

Can anyone work the video?

Many modern gadgets are difficult to use, and video cassette recorders are no exception. Designers of such products should design for us, not for themselves

Harold Thimbleby

VIDEO recorders and photocopiers, simple fax machines and telephones, even ticket machines on the railways, often seem unnecessarily difficult to use. Last December I bought myself a video cassette recorder advertised as "simple to use". In the first three weeks I failed repeatedly to program the machine to record from the TV, and after months of practice I still make mistakes. I am not alone. According to a survey last year by Ferguson, the British manufacturer, more than one in four VCR owners never use the timer on their machines to record a programme: they don't use it because they've found it far too hard to operate.

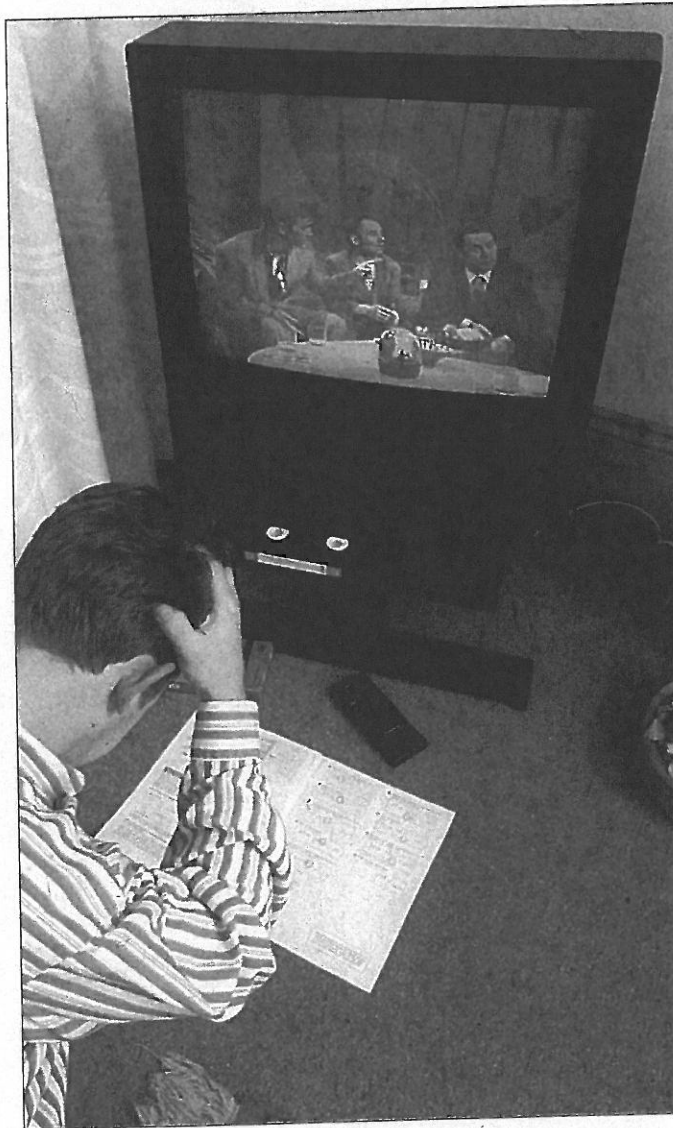
So why do manufacturers keep on designing and producing VCRs that are awkward to use if the problems are so obvious? First, the problems we notice are not obvious to technically minded designers with years of experience and trained to understand how gadgets work. Secondly, designers tend to add one or two features at a time to each model, whereas you or I face all a machine's features at once. Thirdly, although finding problems in a finished product is easy, it is too late by then to do anything about the design. Finally, if manufacturers can

get away with selling products that are difficult to use, it is not worth the effort of any one of them to make improvements.

Some manufacturers say they concentrate on providing a wide range of features rather than on making the machines easy to use. But that begs the question, "why can't you have features that are easy to use?" The answer is you can.

Good design practice is a mixture of specific guidelines and general principles. For a start, designers should build a prototype and try it out on typical members of the public—not on colleagues in the development laboratory. Simple public trials would quickly reveal many design mistakes. In an ideal world, there would be some quality control criterion, such as that the VCR must be redesigned repeatedly until, say, 90 per cent of users can work 90 per cent of the features correctly 90 per cent of the time.

I often fail to set the timer on my recorder correctly because I believe I have completed the job when I transmit the settings to the VCR from the remote control unit. In fact, another step



All photographs by Pete Addis

"Are you a computer programmer, or something?"

"No, I'm a professor of information technology, actually..."

is required: I have to switch the VCR into "Timer" mode. If trials with a prototype had shown this to be a frequent problem, the design could have been easily changed by ensuring that the act of transmitting information to the VCR either put the machine in the "Timer" mode automatically, or caused the video machine's display to say something to remind users to do it themselves.

The designers of cash dispensing machines have learnt this lesson. The dispensers return your cash card before giving you any money. If they didn't, you would feel you'd done what you came for as soon as the cash appeared and you might walk off leaving your card behind.

A VCR's front panel display should be legible from

the distance that the remote controller is normally used. The text on my machine is 2 millimetres high, which is unreadable even at arm's length—and the TV stand places the VCR so near the floor that you have to lie down to get close enough. Some manufacturers solve this problem by displaying readable text as a subtitle on the TV screen; the front panel of the VCR then shows only basic information, such as whether the machine itself is on or off.

Some remote control units can learn the codes from other makes of unit. Thus, if your TV is from one manufacturer and your VCR from another, you can program your unit to change channels on your TV—you don't end up with useless TV buttons on your VCR remote controller, nor useless VCR buttons on your TV controller.

Many manufacturers don't make full use of the microprocessors inside VCRs and their remote control units. Others do. Teletext transmits the times of programmes, and several VCRs already use this information for setting up a recording.

Presumably this facility is not available on cheaper machines for marketing reasons. In Germany, VPS (Video Programming System) ensures that the programme you want to record switches your machine on and off at the precise times of transmission.

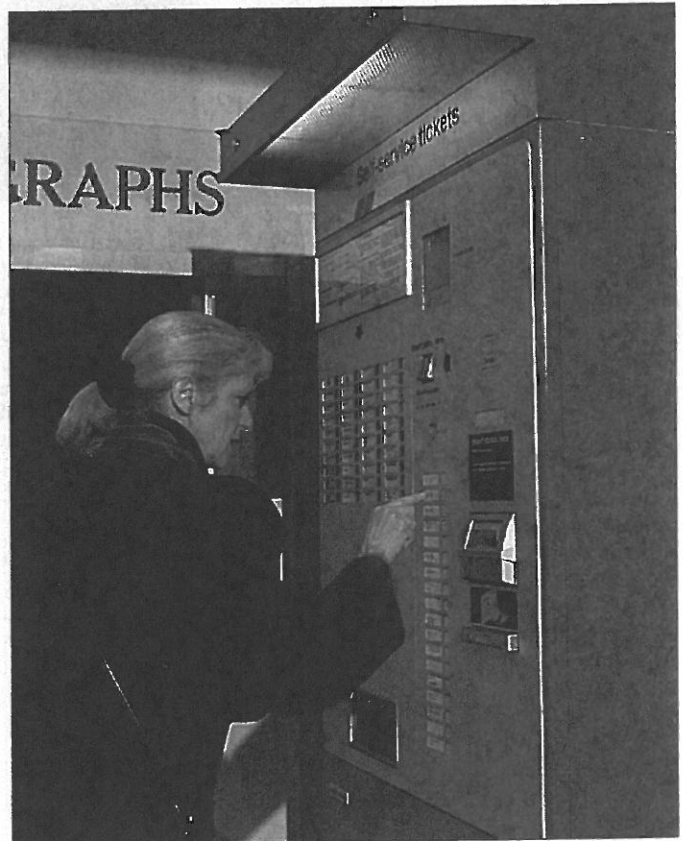
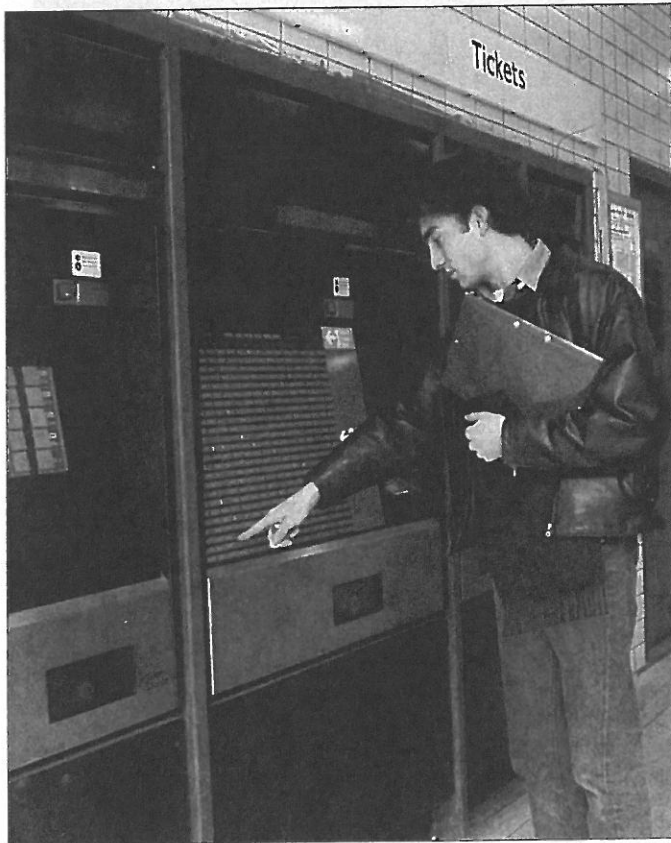
Besides specific design guidelines of this sort, there are four simple principles of good design practice. The first is that designers should make frequent tasks easy and less frequent ones harder. My VCR has only nine buttons on its main display, but pulling down the front panel reveals another 13. This arrangement means that little-used features are harder to activate by mistake, which is a good idea. Many telephones use the same idea: 10 digits plus “#” and “*” are all you see. The machines are easy to use for the commonest operation, dialling numbers, but if you press the buttons in the right way all sorts of curious hidden features become available.

If only my VCR's remote control unit was so well designed. Take, for instance, the button that advances the clock by one

harder to do, so that ejecting a cassette from the machine takes more deliberation.

A simple rule is that the number of button presses to do something should be proportional to the logarithm of the probability that you want to do it. This is related to the Principle of Least Effort, formulated more than 40 years by the American philologist George Zipf. You play tapes far more often than you set the clock, so the design should have fewer button presses for play than for setting the clock.

The Zipf idea has to be modified slightly to take account of other factors. Infrequently used sequences are likely to be forgotten, so they should be made as memorable as possible. At one extreme, this requires manufacturers to provide specially labelled buttons, such as “Set Clock” and “Play”; but this would mean a galaxy of buttons on the front of your machine. At the other extreme, everything could be done in Morse code, using only one button! Providing help on the TV screen makes the design trade-off easy: you could then be



Ticket machines in London's underground (left) and suburban railway networks are not as easy to use as they could be

hour when it is pressed; press the same button for 2 seconds and it goes back an hour. These are facilities used only once a year—and yet the button is easy to press by mistake. Not surprisingly, the clock on my remote control is usually running several hours fast because this button has been tapped by accident. Perversely, facilities used more often are much harder to operate, and frequently require complex button sequences. They may be hard to do by accident, but they are unnecessarily hard to do deliberately.

How often you want to do something and how difficult it is to do are design considerations. So too is the risk of doing something wrong. For example, ejecting a cassette and switching the VCR off are both achieved with single button presses, both on my VCR and on its remote controller. The difference is that the “Eject” button is irreversible from the remote controller—you have to walk over to the VCR and push the cassette back in. It should therefore have been made

guided through any long, unmemorable sequences, even using fewer buttons without special labels.

The Zipf principle encourages a design that plays safe and avoids mistakes: operations that you are not expected to perform often are designed to be harder to do. My remote control unit will not start to record a programme unless the “Play” button is pressed simultaneously with the “Record” button. This, then, takes two button presses instead of one: in Zipf terms, it corresponds to a lower design probability for recording than playback.

There are other ways to improve “safety”. Buttons can be made awkward to press. “Time-outs” can be used to ensure that when a sequence of button presses is not completed fast enough, the VCR resets and does nothing. But time-outs contribute more to a user's stress than to safety: if something you do rarely is, by design, made complex, the task is difficult enough without the addition of time sanctions.

When 'simpler to use' does not mean simple . . .

THE VCR I bought had been advertised as "simple to use". When I returned to the shop to complain that the machine was not at all simple to use, I was told that it was certainly simpler than the others they sold. I suggested that "simple" and "simpler" weren't quite the same.

ASSISTANT: Well, people often get their teenagers to operate it.

ME: I'm not old enough to have teenage children.

AT: Many people don't use the timer.

ME: I wouldn't need a VCR if I didn't want to watch programmes that are on when I'm not around. I need the timer.

AT: It's really quite easy, once you get used to it.

ME: I really don't think I will get used to it. What do you do if you should press this button, anyway?

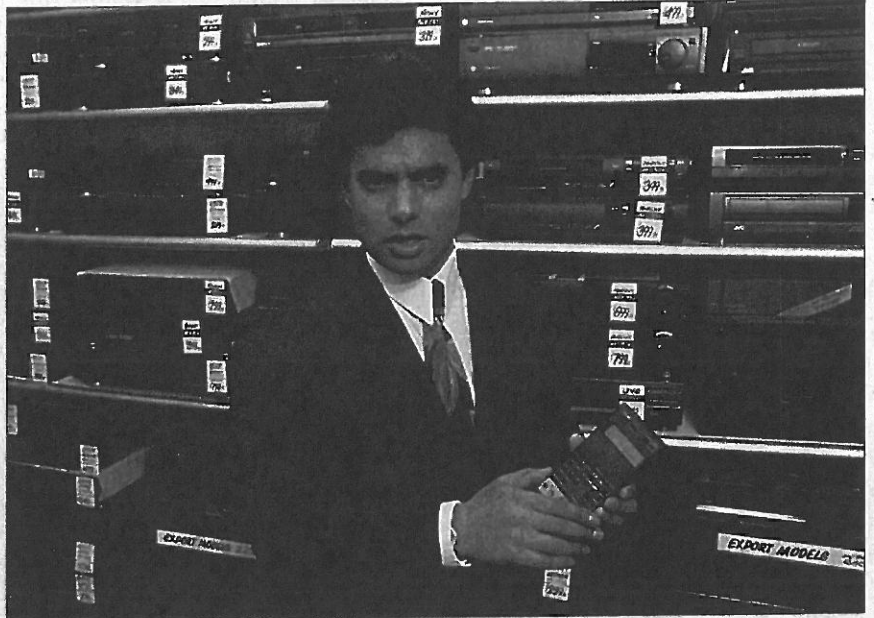
AT: Why would you want to press that button?

ME: Perhaps by accident; but what should you do—do you see that the time is wrong now?

AT: I think you press it again . . . Oh! No you don't! When that happens, I take the batteries out, like this. That's the easiest way to reset it, you see.

ME: I see. Actually, the manual says you should hold this button down for two seconds. It's not simple is it? But suppose you want to record a programme today?

AT: Easy. Press this button! Then enter today's date.



ME: I see. But what date is today? The VCR knows today's date, doesn't it? Why doesn't it show it when you need it? If I press 9—look—it says "Repeat" as well as today's date. What does that mean?

AT: Look at this video recorder, it's much more complicated! You got a simple one.

ME: What does this do?

AT: Are you a programmer?

ME: I'm a professor of information technology, actually.

AT: Please write to them and tell them how bad they are! Maybe a letter from you would do some good. We had to send one video recorder back once, it was so bad . . . □

Of course, one of the things everyone does often is make mistakes. So recovering from mistakes should be easy, perhaps a single button press. On many VCRs it isn't. On some recorders you must set a programme time if you have pressed the timer button. This is especially stressful if you accidentally press the timer button when trying to record a programme that has just started. And the resulting stress causes you to make more mistakes.

Although the first principle is to make frequent operations easy, it is not always obvious what "easy" is. As a rule, consistency makes things easier because as more things can be done the same way, less has to be learnt. Consistency, then, is the second principle.

My VCR has 22 buttons against the remote control's 55. The buttons on the VCR and the remote control unit cannot be used in the same way and features available from one are not always there on the other. The "Record" button on the remote control unit does nothing unless it is pressed together with the "Play" button, and the VCR will start recording only if it is in a mode where "Play" would have worked anyway. However, the VCR itself starts recording as soon as its "Record" button is pressed; there is no interlock with the "Play" button. These are simple inconsistencies.

A difference in the number of buttons is not the only numerical inconsistency. The remote control unit can record up to four programme times; the VCR can manage eight. There seems to be no good reason for this inconsistency. It is compounded by the fact that the unit lets you change any of its four programmed times but, if you transmit them, the VCR responds as though they are new programme times—unless the VCR has all its eight times set up, in which case you have to do something else.

There is a "Transmit Ready" symbol that blinks on the remote control unit whenever it is transmitting something to the VCR. The symbol also blinks when the unit has been programmed, but is not transmitting. Furthermore, the "Transmit" button only transmits one of four possible programme times, which means that you may have to transmit up to four programme times separately. It would have made more sense for it to transmit all the programme times, but since the remote control unit only handles four against the VCR's eight, this improvement has been pre-empted.

Pressing "Eject" rapidly after "Rewind" ensures that the cassette ejects when the rewind has completed; likewise, pressing "On/Off" rapidly after "Rewind" ensures that the VCR switches off after the "Rewind" has completed. However, pressing "Play" rapidly after "Rewind" does not rewind the tape to the start and begin playing, as might be expected, but instead immediately starts playing without any rewind.

Consistency is an heuristic for good design. If you think a particular feature is a good idea for the remote control, why not put it on the VCR? Or if some feature is not a good idea on the VCR, is it really a good idea on the remote control? And vice versa. A notable benefit of making the buttons and displays of the remote control unit and the VCR consistent would be that (in my case) the instruction manual would be approximately halved in size, with the learning burden correspondingly reduced. You could avoid inconsistency or duplication by dispensing with either the remote control unit or the buttons on the VCR.

Whether buttons are consistent or not depends on what they seem to do. That leads to the third principle: every action should have a reaction. There has to be feedback. Without feedback you cannot learn to do anything well.

Some video recorders have a scheme for setting UHF channels by pressing "+" or "-" buttons. One button increases the channel frequency, the other decreases it. If you don't receive feedback that the frequency is changing, you cannot tell whether the VCR has got stuck at the highest or lowest frequency—and that you aren't going to find any more channels however long you keep your finger on the button.

Learning from mistakes

Feedback helps the user make fewer errors but almost all VCRs do nothing, not even beep, when the user makes a mistake. The machine could tell you that you have tried to record two programmes simultaneously, that the tape isn't long enough for the planned recording, or that a date entered is yesterday or unbelievably far into the future. Because it is easy to make mistakes entering dates, it helps to add redundancy: if the user is required to enter the date and the day of week, the VCR has an even better chance of checking that the date is sensible and to provide helpful feedback if necessary.

Feedback helps you to see the success of each step of a sequence of actions. If, furthermore, you can see all the steps you have taken in a sequence, there are new possibilities. If you can see feedback from all your actions you can in principle go back and change some of them. Ultimately, it shouldn't matter in what order you press buttons—just as you can write a story backwards using a word processor if you feel so inclined. This is the fourth and last principle of good design—be free of history.

On some VCRs you must enter programme times strictly in the order: day of month, month, daily or weekly, minutes, hours—first for start time, then for stop time—and then the programme channel. If you make a mistake, you have to work your way to the end, then start all over again and risk making another error. On my VCR, there are two arrow keys that allow me to return, as it were, to the past and change the start time after I have set the channel number. Having a machine that is free of history in this way allows me to review what I have done, and change it if it does not suit me.

This is something that the designers of the automatic ticket machines on London's underground and suburban railway networks have still to learn. Both types of machine demand that the destination and the type of ticket required are provided in a particular order. At least there's some feedback, however: the machines do tell you when you've provided the two pieces of information in the "wrong" order—though they punish you by making you wait before timing-out. It doesn't help that the machines are not consistent: the machine on the underground network wants ticket type before destination, while the other one wants destination before ticket type. The designer accommodates the Zipf principle by providing a separate machine for those people who make the same journey regularly and know the fare: they need press only one button to get their ticket.

Some of the problems in using VCRs are the result of lack of thought, others are clearly lack of testing. Most of them, however, are the result of ignorance of simple design principles. VCRs can be made much more usable without compromising their technical features. It is ironic that TV games are more complex and yet easier to use. And TV games are far more fun than video recorders—because more thought goes into making them easier to use. □

Harold Thimbleby is professor of information technology at the University of Stirling. He will be talking about video cassette recorders and multimedia in the Ergonomics Society Annual Lecture at the University of Southampton in April.

Further reading *User Interface Design* by Harold Thimbleby, published last year by Addison-Wesley, Wokingham, Berkshire. *The Psychology of Everyday Things* by Donald Norman, published by Basic Books, New York, 1988. *On Human Communication* by Colin Cherry, third edition published by MIT, 1978.



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