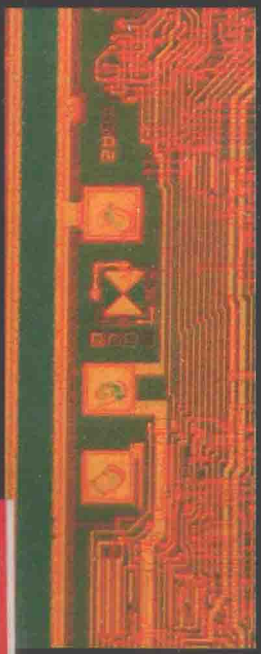
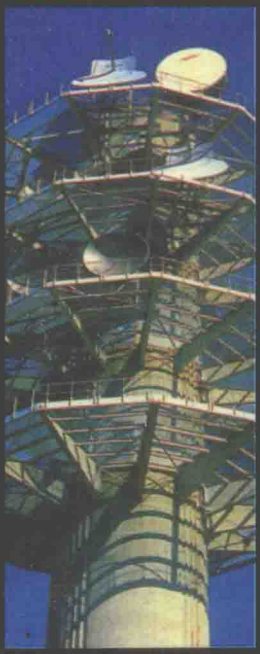
企鹅分类词典 信息技术

THE PENGUIN

DICTIONARY OF INFORMATION TECHNOLOGY

TONY GUNTON





外文出版社 FOREIGN LANGUAGES PRESS

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PENGUIN BOOKS

Published by the Penguin Group
Penguin Books Ltd, 27 Wrights Lane, London W8 5TZ, England
Penguin Books USA Inc., 375 Hudson Street, New York, New York 10014, USA
Penguin Books Australia Ltd, Ringwood, Victoria, Australia
Penguin Books Canada Ltd, 10 Alcorn Avenue, Toronto, Ontario, Canada M4V 3B2
Penguin Books (NZ) Ltd, 182-190 Wairau Road, Auckland 10, New Zealand

Penguin Books Ltd, Registered Offices: Harmondsworth, Middlesex, England

First published by NCC Blackwell Ltd 1990
Second edition 1993
This edition published in Penguin Books 1994

Published by arrangement with the Penguin Group
27 Wrights Lane, London W8 5TZ, England
Reprinted in the People's Republic of China
by the Foreign Languages Press 1996
24 Baiwanzhuang Road, Beijing 100037, China

ISBN 7-119-01895-7
Not for sale outside the People's Republic of China

图书在版编目(CIP)数据

企鹅信息技术词典:英文/(英)冈顿(Gunton, T.)编著.
北京: 外文出版社, 1996.12
ISBN 7-119-01895-7

Ⅰ.企… Ⅱ.冈… Ⅲ.信息技术-词典-英文 Ⅳ.G202-61

中国版本图书馆 CIP 数据核字(96)第 07991 号

英国企鹅出版集团授权外文出版社
在中国独家出版发行英文版

企鹅信息技术词典

托尼·冈顿 编

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外文出版社出版
(中国北京百万庄路 24 号)
邮政编码 100037
北京第二新华印刷厂印刷
1996 年(32 开)第一版
(英)
ISBN 7-119-01895-7/H·626(外)
著作权合同登记图字 01-95-479
定价:14.80 元

PENGUIN REFERENCE BOOKS

THE PENGUIN DICTIONARY OF INFORMATION TECHNOLOGY

Tony Gunton is an independent consultant and author, specializing in the management implications of information technology. Since graduating from Cambridge University with a degree in modern languages he has spent over twenty years in the information-technology industry. He has operated in a variety of roles, including product development, project and line management and, most recently, consultancy and sponsored research. He was one of the founders of Butler, Cox & Partners Ltd, a UK-based management consulting firm specializing in information technology that has established a very high reputation worldwide. He is author of *End User Focus, Infrastructure: Building a Framework for Corporate Information Handling* and *Inside Information Technology: A Guide to the Management Issues* and editor of the Prentice–Hall Business Information Technology series.

Preface to first edition

The problem to be faced when producing a dictionary about information technology is that the topic is so difficult to pin down. In the first place, it is one of the fastest-moving technologies we have ever known, driven along at relentless speed by advances in microelectronics that seem to have no limit. As an inevitable result, new terms are invented and old ones become redundant, almost weekly.

It is also a very versatile technology. It started under the much more humble label of *data processing*, but for the last decade has been reaching out its tentacles, both into neighbouring long-established industries such as office equipment and telecommunications, and into more distant territory such as broadcasting (for example, *teletext, data broadcasting*); printing and publishing (*desktop publishing*); manufacturing (*computer-integrated manufacturing, flexible manufacturing systems*).

To cope with the pace of change in terminology, I have tried to give the emerging technologies which seem to me to have most promise more space than their present status might seem to justify. To cope with the spread of information technology, I have had to decide where it finishes and where the technology whose territory it is invading begins. So it will be helpful if I explain at the outset what the dictionary covers, beginning by saying who it is aimed at.

Who is it for?

Information technology used to be the preserve of the specialist, but now it is an everyday experience for many people, whether through the banking machine they use to get cash, or through the personal computer they have on their office desk or at home.

This dictionary is intended for laypeople such as these as well as for computer specialists, including both complete newcomers and those already involved with information technology as non-specialists, whether at work, as a leisure interest, or in pursuit of training or education. Throughout, I have tried to make the definitions as clear as possible for

such a reader. Generally, this has not meant abandoning technical precision, but on occasions where I felt greater technical precision would obscure the meaning, clarity has come first.

But, as mentioned above, information technology covers a very wide field, and one that is still expanding and changing rapidly. The dictionary will also be valuable for computer specialists who wish to keep abreast of the many developments within their own industry.

I have tried to make each entry stand on its own as far as reasonably practical, rather than requiring readers to wade through a number of other references to disentangle the sense of the particular word they want. But I have also provided cross-references for those who do want to place words in their full context. Some key terms do recur again and again in definitions though, and unfortunately several of these are widely used with differing meanings. Readers may therefore find it helpful to look at the short explanation of how I use some of these terms, given below.

What the dictionary covers

But first let me outline what territory the dictionary covers:

- The base technologies of information technology, starting at the level of the integrated circuit, popularly known as the silicon chip, and moving up from there to the computers, storage devices, terminals, and telecommunications networks in which they are embodied. All of those technologies have been around for decades, but all are undergoing change. Notably, storage devices based on optical technologies are arriving to challenge the magnetic disk (see *optical disk* and *document image processing*), and the methods used to interface people with computer equipment are at last starting to catch up with the needs (see *graphical user interface*). Meantime, telecommunications is undergoing massive change as new technologies arrive to cope with the desktop processing revolution (see *local area network*).
- The way the information technology industry operates. This includes the different types of organization supplying products and services, and the terms used to describe their marketing methods and tactics (for example, *bundle*, *upwards-compatible*). It also includes the various specialists in the *information systems department*, and the activities they undertake.
- Applications within the 'traditional' areas of data processing – what they do, how they operate, how they are described. This is at the level of key concepts and issues arising from the application of computers that may affect anyone working in business, non-specialist or specialist, and especially covering the key technologies of *database management* and *systems development*.

- What I call 'end-user systems' – areas such as personal computing and office automation where the end-user has much of the discretion in deciding how to use the equipment. Here I cover the terms used to describe the features and facilities of the applications on offer, applications such as *spreadsheet*, *word processing*, and *electronic mail*.
- Programming is the key to the versatility of information technology and is now becoming steadily less and less of a black art, through languages like *BASIC* on personal computers, and the applications packages into which simple mini-programs can easily be embedded. So I cover some key programming terms, describing concepts and methods at a level that will help the interested outsider, the occasional programmer, or anyone who has to deal with programmers.
- Among the emerging technologies, I have already mentioned *optical disk* and *document image processing*. To those I would add in particular *expert systems*, *hypertext*, and *object-oriented programming*.
- I have also picked out some key trade names that already have achieved, or are likely to achieve, the status of *de facto* standards, and the more important among a plethora of abbreviations and acronyms.

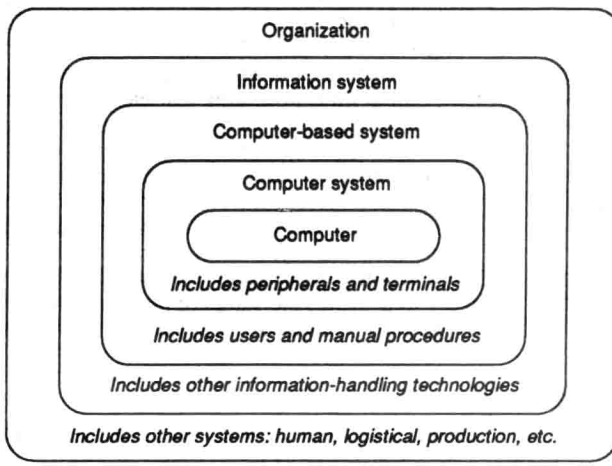
A note on basic terms

It is the purpose of a dictionary to explain how terms are used, rather than to lay down hard-and-fast definitions of how words *should* be used. Unfortunately, however, many key terms are used loosely, whether by carelessness, or deliberately by those more interested in creating a marketing impression than in fair use of language. This being so, it is important that I should explain how I have used some key terms that recur frequently within the definitions.

(1) Systems within systems

First, there is the question of how to describe systems, which form a hierarchy one within another (see figure below). As the figure illustrates, I have used *information system* to mean a complete information system in the business sense, including the people that use information and the procedures they adopt. Information systems use long-established technologies such as paper filing systems as well as information technology, and serve to process and distribute the information that organisations use to plan, monitor and control their activites. Within information systems, we find *computer-based systems* (which might equally well be called *IT-based systems*), consisting of a computer system, and the people and procedures that make use of it. A *computer system*, then, is a combination of devices, centred round a computer, that are interconnected and operate in cooperation with one another – the computer along with its peripherals

and terminals, the software it runs, and the data it processes. The *computer* itself, finally, comprises the processor, memory and input/output logic, plus a device used to control it, such as a visual display screen and keyboard on a small computer or a console typewriter on a larger one.



(2) Data, information and knowledge

Clearly the term *information* is central to any understanding of information technology. Do we really know what it is? If we do know, we certainly do not agree about the correct definition. Some place information in a hierarchy between raw facts, referred to as data, and knowledge. Data is transformed into information when it is put into the correct context and related to a particular problem or decision. On this basis it can be defined as 'facts to which a meaning can be attached'. However, some distinguished academics argue that information may be considered a physical entity in its own right, just like matter and energy, although it clearly is not as 'real' as they are.[1] They point out that all organized structures contain and may transmit information – DNA, for example, from the organic world, or a silicon chip from the inorganic world.

The term is also used in a more general sense to encompass all the different ways of representing facts and events within information systems, appearing in various forms including data (structured facts), text

1 See Tom Stonier 'Towards a new theory of information', *Telecommunications Policy*, **10**, 4, Dec 1986.

(readable words), speech, image and video (still and moving pictures). I have chosen to use the term in this sense, partly to avoid controversy, partly because we simply do not have another word serving this purpose. Following on from this definition, data is just one form of the information that computer-based systems handle, consisting of highly structured numbers and text.

Is information processing the end of the story? With advances in artificial intelligence research, we are now told that *knowledge processing* is possible also. In its established sense, knowledge is defined as familiarity or understanding gained through human experience, from which it would seem to follow that computers can neither possess nor process knowledge. What they certainly can do is process information so organized that they are able to mimic some of the processes of human thought, representing some of the subtleties of deduction and inference. See, for example, *knowledge base* and *knowledge elicitation*.

Spellings and sequence

I have tried to use the spellings that are in widest use, and that means adopting a number that are of US origin such as *disk*, *program* and *analog*.

The entries have been arranged according to strict alphabetical sequence of each word and, for the many terms composed of two or more words, the sequence is determined by the first word, then by the second, and so on. Here I have treated hyphenated words as if they were two separate words. This means, for example, that *bit-mapped display* comes after *bit map* and *bit map scanning*. A few terms begin with a numeral, and here I have given the numeral the signifance of the corresponding word (e.g. *3270* and *4GL* are positioned as if they began with *thirty* and *four* respectively).

Tony Gunton
Upminster
December 1989

Preface to second edition

It is just over three years since the first edition of this dictionary was compiled and in that time I have added several hundred new terms, revised about as many of the original definitions, and discarded just a few entries. Some of those changes, I must admit, were omissions from the first edition plus a few corrections, but most of them reflect the continuing advance of information technology into new territory.

As the technology advances so, naturally enough, new terms are invented to describe what it does. Shortly afterwards, new standards emerge for the formatting and transfer of information from machine to machine and from site to site. As the population of computers continues to grow, so this aspect of innovation becomes more and more important since people want to go on exploiting many of their current applications while moving on to take advantage of new possibilities. As many of the new terms relate to this requirement for (in the jargon) *interoperability* as they do to the innovations that have thrown a new spanner into the *compatibility* works.

If new terms are anything to go by, the greatest advances have been in the field of *multimedia*. Today's top-of-the-range personal computers can drive large photograph-quality colour display screens; process and store scanned images of similar quality; and capture and play back clips of speech or video. Multimedia was being talked about in 1989; in 1993 it is available to anyone who can think up something useful to do with it.

Object orientation also was being talked about in 1989; in 1993 no software or systems salesmen worth his or her salt can afford to leave the term off the brochure or out of the sales presentation.

Telecommunications moves forward too. A great deal has been done to help all those personal computers on office desks to take advantage of the huge transmission capacity available in the digital networks hastily being installed all round the world

Tony Gunton
Upminster
April 1993

A

A/D Abbreviation of *analog-to-digital.*

ABI Abbreviation of *application binary interface.*

abort To stop a program, or some other computing activity, before it reaches its intended conclusion.

absolute address A number that identifies the address in hardware terms of a location in a computer's memory. Memory locations are normally numbered from zero upwards, either in bytes or in words.

Compare *relative address.*

abstract data type A data type consisting of a structure for the data item, plus the operations associated with it. Thus in a manufacturing application, the abstract data type 'part' might have the operations 'release', 'order', 'stock', 'sell' defined for it. Contrast with a conventional data type, which defines only the structure of the data.

accelerator card An expansion card containing a processor that shares the work normally performed by a personal computer's main processor, thus improving processing performance.

acceptance test A test organised by the intended users of a computer-based system before it goes into service, designed to determine whether or not it meets their (previously specified) requirements.

access control Mechanisms included within computer-based systems, and associated procedures, designed to ensure that individuals only gain access to those facilities that they are authorised to use.

See also *password protection.*

access method In general, the way in which records on a mass storage file are retrieved and updated. Also used to describe the software components that enable applications programs to do this. In this case, access method is usually preceded by a description of the file organisation, or in other words the method used to locate records, as in *indexed sequential access method.*

access network The part of a communications network that enables users to connect to it and request its services (as opposed to the *transport network* that serves to carry the information).

access path The means of tracing a computer system resource (a data file, for example) with a multilevel address, such as where the first part of the address identifies a disk, the second part a sub-directory or folder on that disk, and the third a particular entry in the sub-directory.

access time The time needed to retrieve data from a storage device, measured from when the command to read from it is issued until the data is transferred into memory ready for processing. Access time has three main components: (1) seek time, which is the time the storage device needs to position the read/write heads; (2) latency, in other words rotational delay; and (3) read time, which is the time taken to transfer data from the storage device into computer memory. Additional delays may be introduced if the operating software has to wait for a channel to become available to exchange commands and data with the storage device.

accounting routines Routines within an operating system that measure and record the use of a computer system's resources. The information they produce may be used to plan upgrades to the configuration or to work out charges for users.

accumulator A special register used for arithmetic calculations, forming part of the arithmetic/logic unit of a processor.

ACK Abbreviation of *acknowledge character.*

acknowledge character (ACK) A control character used in data communications to indicate that a message has been received correctly. On receiving this character in reply to a message sent down a transmission line, the sending device knows that it can safely continue with further processing, such as sending another message.

Compare *negative acknowledge.*

ACM Abbreviation of *Association of Computing Machinery.*

acoustic coupler A low cost device used to connect (especially portable) personal computers and terminals to the public telephone network, so that data can be transmitted.

The telephone handset is placed in sockets on top of the device. It converts digital data received from the computer or terminal into audible sounds which are sent via the handset, and vice versa.

Compare *modem*.

action diagram A way of representing the processing logic of a program. The basic construct of action diagrams is a square bracket, of which there are various types to represent different control structures and which indicate the possible flow of control within the program. Each bracket surrounds a group of actions, which are described by English-like statements.

active Used of systems that take the initiative to advise their human users of events. An active electronic mail system, for example, is one that alerts a subscriber that a message has arrived, rather than putting it in a electronic mailbox and waiting for the subscriber to collect.

Compare *passive*.

active matrix A technology for liquid crystal display (LCD) screens, used on some portable computers. It is a relatively expensive technology but brighter and with a wider viewing angle than cheaper alternatives.

Compare *supertwist*.

active star A star topology for a network in which the branches of the star are connected via an active component – a controller – that forms the hub of the star. When it receives a signal from one of the branches, the controller forwards it only along the branch to which it is addressed, boosting the signal as it does so. This means that longer wires and more devices can be supported on an active star network than on an equivalent passive star.

activity decomposition diagram A diagram used during the design phase of a computer application. It represents an application in terms of the activities that are performed, each level in the diagram showing these at an increasing level of detail.

activity rate The proportion of records in a data file accessed in a given period.

Compare *hit rate*.

Ada A programming language developed for the US Department of Defense. It is designed for real-time systems and particularly for command and control systems such as are used by the military. It is named after Ada, Lady Lovelace, who first formulated the principles of programming.

adaptive allocation See *dynamic allocation*.

adaptive interface An interface that changes depending on the level of skill of the user,

for example by using succinct rather than lengthy explanations or prompts.

add-in card See *expansion card.*

address (1) A number or name identifying a particular computer resource, such as the whereabouts of an item of data in memory or of a record on a direct access storage device such as a disk. See addressing.

(2) Part of a program instruction that specifies where in memory an operand is to be found. The other parts of an instruction are the operation code and the operand(s).

(3) An identifiable device or physical location in a network of devices connected by transmission links.

address buffer A special memory location where a processor stores the address of the next program instruction to be executed. Also known as control register and program counter.

address field A data field, occupying a fixed position within a message or frame, that contains the address of the receiving device. An address field is needed whenever a number of devices share a communications line (as on multipoint lines) or a network (such as a packet-switching network).

addressing The method used to identify individual items within any computer system resource, such as physical records on a direct access storage device or devices attached to a communications network. Addressing schemes may be single level as for memory, where words or bytes are numbered sequentially from zero upwards; or multilevel, where the first part of the address identifies a path, the second part a branch off that path, and so on. Applications programs rarely use physical addresses, where the address corresponds to the hardware address of the device or record, but most often use logical addresses, which the operating software translates into physical addresses. Often, the logical address is exchanged between the applications program and the operating software when the resource is assigned, such as when a file is opened or when a call is established to a remote device across a network. This logical address is then used in all messages or commands until the resource is released again. The advantage of logical addressing is that applications programs do not need to know precise details of the resources available at the time they are running.

ADPCM A widely-used format for encoding audio signals for processing and storage by computer. It is embodied in two leading formats for compact disk, CD-I and CD-ROM XA.

advanced manufacturing technology (AMT) An umbrella term covering all modern computer-based production technologies, including computer numerically controlled (CNC) machine tools, flexible manufacturing systems (FMS) and computer-integrated

manufacturing (CIM).

agent A system component (usually software) that takes responsibility for completing one stage of a chain of tasks. For example, CCITT's X.400 standard for electronic mail defines a 'message transfer agent'. An electronic mail message may cross a number of national networks before it reaches its destination, and in each of those a message transfer agent will accept the message either from the originator or from the preceding agent in the chain, and then take responsibility for delivering it to the next agent or to the final recipient.

AI Abbreviation of *artificial intelligence*.

AIFF Abbreviation of *audio interchange file format*.

Algol Abbreviation of algorithmic language, a high-level language used mainly for scientific applications. Algol, the first of the block-structured languages, was introduced in 1958.

allocate Place under the control of a program. System resources such as an area of memory or a peripheral unit may be allocated to a program by the operating system as a result either of a request from the program or a command entered by a computer operator.

alphageometric A method of displaying alphanumeric characters and graphic shapes, by generating them from geometric instructions (known as picture description instructions) transmitted to the visual display device. This method permits the device to display line drawings, colour-filled polygons and approximately curved shapes, as well as text. It is used in videotex systems.

alphameric See *alphanumeric*.

alphamosaic A method of displaying alphanumeric characters and graphic shapes, by generating them from a limited number of mosaic elemental shapes. This permits the terminal to display crude shapes, as well as text, but curved or diagonal lines take on a staircase effect. It is used in videotex systems and for broadcast teletext such as the BBC's Ceefax and ITV's Oracle.

alphanumeric Consisting of alphabetic and numeric characters. Sometimes used to include additionally the special symbols (punctuation, etc.) such as are found on a typewriter keyboard.

alphaphotographic A method of displaying text and picture-quality graphics, assembled from picture elements transmitted individually to the display terminal. This method is used in some videotex systems, and makes heavy demands on the transmission link and

the decoder.

alternate path routing Selection of a path through a communications network according to prevailing circumstances, rather than in a fixed, predefined way. Alternate path routing is used in switched networks, such as packet-switching networks, to optimise the throughput of the network and to ensure that failures of network components have a minimum impact on service to network users. When deciding which route to use for a particular message, the switching nodes will take account of known equipment faults and of the loading of the alternative paths that are available.

Alvey programme A programme of research into advanced information technologies, launched by the UK Government in May 1983 with joint state and industry funding. John Alvey was chairman of the committee whose report, published in October 1982, recommended to Government that such a programme should be launched. It identified four technical areas in which major advances were required: (1) software engineering; (2) man/machine interface; (3) intelligent knowledge-based systems; and (4) very large scale integration (VLSI).

The first phase of the Alvey Programme finished in 1987, when it was restructured by Government and, effectively, downgraded.

American National Standards Institute (ANSI) The US national standards-making body. It has been particularly effective in establishing standards for programming languages and database management systems.

AMIS Abbreviation of *audio media integration standard.*

AMT Abbreviation of *advanced manufacturing technology.*

ANA Abbreviation of *Article Numbering Association.*

analog In the form of continuously variable physical quantities. Contrast with digital, where information is expressed as a series of discrete numeric values. Digital computers, by definition, can only handle information in digital form, which means that analog signals must be converted to digital form before they can be processed.

Today's public telephone networks, by contrast, are designed for analog traffic – waveforms representing sound – although they are now gradually being converted to digital working, This is why modems are needed for data transmission – they convert digital data into analog signals for transmission, then reverse the process on receipt. Analog working has a disadvantage for normal telephone traffic as well as for computer data. Because the signal varies continuously and unpredictably, it is difficult to reconstruct it when it is distorted by interference. With digital signals, on the other hand, consisting of a series of 0s or 1s, it is much easier to reconstruct the signal exactly as it was sent.