, indeed, for the general reader seeking to understand something about new technologies and their interaction with society. Although it is the sole responsibility of the author, it would not have been written without the help and encouragement of a band of people too numerous to mention individually, but all in some way connected with the Queen's University. I would also like to thank Peter Dale, who compiled the index.

Bill Martin
Queen's University, Belfast
August, 1987

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CHAPTER 1

Information

Whether to the hunters and herdsmen of preindustrial times, or to latter-day captains of industry and commerce, information has always been important. Today, however, something is happening to information, to its role and status, its form and structure, that suggests developments of an entirely different order. Information has become a talisman, a symbol of political potency and economic prosperity. As a geopolitical phenomenon it carries implications for relations between nations, for the future of institutions, for value systems and for ways of life. Economically, information has already become a factor of such central importance that it is confidently forecast that the developed nations will be 'information economies' by the end of the present century.¹ While this chapter will focus directly on the subject of information, others will reinforce this general theme with a range of contexts – economic, technological, social and cultural. The overall aim is to consider the wider role of information in the modern world and, in particular, to look for evidence of the emergence of information societies.

What is information?

In a sense this is a question which anybody could answer. Information is all around us. Information is the staple diet of the readers of newspapers and the mass audiences of the broadcasting media and the cinema. It is directed ceaselessly at those millions of consumers so relentlessly targeted by the advertising industry, and is dispensed around the clock from any number of enquiry desks at railway stations and airports, libraries and similar public service institutions. In this popularly understood sense of the term, therefore, information is that which adds to our awareness or understanding of some topic, problem or event. It is variously perceived as facts, intelligence, data, news and knowledge.

This information can be delivered orally or it can come in visual form as data, text or graphics. To a considerable extent, moreover, the production and delivery of information is electronic in nature. In such cases, the end product is not just words on a page or even images on a visual display unit (VDU), but

the outcome of remote sensing activities in outer space or of digitised transactions in the banking or airline industries.

Seen thus, information is an ingredient common to all areas of human endeavour, be they day-to-day affairs of business, matters of life and death, or the most trivial of pursuits. Without an uninterrupted flow of up-to-date and relevant information, governments could not govern, industry, commerce and the public services would cease to function, and the everyday duties of citizenship, from abiding by the law to exercising the franchise, would become impossible. Less seriously, people would be unable to gamble on horses, follow the fortunes of popular musicians in the 'hit parade' or consult their horoscopes in the newspapers.

Whether or not the recipients of this material ever give much thought to either its nature or significance is of less immediate importance than the fact that they require it and would be all too aware if, for whatever reason, it ceased to be available. In the circumstances, there can be little mystery about a concept which is of such obvious utility and importance. Surely the vast majority of people know about information and why it is important, if only to themselves? The difficulty is that there is another, more technical manifestation of the term 'information', and one which raises a number of issues of relevance to this chapter. These theoretical aspects, which include, for example, the interrelationships and differences between information, data and knowledge, will be considered below. In the meantime, let us look briefly at the generation of this everyday information resource, and at some of the uses to which it is put.

The generation of information

During the 1960s and 1970s the so-called 'information explosion' was the object of considerable attention, not least in information science circles. The outstanding example of the time was the exponential growth rate of scientific literature, reported to be doubling in volume every 15 years. However, little attention was paid to other, nonprint sources of information provision, such as the cinema and the broadcasting media. Today, with fears of information inundation if anything more acute, the focus of concern has broadened to include oral and electronic as well as print-based media. The information can come in the form of computer software, electronic mail, videotex or video, compact audio or optical digital disk and, of course, print on paper.

Somewhat ironically, that very information technology that promised so much in the way of controlling information output has, in some respects, succeeded merely in aggravating the problem. The onset of distributed information processing, with desktop access to word processing, printing and document delivery facilities, has undoubtedly swollen the volume of print

communication, particularly as regards internal communication within organisations. It has also succeeded in a few short years in bringing into question patterns of information generation and communication built up over centuries, notably as concerns author-publisher relationships and the role and function of various information intermediaries in society. Not only is the generation of information something which occurs right across the social framework, but also the sources from which these various forms of information are provided and distributed have themselves multiplied. These range across a spectrum which stretches from the individual citizen or one-person firm at one end, to government and its agencies at the other, with in between an enormous mass of commercial and nonprofit information producers, distributors and coordinators.

This integration of functions need not necessarily mean the complete collapse of established practices nor the displacement of one social or occupational group by another. Hence, while in theory the potential exists for people to be their own publishers, the benefits of specialisation and the division of labour continue to obtain, particularly in relation to large volume, high-quality commercial operation. Similar commercial considerations have dictated the diversification of many traditional publishing companies into the field of electronic publishing. Nor, indeed, has the experience of information intermediaries turned out to be anything like that of the endangered species they were supposed to become with the advent of online database access. Although librarians and information scientists would be ill-advised to ignore the implications of direct end-user access to information, there are already indications that, far from being redundant, the intermediary will be in even greater demand in an advisory and interpretative capacity.²

There have of course been serious repercussions within the information community as a result of technological and other developments, and none more dramatic than the implications for information access and supply. Until comparatively recently, this would have been the clearly defined responsibility of certain established groups or intermediaries, including professional and voluntary bodies, government departments and relevant agencies. Furthermore, as a public service, this information would in the great majority of cases have been provided free of charge to the user. However, with the emergence of business opportunities in the provision of certain kinds of information, an additional class of intermediaries has appeared, whose relationship to the public is based not on ideals of service but on the pursuit of profit. Admittedly, a service is involved, but it is service at a price. This development has serious implications for the future of the traditional information intermediaries, for government information policies and the law of the land, and not least for information users. These and related matters are considered in greater detail in Chapter 6. This section, on popular

perceptions of information, concludes with two brief examples of its application in everyday settings.

Information for what?

The areas chosen by way of illustration are education and entertainment, activities which at first glance might not appear to have very much in common. On closer examination, however, they will be seen to display considerable evidence of mutual reinforcement and support. This is apparent in an overlap in the communities served, in the complementary nature of their work, and in a shared interest in exploiting the potential of information technology.

Education

Information is the lifeblood of education. It is the essential ingredient in new ideas, in course content and curriculum development, and in the creation of materials and methods for teaching and learning. Therefore, the undoubted problems caused by an exponential growth in information of all kinds are more than offset by the benefits to educational development. The new technologies feature prominently in the production and dissemination of this educational information, and in its management and control. As a result, there has been a marked increase in the amount of informal learning, that is educational activity outside the classroom and involving students of all ages and levels of attainment. With not just television receivers but, increasingly, microcomputers and video recorders appearing in homes as well as in educational establishments, the nature and content of this informal education is also changing. Indeed, located as it is in both environments, information technology has dramatically altered the relationship between learning and leisure.³

Within the specific context of education, the major manifestations of technology are those of television and radio, with the use of microcomputers and, to a lesser extent, video recorders growing in importance. Although it will be some time before the full potential of even these relatively well-established technologies is realised, the advantages are already apparent and include: exposure to new ideas and experiences; development of logical thinking and reasoning abilities; support for training in new skills such as programming or for remedial activity in basic numeracy and literacy; and the simulation of real life situations.⁴

In informational terms, education can involve the use of television and radio for the delivery of software and access to 'courseware' written for specific subject areas. It can entail the use of microcomputers for access to viewdata and videotex, as well as to online databases. It can involve the use of a wide

variety of interactive, multimedia learning packages, combining input from radio and television and from videodisks and cassettes with a wide range of published materials. Indeed, in the case of such programmes, the distinction between education and entertainment can be extremely hard to draw. Before turning to this entertainment component, however, a final word should be said about the general educational significance of information.

Already in schools, children are acquiring a measure of both computer awareness – that is, a general knowledge of computers – and computer literacy, which involves knowing how they work and how to program them.⁵ The time could well be right for the development of these activities, through the provision of courses in what might be termed 'information literacy'. In this case, 'information literacy' denotes an awareness of the importance of information in everyday life, and a facility in obtaining, evaluating and using it for a wide range of workaday purposes. It seems not unreasonable to suggest that such understanding and its associated skills should be formally taught, rather than leaving to chance the acquisition of attributes deemed critical to future employment and life chances. This provision should be there for all who need it, for those in continuing education as well as those at primary or secondary level.

Entertainment

One of the most exciting developments in education in recent times has been a virtual revolution in the packaging and presentation of information. Subjects whose names were once bywords for boredom have taken on an entirely different aspect in the eyes of both teachers and learners. Much of the credit for these developments must go to the educational broadcasters, to people working within the major television networks, for example, or with the Open University. To pass muster at this level, programmes must not only be informative but they must also be interesting and entertaining. There can be little doubting the success of the broadcasters' efforts or the positive effects that these have had on the nature and format of the information subsequently provided. One result is that programmes produced for a specific educational purpose, and never intended to be anything other than minority viewing or listening, can quite unexpectedly generate demand at the level of the mass audience.

In the sphere of entertainment as such, moreover, there is a sizeable element of information content. Who has not by reading an historical novel or listening to 'drama-documentaries' on the radio acquired more than a smattering of information on any number of subjects? Surely it is as much the purpose of satire to illuminate and inform as it is to amuse and entertain?

Hence, throughout the entertainment industry, in the cinema, in the sports pages or the magazine sections of the newspapers, and even on radio music programmes hosted by popular disc jockeys there is a sizeable degree of information content, some of it more structured or scripted than others. Very little of this entertainment-based information would be available without a considerable amount of technical backup and support, much of it in the form of new electronic technologies. This ranges from the serious business of electronic news-gathering to the provision of videotex services offering cookery recipes, jokes, games and puzzles, even book reviews.

Therefore, information truly is all around us. It is a social constant, something that is to be found in the most unlikely and unexpected of settings. As was made clear at the outset, however, information is a concept that has two distinct and very different aspects – the popular and the technical. A fair amount of attention has been given to the first of these, with information treated in its everyday guise as news, fact or content. The time has now come to look in some detail at the alternative, more technical interpretation of the concept.

Information theory

Ironically, in this more objective and scientific approach to the concept, progress is bedevilled by the frequently contradictory nature of existing definitions, and by the absence of any consensus on the nature and characteristics of information. Hence, even the information science profession, whose interest lies in the study of information and related phenomena, is unable to agree upon an operational definition. Whereas progress has been made by adopting a conceptual rather than a definitional approach to information, thereby shifting the focus from the correctness or otherwise of the definitions to the usefulness of the concepts,⁶ there are those who would question the value of either approach, maintaining that as information science is an empirical discipline it ought not to concern itself with the 'nature' of information or with questions of an ontological or metaphysical nature, which belong to the field of philosophy and not science.⁷ Where the subject in question is the nature and purpose of information science, there may well be a point to such objections. In the context of a volume dealing with the role of information in society, however, they carry much less weight. Indeed, it is essential that some general understanding be established as to what is meant by information, in its formal scientific, as well as its more popular, connotation. This will be attempted by reviewing the perception of information within a number of disciplines.

The popular perception of information revolves around the meaning and

content conveyed by the information transaction. Information is sought and provided on the assumption that the person receiving it will be better informed, whether this is in terms of the times of trains in and out of Paddington Station or the constitutional history of the United States. This concern with meaning and content is by no means confined to the general public, however, as the examples of the education and library services will confirm. A primary function of all education is the dissemination of information, while among public librarians the information function rests upon the content of reference, local history or community information files, that is to say, upon facts, data, opinion and even advice.

Among information scientists, the perceptual spectrum is wider, encompassing both the abstract and the particular: information is perceived as the written or spoken surrogate of knowledge,⁸ and as the result of data processing, usually formal processing.⁹ Wersig is not alone among information scientists in defining information as a reduction in uncertainty.¹⁰ This approach is similar to that found in economics, where information is regarded as something which dispels uncertainty, for example in markets, in consumer preferences or in prices.¹¹ Unfortunately, in its efforts to come to grips with the fundamental concept of information, the information science profession has borrowed widely and not always wisely from other disciplines. Thus, coming to the study of information and knowledge towards the end of an illustrious career in economics, Machlup quickly disposed of certain long-held notions concerning the beneficial effects of information on both uncertainty and the decision-making process. He observed that more than 90 per cent of all information received is unrelated to any decisions or impending actions, while countless numbers of messages are received by people without any effect on their uncertainty.¹²

Although, in both cases, Machlup was using information in its everyday sense, the reservations about the link with uncertainty apply with equal force where more scientific formulations of information are employed. In one such instance Kochen, indeed, describes information as a reduction in uncertainty, but in the context of message transmission over a telecommunications channel, and involving such related concepts as entropy, order, energy, organisation and control.¹³ Furthermore, Kochen was at pains to emphasise that, as used in this technical sense, information was completely divorced from meaning and the less precise forms of usage that could connect it to the kinds of information to be found in books and documents. These examples demonstrate not just the essential differences between the everyday and the technical concepts of information, but also the difficulties inherent in the wholesale transfer of concepts from one professional environment or academic discipline to another. In the conceptualisation of information, the outstanding example of this practice, and the major source of subsequent