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BEWILDERMENT

I fear none of the existing machines; what I fear is the extraordinary rapidity with which they are becoming something very different to what they are at present.... Should not that movement be jealously watched, and checked while we can still check it? – *Samuel Butler, 'The Book of the Machines', in Erewhon (1872).*

As the computer age gathers momentum the 'man in the street' is very likely going to be bewildered by it all, particularly in the next twenty years because general education about computers and their usage is largely unavailable today – a lack of foresight we shall pay for. Subsequent generations will probably take computers in their stride, and the ubiquitous machines will then be better attuned to working with people. Today, however, there are already signs of bewilderment in the populace.

As Bernard Levin wrote not too long ago in the *Daily Mail*, 'I begin to suspect that a long period of purgatory has got to be gone through' before we reach the computerized Kingdom of Heaven; 'we are presently stuck well into it.' Levin continued:

> Bank statements (with the exception of those provided for their customers by Coutts and one or two of the other small banks) are now worked out and presented by computer. The only noticeable effect on the banks' customers has been entirely adverse.
>
> Details of cheques drawn, and credits paid in, are no longer given. I know only that on such a date I paid such a sum to an anonymous set of figures, and on such a date I received a sum from another such disembodied source.
>
> I am unable to check the accuracy of the statement without tediously going through the cancelled cheques, and since I do not in fact do so, I have no idea whether the statements are correct or not.
>
> The result is that the computer, as far as banks are concerned, has brought the customer nothing but inconvenience.[1]

Levin went on to describe errors in gas bills (the public utilities always seem to catch it) and then said:

> But we are also getting to the point at which it may soon be impossible to catch computerised errors at all. The Post Office, for instance, has long refused, as a matter of principle, to admit that it can get [telephone] accounts wrong, let alone that it does; and I notice an increase in bills, from commercial sources, of the 'punched-card' type, which virtually make it impossible to query the account.

Katherine Whitehorn in the *Observer*, equally bewildered, recommended that her readers send back the punched-card bills with staples stuck all over them in the hope that they would wreck the machines into which they were fed.

Levin, recruiting his readers' participation in the protest, concluded:

> I begin to believe that the computer is not the great god we have been led to believe, but a hollow idol, manipulated by crafty priests.

ISFADPM

The International Society For the Abolition of Data Processing Machines aims to bring the bewildered together to combat 'The Beast of Business', and exhorts its members to 'Fight the creeping computer menace! Learn how to

> demagnetize your cheques;
> add millions to your computerized bank statement;
> get ten tons of broken biscuits delivered to people you don't like;
> *worry* a computer;
> *confuse* a computer;
> *wreck* a computer.'[2]

The book contains more than a hundred anecdotes culled from various sources. Many are nonsense, others are innocuous, some are very funny (particularly if anyone really believed them), but a few are genuinely horrific. Nearly all of these result from programming or data collection errors of the type discussed in the last few chapters.

Matusow, an American who has fled from New York to less computerized Britain, believes 'the electronic industry is ... attacking our environment entirely'. He has recruited 2,000 members in England alone, 200 of them within the data processing industry. In their hands his 'Guerilla Warfare Manual for Striking Back at the Computers' could be harmful.

Part of the reason for such hostility is that computer bank statements and punched-card bills are genuinely more difficult to understand than the traditional forms. This is partially due to poor design and partially to cutting costs to a minimum. Some banks which had no alphabetic wording for items on the statement when they first converted to computer operation have now capitulated and issue attractive statements with a worded description of line items – although cheques are still listed by serial number, not by the payee's name. One reader of the *Times* asked, 'Can someone please tell me why the numbers on cheques are now printed in Chinese?'[3]

The use of *numbers* rather than alphabetic descriptions or letters has increased because of the ease with which they are handled by machines. Bank cheques now show the individual's account number on them. Personnel numbers, identification and Social Security numbers are employed increasingly. Telephone numbers have become all digital; Scotland Yard's long-famous WHItehall 1212 has been replaced by a mere collection of digits: 01 230 1212. In a typical newspaper cartoon commenting on this trend, the operator at a computer centre is introduced to a visitor as '76419352784', and the computer is introduced as 'ALFIE'.

Certainly individuals are acquiring many numbers which they must remember. The following list is typical for the United Kingdom:

National Insurance number:	9 digits
bank-account number:	8 digits
savings-account number:	10 digits
home-telephone number:	10 digits (including area code)

office-telephone number:	14	digits (including area code and extension)
car licence-plate numbers:	14	characters (for two cars)
postal code:	6	characters

These total 71 digits, and if one adds such items as safe-deposit–box number, charge-account numbers, passport number, several credit-card numbers, and so on, it soon exceeds 100. Most individuals remember other people's telephone numbers amounting to more than 100 digits.

In the general hostility toward computers, probably a stronger factor than the difficulty in understanding computer forms is the feeling of depersonalization which computers have engendered. If a bill comes from a computer it is more difficult, it seems, to query it. Friendly staff at the local bank no longer seem accessible. One can easily obtain the answer: 'We have no way of checking this figure; it came out of the computer.'

Again, this is probably a temporary phase. The first groping for automation is a struggle. The machines, because of their initial high cost, are only just big enough. Programmers are scarce, time is short, and such systems analysts as can be obtained are lacking in experience and education. But somehow a computer is installed which manages to churn through the work it is given. Later the system will be refined. A bigger and faster machine for the same price has room for far more elegant programs. Bills and statements can then be made as convenient as possible for the user (see Fig. 19.1). And, particularly important, means can be devised to answer the types of questions that may arise.

DIRECT ACCESS FOR QUERIES

Early computer systems used files of data which were not readily accessible because they were on punched cards or tape. The computer could not search its files at random to answer a

Both of these bank statements were produced by computers:

1. A bank statement with no descriptive detail:

014-0-033200 BALANCE FORWARD SEP26 1967 925.40

	CHECKS AND OTHER CHARGES		CREDITS	DATE	BALANCE
51.98			379.36CM	SEP27	1,252.78
18.25	60.00			SEP28	1,174.53
21.78	400.00			OCT 2	752.75
407.92	65.00	60.00			
18.00				OCT 3	201.83
8.00	349.96	16.22	892.68CM	OCT 4	720.33
117.45				OCT 6	602.88
15.41	17.24			OCT16	570.23
13.00				OCT17	557.23
29.30				OCT18	527.93
222.86				OCT20	305.07
30.00	1.90SC	.50MC		OCT25	272.67
NUMBER OF CHECKS	19		BALANCE OCT25	1967	272.67

2. A bank statement with descriptive detail*

MARTIN NORMAN, ESQ.

DATE	DESCRIPTION	DEBITS	CREDITS	BALANCE CREDIT–* DEBIT–DR
6 FEB 69	BROUGHT FORWARD			735 6 2*
7 FEB 69	CASH	15 0 0		720 6 2*
10 FEB 69	BOAC	162 15 9		557 10 5*
10 FEB 69	BOUGHT U.S. DOLLARS	45 19 6		511 10 11*
10 FEB 69	TRAVELLERS CHEQUES	103 4 0		408 6 11*
11 FEB 69	DIV ON 800 LONDON & HALIFAX INVESTMENT			
	TRUST CO LTD ORDY SHS		25 11 9	433 18 8*
13 FEB 69	HANDYMAN SERVICES LTD	14 18 3		419 0 5*
15 FEB 69	SALARY		240 3 8	659 4 1*
17 FEB 69	INT ON £500 AQUILLA ENGINEERING			
	CO DEB STK		13 1 0	672 5 1*
20 FEB 69	CATHERINE'S GALLERIES	26 5 0		646 0 1*
22 FEB 69	OF DEPOSIT ACCOUNT		750 0 0	1396 0 1*
24 FEB 69	CAMERA ACCESSORIES LTD	6 0 10		1389 19 3*
25 FEB 69	MRS ANNABEL CUSTOMER	50 0 0		1339 19 3*
25 FEB 69	CASH CARD WITHDRAWAL	10 0 0		1329 19 3*
25 FEB 69	SOLD 1000 HERODOTUS LTD SHS		530 1 2	1860 0 5*
28 FEB 69	BOUGHT 500 SURE PROPERTIES			
	LTD PREF SHARES	965 12 4		894 8 1*
3 MAR 69	WESSEX DOMESTIC OIL CO	30 0 0		864 8 1*
4 MAR 69	REPAYMENT OF INCOME TAX 1967/68		115 12 3	980 0 4*
5 MAR 69	CARRIED FORWARD			980 0 4*

* A specimen statement from Messrs Coutts & Co., London

A little extra programming helps to lessen confusion

Fig. 19.1

query on request. It may only have had access to a given record once a week or once a month as a cycle of file updating or invoicing came around. Dealing with inquiries from the public was therefore difficult. The only way it could be done was to assign a clerk the job of looking through past computer listings. The machine was programmed to produce piles of paper for this purpose. Even then, the information needed to deal with the query was sometimes unavailable. Answering queries in this way consumed considerable human effort, and so queries tended to be discouraged, giving rise to the impression that an impersonal, incommunicable machine had taken over.

The hope for the future lies in 'direct-access' storage devices. These are coming increasingly into use for a variety of applications, including those in which the public is likely to query bills or statements. Using them, the computer can read any record at random within a fraction of a second, and so can mobilize information as complete as is desired to answer any query. When you telephone the electric-power company to query your bill, the girl you talk to will have a terminal with a screen on which she will display, in a second or so, any facts or figures that could help you. The electric-power company would also benefit in that it will require a smaller staff to handle public queries.

With a scheme such as this, the computer, instead of being bewilderingly remote from its public, is likely to keep them better informed than could have been possible in the pre-computer age. Suppose that you make an airline reservation in the United States for a round-trip flight to Europe. The airline must keep a record of your booking. Now suppose that your adventures in Europe prompt you to change your plans for connecting and return flights. You telephone the airline in Paris to change the booking. The girl who talks to you surprises you by saying 'Oh yes, Mr Jones, your telephone number is 684-0999 in New York City, isn't it? . . . Good . . . now I know I am talking to the right person. You are booked from Paris to Rome on Friday, aren't you, and you want to take your pet sheepdog on board. What changes can I make for you?'

How does she do it? She has a screen connected to the distant computer which displays your reservation record. If the airline had no computer, the most it could do would be to send a cable to New York and ask you to call back another day. And then they would not have had *personal* details about you.

Computers *can* be programmed to improve the personal touch rather than dehumanize everything.

CRIME BY BEWILDERMENT

One organization in Sweden has used ingenious advertising to promote a more human image. The Swedish Savings Bank Data Centres Company launched a campaign using five toy robots named after the services provided by the centre: SPIN, SPUT, SPAN, SPIR, and FRED! These 'happy Spadab brothers', as the robots were called went under the slogan 'We make human life easier and leave more time for essentials', and each of the bank's customers was given a model of one of them. The robot gnomes and their services are now well known to and accepted by the Swedish public.

Madison Avenue has prided itself on its ability to create public acceptance of totally unfamiliar and novel products, many of which are as complex and awe-inspiring as any computer terminal. Perhaps it is not too much to hope that the advertising industry will turn its talents to a genuine necessity of modern life.

The volume of bills and statements that are unclear or lacking in full information has certainly increased with the spread of computers. There is one corollary to this that is alarming: most persons, faced with bills which are unintelligible or uncheckable, but nevertheless not far wrong, *pay* them. This happens, we suspect, particularly when bills are produced by a machine and thus carry an imposing stamp of computerized authority – an image reinforced when querying the bill proves to be virtually impossible. In his New York flat, one of the authors, for example, has no way of reading the electricity meter and hence no way of checking his large electricity bills. Furthermore, the non-payment of bills from most organizations now carries the vague threat of a black mark on one's credit rating – which is itself recorded by computer. The payee is in a cleft stick. The line of least potential trouble is to pay.

The public, then, is being conditioned to pay bills which it cannot fully understand. Thus if an organization mails bills which are unintelligible, are prepared by computer, and also are *deliberately* made out slightly too high, the vast majority of people will pay them. What is more, it would be exceedingly difficult to prove that a felony had taken place, especially if the overcharge were made to look like a programming error.

An acquaintance of one of the authors received a series of bills which he suspected to be incorrect. Although he had great difficulty in checking them, he succeeded in showing, over a period of time, that 10 of them were wrong. All of the errors were in favour of the organization which had sent the bills. Given ten random errors, the probability of their *all* being on the high side (or all on the low side) is 0·001 – the odds are 1024 to 1 against such an occurrence. The errors may not have been deliberate, but they certainly looked suspicious.

A different sort of case of felony-by-bewilderment is reported to have occurred in certain banks in the US. If one walks into a branch of the bank to deposit cash or cheques into his current account, he may select a deposit slip from a rack of different slips. The slip has a box in which the customer writes his account number. Some customers, however, have their own deposit slips which are printed with their account number in machine-readable characters. To commit robbery-by-bewilderment, you do the following: open an account using an assumed name – preferably in a bank with many branch offices – obtain a quantity of deposit slips with the account number printed in the appropriate box, and place a number of these in the deposit-slip rack in each branch. Members of the bewildered public come in, pick up your deposit slips, and write in the sum of money they are depositing and their name on the slip. Names, however, are ignored by the computer: only the account number in the box registers. The money is therefore deposited in your account, not theirs. Withdraw the money quickly and disappear.

USE OF TERMINALS

Much of this book has been concerned with terminals linked by communication lines to computers. Today the terminals are used by persons familiar with computing equipment; by clerks, secretaries, or others trained to carry out a particular operation; by children using computer-assisted instruction; and so on. Nevertheless, it seems likely that a large proportion of the public may run into trouble when they begin using terminals.

The number of people who will use computer terminals will steadily increase. Today some people use them in their work, and a few use them in classrooms, but only those who need them for their professional work are likely to have them in the home. In the future, however, the domestic-terminal market will probably expand into other fields and the average person, even if he does not have a terminal in his home, will be confronted with them elsewhere. The German railways, for example, considered installing at stations teleprinters which the public could use to obtain train information. If you wanted to travel from Cologne to Nuremberg, for example, you would type in this 'city-pair' and the computer would then determine the best train connections for you. In applying for a job or visiting a medical clinic, a person may be granted a preliminary 'interview' as he sits at the screen of a computer terminal. In registering for evening education classes or joining a political club, you may have to enter the required details about yourself directly into a terminal. Arriving in a new city and desiring a hotel room, you may find a terminal at the airport with which you can interrogate a city file of room availability.

The quantity of information we have to supply when filling out forms of one type or another is probably going to become greater with greater use of computer-planning. This information also may be collected on-line at a terminal; this method provides better control of the data's accuracy, and vast amounts of clerical work that would otherwise be involved are avoided. As we commented in Chapter 12 much man-power would be saved if, when we applied for an automobile registration – or any other kind of licence – we did so at a terminal in the appropriate government office (or at home, or at work, if the appropriate computer could be dialled).

The fewer the steps between the originating of new information and its recording in the computer files, the less is the probability of an error. The usual procedure, involving a preprinted form filled in by hand, coded and then punched into cards and read into the machine, produces up to 10 per cent errors, which are seldom discovered until the form-filler is long since departed. On-line data-collection is *much* more accurate. The more the computer does and the less the human, the higher the degree of accuracy.

MOTOR VEHICLE REGISTRATION

Let us suppose, then, that Winston Smith wants to renew his automobile registration. He walks into his local government office, the Post Office in an English town, sits down at a machine with a typewriter keyboard and screen, and the following dialogue ensues:

SCREEN: To communicate with the computer please press the Attention key.

User presses Attention *key.*

SCREEN: Farnham G.P.O. Set 8 10/10/84 11.03 AM
Which of the following activities do you wish to perform? Enter one digit.
1: Check personal records
2: Obtain licence
3: New-resident registration
4: Check-rating assessment
5: Other

USER: 2 (*presses* Enter *key*).

SCREEN: Which type of licence do you wish to obtain? Enter one digit:
1: Motor-vehicle
2: Boat
3: Radio or television
4: Marriage
5: Firearms

6: Dog
7: Other

USER: 1 (*presses* Enter *key*).

SCREEN: Motor-vehicle licence. Type 'New' or 'Renew'.

USER: RNEW (*presses* Enter *key*). [*Note*: user's spelling mistake]

SCREEN: Entry not accepted. Type 'New' if you wish to obtain a new licence. Type 'Renew' if you wish to renew a previous licence.

USER: RENEW (*presses* Enter *key*).

SCREEN: What was your old licence number? Type 'Don't know' if unknown.

USER: DON'T KNOW (*presses* Enter *key*).

SCREEN: Enter your personal identification number.

USER: SMIW6079 (*presses* Enter *key*).

SCREEN: Are you Winston P. Smith, owner of blue Ford, number XNJ277F? Answer 'Yes' or 'No' please.

User presses Yes *key or types* Yes, *and presses* Enter *key*.

SCREEN: Please check each statement that follows: After each, type 'C' if correct, type 'X' if incorrect.

The computer then reviews all the information on last year's licence, item by item, updating it as necessary; it checks the insurance file, checks the validity of the driver's address, and inquires about the annual test certificates, and calculates the fee. It asks the user whether he wishes to pay by credit-transfer; if so, it transmits a message to his bank computer, which debits his account. It updates the car log book in its files and produces a summary of the licence on a card which can be read automatically by the transmitter in a police patrol car.

Highly efficient, but is the public going to be able to cope with it?

In this case, probably yes. There will be an assistant to show people how to work the machine if they do not know, and to help them if they reach a deadlock in their dialogue with the computer. A few people may reach a state of paralysis when confronted with the terminal; then the assistant will have to complete their entries for them.

SCHOOLCHILD TERMINAL

In Chapter 7 we discussed schoolchildren doing their homework on a simple terminal. In this case they learned how to use it very easily. They were intelligent and at an age when one learns easily. Some older people had more difficulty with it, however. The terminal operates somewhat as follows:

The keys on the terminal are labelled as in Fig. 19.2. Note that each key represents two possible meanings – either the digit for which it is normally used, or an alternate meaning as shown. The alternate meaning of key 7, for example, is 'divide'. If the child wishes to use a key's alternate meaning, he presses that key and then immediately afterward presses the key labelled '*'. The sequence '7*', therefore, signifies the arithmetic operator 'divided by'. To end each operation the child signals '**'.

Thus if he wishes to divide 3 by 14, he keys in 3, 'divided by' (7), 14, and 'end of operation' (**) in that sequence, thus:

3 7* 14 **

and the computer speaks back over the telephone with a distinct human voice:

Your answer: Zero . Point . Two . One . Four . Two . Eight .

Five . Seven . One . Four . Two . . .

and so on up to fourteen digits.

He keys 1* to mean 'decimal point' and 0* for 'minus'; thus to subtract 3·8692 from 14·908, she would key:

141*908 0* 31*8692 **

The machine replies:

Your answer: One . One . Point . Zero . Three . Eight . Eight.

If she failed to write this all down and wants it repeated, she presses

8* **.

The machine is equipped with temporary and permanent memory locations which she can use. She refers to these with keys 2 and 3, which are labelled with their alternate meanings 'keep' and 'use'. If she presses 2*0, this means: 'Place a number into temporary-storage number 0 for use in the next problem.' If she presses 2*7, this means: 'Place a number in permanent-storage number 7 for future use.' Similarly, she can use the contents of, say permanent-storage number 9 by keying 3*9.

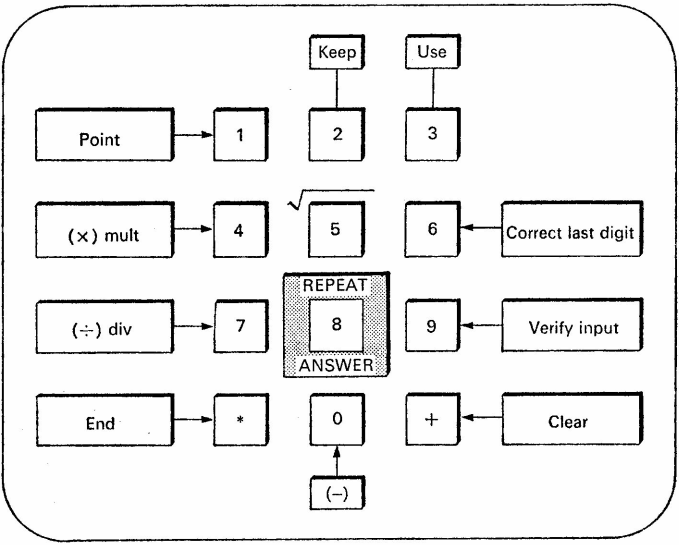


Fig. 19.2 Label to touch-tone telephone keyboard.

To calculate pi × 3.78^2, the sequence would be as follows:

GIRL: **31*78 4* 31*78 2*0 ****
COMPUTER: *Your answer: Holds One . Four . Point . Two . Eight . Eight . Four . Key your function.*
GIRL: **4* 31*1416 ****
COMPUTER: *Your answer: Four . Four . Point . Eight . Eight . Eight . Four . Three . Seven . Four . Four.*

If she makes mistakes which the computer can detect, it will inform her, as with other terminal systems, thus:

GIRL: **31*78 4* 31*78 2* ****

COMPUTER: *A storage location has not been indicated. Please re-enter your problem and specify a storage location after the Use function.*

GIRL: **31*78 4* 31*78 2*97 ****

COMPUTER: *You have specified a storage location which does not exist. Please re-enter your problem.*

GIRL: **723 7* 3*9 ***

COMPUTER: *You have indicated a division by zero. Change your division and re-enter the problem.*

GIRL: **723 7* 379 ****

COMPUTER: *Your answer: One . Nine . Zero . Seven . Six . Five . One . Seven . One . Five . Three . Nine . Five . Seven . Your message has not been followed by the End function . Verify your entry.*

GIRL: **9* ****

COMPUTER: *Your entry: Seven . Two . Three . Divided by . Three . Seven . Nine.*

Bewildering? To a considerable number of people, if they are not properly trained, it probably will be. Some of the other uses of home terminals discussed in Chapter 7 will be more so. There are many who never even learn how to use the controls on their cameras.

THE NATURE OF THE DIFFICULTIES

The difficulty in using a terminal depends upon three factors. First, the terminal machine itself may be hard to use. This has been true of some elaborately designed machines which exhibit a confusing array of knobs and switches. On the other hand, some terminals are very simple to use. Using some of the machines designed for computer-assisted instruction is literally child's play. Let us then discount the machine itself as a bewilderment factor, assuming that manufacturers learn the lessons to be derived from experience with today's machines.

Second, the application to which a terminal is put will determine the degree of difficulty in using it. The applications discussed above are fairly simple. More difficult dialogues are required by other applications, including some designed for the general public – such as searching for suitable job-openings at an employment-office terminal, planning vacations, or tracking down literature in a library. The applications for which the professional man may use his terminal are in many cases of much greater complexity and often involve programming.

Third, the particular language used to communicate with the machine, or the structure of the dialogue, has a major effect on the relative ease or difficulty of use. In the earlier example of renewing a motor licence, the dialogue is easy for the user. He is told on the screen exactly what to do and the computer is programmed to give him maximum assistance. When he keys in wrong wording, the machine helps him out. It is very important that such applications be programmed with maximum consideration for the user in mind, and that extensive research be conducted on the ways people with no special training react to a particular dialogue structure. If the user becomes bewildered or is embarrassed at the terminal, he is likely to adopt a hostile attitude toward the whole idea of using computers in this way.

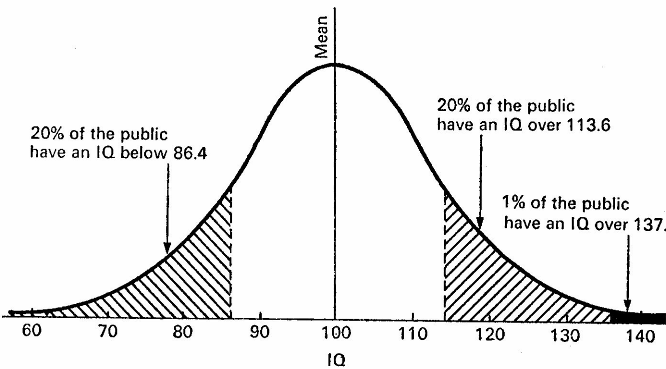
Many of the dialogue structures in use today are *much* more difficult for the user than the above illustrations. An airline agent at the screen of a reservation terminal, for example, would be quite bewildered by the system if she had not had extensive training.[4]

With a terminal in the home, the user will eventually be able to dial a wide variety of computers offering different services. It is likely that these will use a host of different dialogue structures and computer 'languages', although some degree of standardization will probably come about. The user will have to go through a sequence for selecting the program he wishes to use.

Using a terminal for problem-solving can involve much greater difficulties than those encountered in the above illustrations. A computer language must be learned, and some skill is needed. A major portion of today's terminal usage is on a high level of complexity. This is typical of the work of engineers, statisticians, architects, and similar professionals performing their basic calculations.

Much of the interesting terminal work, however, is of an even higher level of complexity than this. Writing textile-design programs, testing hypotheses about making money on the stock exchange, simulating a 'system' for the Las Vegas tables – all these could be entertainment for computer hobbyists, but all demand a high degree of facility in using the machine.

Some people seem to be at home with the machines as soon as they make contact with them; others are surprisingly ill at



Area under a section of the curve equals the fraction of the public having an IQ within that range. (Total area under curve = 1)

Figure 19.3

ease. For some, every program they touch ends in disaster. Dexterity in using computers is a gift, like most gifts, given to men in differing proportions. Even highly trained programmers differ very widely in their capabilities.

Figure 19.3 shows the distribution of intelligence quotients among the general public. The ability to be productive with computers is not the same as IQ. Some people of high intelligence are poor at using machines. However, the distribution of machine capability probably follows a similar *Gaussian* curve: the bottom 20 per cent may never be able to cope with even such simple uses of terminals as the motor licence illustration above; whereas the top 20 per cent will probably be able to learn terminal operations involving programming. Perhaps by creating easier problem-solving languages and teaching people at an early age we can extend the range of peoples' competence. The sophisticated uses of machines, however, will always demand a very high ability, and those at the top of the capability distribution will have a special relation with the machines. Observing the symbiotic relation between a highly proficient user and a computer – communicating perhaps with a screen, keyboard, and light pen – is an extremely powerful and impressive experience. Such men are rare and surely rate a special place in the computerized world ahead.

The gifted will have immensely powerful facilities available to them in the society we visualize, while those who either do not like or do not understand the machines may become increasingly bewildered and hostile. Probably an entirely fresh generation educated in the ways of computers must emerge before the populace feels at home with the new machines.

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