dustry spokesmen at the meeting were government regulations, patent policies, tax requirements, and investment restrictions. (A new law that requires pension fund trustees to invest only in so-called safe undertakings was the object of much criticism.)

Considering the lack of agreement about the questions, dissension over the solutions to these problems was understandable. Markley Roberts, a staff economist for the AFL-CIO, suggested that large multinational corporations, which dominate industry research efforts, stop exporting technology to potentially competitive nations. Representative J. J. Pickle (D–Tex.), a member of the House Ways and Means Committee, said that tax credits for research and development should be increased and the tax on capital gains reduced. Another observation was offered by Edward David, president of the Exxon Research & Engineering Company. Noting a recent $240 million agreement for long-term cooperative research signed by his own company and the Department of Energy, David suggested that such arrangements serve to stimulate industry interest in innovation.—R. JEFFREY SMITH

Science in Europe/ British May Use Telephones, TV's, to Tap Data Bank

On 1 June a new information service with some revolutionary implications went into operation in Britain. Through the regular telephone network it provides access to a computer-based information system, using an ordinary TV set as the display terminal. It may be the biggest thing to happen to communications since the invention of radio; or it may be about to rival the Ford Edsel as a marketing disaster. The silence you hear is the sound of breath being held.

The service is called Prestel and has been devised and brought to market by the British Post Office, in collaboration with the electronics industry, the TV manufacturers, and the British Broadcasting Corporation (BBC). While it might be unfair to imply that the Post Office has been responsible for no innovations since the penny post way back in the 19th century, it does not have the image of a go-getting organization. Yet there seems no doubt that with Prestel it has come up with an idea which, if it catches on, could bring enormous changes in the office, the home, education, newspapers, and in the way information is exchanged and used.

The concept is simple. Using an ordinary telephone, a Prestel user dials a central computer packed with information on a wide range of topics, from financial data to consumer reports and mail-order catalogs. When the connection is made an index page appears on his TV screen, and by pressing buttons on a hand-held keyboard, the user can find his way into the data bank, which can hold up to 250,000 "pages" of information. (Each page holds about 150 words.) It costs him 3 pence (just over 5 cents) for the basic call, plus another 1 to 2 pence for every page he consults. The charges appear automatically on his quarterly telephone bill.

In this transaction the Post Office merely acts as the carrier, giving the user access to information supplied by more than 100 "information providers." These include the Stock Exchange, Reuters, the Consumer Association, local newspapers, chains of shops, the Meteorological Office, travel agents, the Sports Council, the motoring associations, as well as totally new "electronic publishing" companies which have been set up to exploit the new medium. The information providers can put their own price on each page of information they supply; some pages, like weather reports, or advertisements, would be free, while others, like financial information, would cost whatever their providers think they are worth. How many pages, and which ones, each subscriber has consulted is automatically recorded by the Post Office, and is billed accordingly. From the revenue received the Post Office subtracts the cost of running the service, takes its own profit, and sends the rest to the information providers. A provider whose information proves useless—and is therefore seldom consulted—will earn nothing from the system. A provider whose information is widely consulted will do very nicely; the system thus puts a premium on the success of each provider in attracting users.

On 1 June the system went live for the first time, although only in a limited way to the first few hundred users who are acting as a test market. The system should be nationwide by the beginning of 1979, although it now looks as if it will slip a few months and likely come on stream some time in the spring of 1979.

Prestel is, in fact, just one of a range of information systems which have been in development in Britain for the past decade, and are known by the generic title of "teletext." The simplest are systems for broadcasting short news items or simple information, using two spare lines from the 625-line TV signal. These two lines fall outside the area of the TV screen, so play no part in carrying the normal TV picture. Instead, they are used for carrying up to 800 pages of written information in a format similar to Prestel. The information transmitted includes such things as news reports, sports results, and gardening tips. The user selects the page he wants with a hand-held keyboard.

This system was developed by the BBC and the Independent Broadcasting Authority (the organization responsible for the control of commercial TV and radio in Britain). It is now available, under the name Ceefax for the BBC version and Oracle for the commercial channel. The information it supplies is free once the user has bought a specially adapted TV set. Unlike Prestel, the Ceefax and Oracle systems broadcast their information and are not, therefore, interactive systems. They are also limited in capacity by the fact that they have only two lines in the TV signal to use as carriers. But they are ideally suited for the provision of news and seem likely to dominate that end of the market. So far, there are not very many users; those there are find the system particularly useful when they get home at night and want to be brought quickly up to date with the news.

Prestel is a system with wider possibilities. There are no limitations on the amount of information it can store, and since it is an interactive system it can do things Ceefax and Oracle cannot.

For example, Mills and Allen Communications Ltd., one of the new electronic publishing companies which act as information providers for Prestel, has designed a page for the Save the Children Fund, a British charity. The page is an advertisement urging the Prestel user to

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"Press a key to give 10 p." The user who does will find himself debited 10 pence on his next quarterly telephone bill, and the money will go directly to the Save the Children Fund. They say that the system will simplify logistics of giving to charity and thus encourage more people to give. "It's charity at the press of a button," says Richard Hooper of Mills and Allen.

Another information provider is Currys, a chain of 480 shops specializing in consumer durables such as TV sets, washing machines, and refrigerators. Their pages will consist of a catalog of products much like a mail-order catalog. By use of the Prestel keyboard, the user will be able to select and purchase items from the catalog and specify how he wants to pay. The recording equipment notes the order, passes it on to Currys, and the item is delivered direct to the customer. He need never leave his armchair.

Extending the system a little further, it could be used for working out travel itineraries and booking tickets. The user could consult the airline timetables through Prestel and then, through a link between the Prestel computer and the airline reservation computers, find out if there are any empty seats and book the tickets.

It could also, in the longer term, begin to take the place of mail. By providing each user with a keyboard equipped with the necessary electronic logic—in the form of microprocessors—it will be possible to key in a message and route it through the telephone network to a specified recipient. This could bring Telex or Teletype services to many more users. If the intended recipient of the message is out, a simple audio cassette recorder can be used to store the message, with a flashing light to indicate that a message is waiting. A copy printer can be added to the system if a hard copy is needed.

These last refinements have all been developed by the General Electric Company (no connection with American GE) and, although they will not be available immediately, could quite easily be added to the system later. They use perfectly conventional technology. Robert Clayton, technical director of the company, believes that at first these systems will be used principally in offices, but foresees their extension to the home by the end of the century.

The unanswered question is just how many people will want to use the range of services Prestel can supply. At present, a TV set equipped with the necessary extras to act as a Teletext receiver costs about twice as much as a regular TV set—around £600. But marketing has hardly begun and prices are expected to fall rapidly; by 1980, the extra cost over an ordinary TV set could be down to £60 or so, according to one firm of electronic consultants. At that price, it seems likely that most buyers will prefer the Teletext TV.

In the shorter term, companies rather than individuals may be able to justify paying more for the service. Stockbrokers can have immediate access to market prices, bookmakers to race results, travel agents to timetables, journalists to reference books and directories. Compared with a conventional computer information service, Prestel is inexpensive; Alex Reid, the Post Office's director for Prestel, says it will cost in use only one-tenth as much as existing computer information services. "We see it as a form of very simple and open electronic publishing where everybody who has some information they want to disseminate can do so quickly and cheaply," Reid says.

Other Advantages

From the Post Office point of view, Prestel offers another advantage. The telephone network is, they say, a "vastly under-used asset," with the average home telephone in Britain being used less than twice a day. By combining Britain's 13 million telephones with its 18 million TV sets, the Post Office hopes to get a better return from its huge investment in telephone equipment. The TV industry also sees it as an opportunity both to sell more sets and to recover some of the market lost to cheaper Japanese imports.

Why Britain, with its ailing TV manufacturers and its nationalized Post Office, should have turned out to be an innovator in this field seems to boil down to one individual, credited by the Post Office as the inventor of Prestel. He is Sam Fedida, an engineer at the Post Office's research center near Norwich. In the 1960's, Fedida was working on the videophone, an idea which failed because the telephone network does not have sufficient capacity to carry video signals.

Once that idea was dropped, he turned his attention to other ways of using the telephone network and came up with Prestel. The Post Office then devised the system and wrote the computer software, while the TV manufacturers designed and built the Teletext TV sets. Foreign interest in the system has been considerable, and the Post Office has already sold the technology to West Germany. Last October the system was shown at a telecommunications conference in Atlanta and, according to Roy Bright of the Post Office, who is responsible for selling the technology abroad, caused astonishment and delight.

Not everything, however, has gone smoothly. For years, the Post Office called the system by another name—Viewdata—but when they came to register the name found it was already registered by somebody else, so had to settle for Prestel. There have also been snags in getting the data from the information providers on to the central computer, and in the interface between the TV sets and the telephone network. Reid admits there have been problems, partly caused by the fact that the system has grown in scope since it was first thought of. But he says that the problem of access to the computer, which had prevented the information providers from getting their data in, is now almost solved. Magnetic tape facilities have been provided, so that information providers can, if they wish, simply deliver their data on tape.

The implications of the Teletext revolution for other communications media could be considerable. It seems likely, for example, to erode the profitability of newspapers by siphoning off classified advertising revenue, and of the postal service by creating "electronic mail." This may be one reason why a number of newspapers have become involved as information providers, including the Financial Times and the Westminster Press group.

But most people believe it will be a totally new product that will not directly attack the existing media. Reid says he sees it as "a complement to the printed work, rather than a competitor," and Jack Beverley, group managing editor for Westminster Press, believes that newspapers will remain the best and cheapest medium for classified advertising. Compared with newspapers, Prestel is an expensive way of buying information; compared with computerized information systems, it is cheap. It may therefore create a totally new market which has little in common with existing media.

Alternatively, it may turn out to have no market at all. The Post Office, which has invested £28 million in the system, will be anxiously watching the results of the test market, as will the information providers, who have also invested heavily. "My position now is that we're either on the brink of a new communications medium, or we're on the brink of disaster," says Hooper. He himself is optimistic; people introduced to the system for the first time are, he says, "totally gripped by it—they're actually amazed by the technology." Whether amazement equals profits remains to be seen.

—NIGEL HAWKES