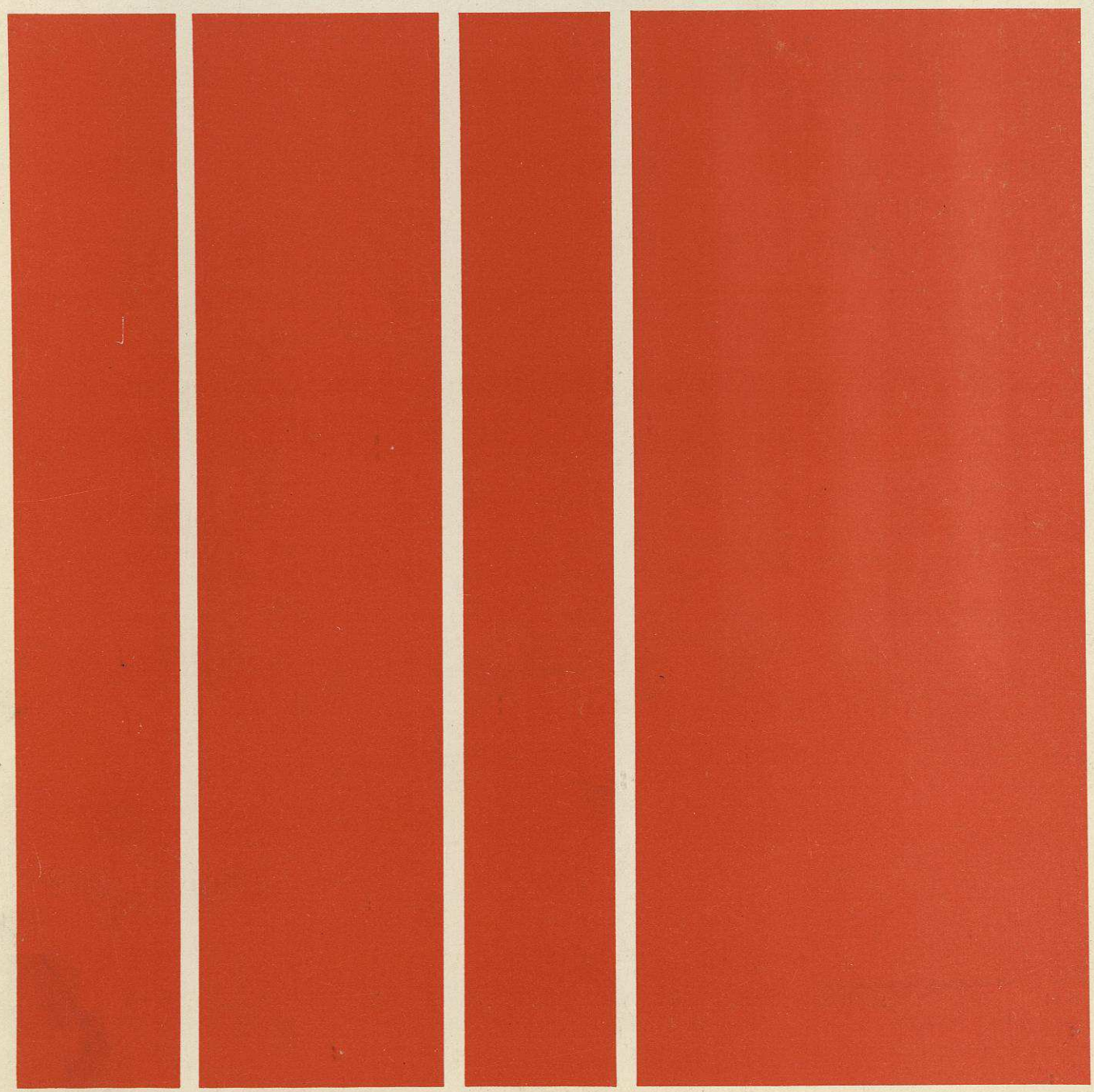
Transcript

Management Conference

Bristol
October 31 &
November 1, 1978



The Butler Cox Foundation

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MANAGEMENT CONFERENCE TRANSCRIPT

Bristol, October 31 and November 1, 1978

Butler Cox & Partners Limited, Morley House, 26 Holborn Viaduct, London EC1A 2BP

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INTRODUCTION

David Butler
Chairman, Butler Cox & Partners Limited

BUTLER: Let me welcome you to this Management Conference of the Butler Cox Foundation. I should like to extend a particular welcome to those organisations which have become members of the Foundation since our last Management Conference, in the spring of this year. I am glad to say that it is quite a lengthy list of organisations: BICC, British Leyland, the Burton Group, Cadbury Schweppes, Courage, Debenhams, the Mars Group, Midland Bank, Samuel Montagu, and Shell UK. A particular welcome to those new members.

I wonder if I might ask a favour of some of the old members. If you cast back your minds to your first Management Conference, I think that you will remember that it took a little bit of time and effort to understand how the conferences work, to get into the swing of things, and to develop what we call the 'club' atmosphere within the Foundation. I and my staff will be doing everything that we can to help the new members to get aboard this moving carousel as fast as possible. We should be grateful for the help of those of you who do know how these conferences work in extending a friendly and helpful welcome to a rather substantial number of new members.

The theme of the Conference is 'Management Priorities for the 1980s', and we have deliberately chosen the subjects to cover a wide range of areas of interest. Over the next two days we shall cover problems and opportunities which are predominantly technical in nature as well as those which are fundamentally concerned with human values and the way that people respond to the kinds of technology that we want to study.

I do not want to take any more time than is essential at the beginning of the Conference, but there is one thing that I should like to mention before we move into the first session because it will be an interesting event and something of a 'first' so far as we are concerned. After consultation with the members of the Foundation, it has been agreed that the next Management Conference, next spring, will take place in the USA. There are more complex arrangements to be made and more thought given by the members to the amount of time necessary to attend such a Conference, and possibly to combine it with other business activities in the USA, but we feel also that it will provide us with an improved opportunity to get to understand some of the many interesting things that people in the States are trying to do. As the administrative details for that Conference are finalised, obviously all members will be kept informed.

So to this Conference. Clearly, the kinds of technology with which we are concerned — computer systems, telecommunications, office products — have their own economic and social impact on the fabric of society. Indeed, I believe that at the present time the potential impact of those technologies in social and economic terms is less than well understood and often widely misinterpreted. Nevertheless, the fact that they will have this impact is, to some extent anyway, recognised.

Perhaps what is less clearly recognised, certainly by many of us working, we like to think, near to the technological 'sharp end', is that these activities also take place in a social and economic context which has its own reality and its own significance, and which envelops and surrounds everything that we may try to do.

I believe that it is easy for us to slip into lazy habits of thinking that what has gone on for as long as we can remember is likely to go on for as long as we shall care. It is in an effort to focus attention on some of the truly significant and almost alarming economic and social changes which we have witnessed in the past few years, and to look ahead to the future, that we have invited our first speaker to take part in the Conference.

I have heard him speak once before, and I know that he will not take it amiss if I say that what impressed me most about him was that, in contrast to many economists, he did not seem to be peddling a pet theory to which the facts must somehow be squeezed to fit, but rather looking practically and pragmatically at what has happened in the world in the past few years and what the consequences of that might be for the future.

AN ECONOMIC AND SOCIAL FORECAST FOR THE EARLY 1980s

F. Blackaby
National Institute of Economic and Social Research

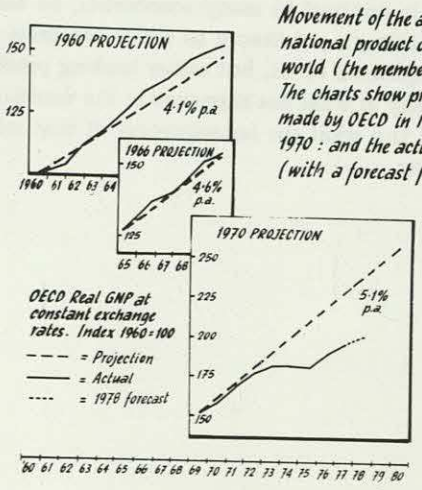
Frank Blackaby read economics at Cambridge; worked in the Treasury for seven years; has been at the National Institute of Economic and Social Research since 1958 (apart from three years in Stockholm at the Stockholm International Peace Research Institute). He is the author or editor of books on economic policy, on incomes policy, and (outside the field of economics) on armaments, disarmament and the arms trade.

BUTLER: Gentlemen, a distinguished economist, editor, author and lecturer — Frank Blackaby.

BLACKABY: It is true that my concern is with the future, but before one starts looking at the future it is important to extract all the information that one can from the past and the present. To adapt slightly a phrase of Aneurin Bevan's: "There is no point in looking in the crystal until you've read the book."

There are now trends and changes in trends in the world economy — and that is what I will be talking about — that set the questions for the future. I want to start by dealing with some of the past facts. What I propose to do is to set out some of the things that have happened — and things have happened in the world economy — particularly in the past five years and, after presenting these facts to consider some of the alternative possibilities for what is going to happen in the next five or ten years.

WORLD ECONOMIC GROWTH



Movement of the aggregate real national product of the 'western' world (the members of OECD). The charts show projections made by OECD in 1960, 1966 and 1970: and the actual movement (with a forecast for 1978).

I want to start with what I think is probably the main problem: what has happened to world economic growth, particularly since 1973? When I say "world economic growth", strictly speaking this is for the Western industrial countries, the members of OECD. They drive the world economy. If their growth goes ahead, the world follows. They are in the driving seat of what happens.

Right back in1960 the OECD produced what was then a very ambitious forecast or projection for growth in the West, of 4.1% a year. That is the dashed line. The solid line is what happened. You will see that the West beat that projection; we had in the West in general a 4.5% growth rate. That is the first proposition. The second is that although that line wobbles a bit from time to time there are really no substantial kinks at all, there are no significant deviations. If one had been giving this lecture at any time in the 1960s and one had been asked what the world growth rate was likely to be, one would have said, "It's on a 4% to 5% growth path. There is no significant shift. It seems likely to stay there," and one would have been right.

In 1965, given what had already happened, they shifted up their projection to 4.6% and they were more or less bang on target. Here again, the second part of the '60s, no significant deviation. Coming to 1970, they put the figure up. They set their projection for '70 to '80 at 5.1%, and up to '73 this time the actual is a bit below this projection but not by very much. So here you have 13 years in which there was no significant slip in world economic growth. It was down a bit one year, up a bit another, but at any time, if this lecture had been given in that time, it would to some extent have been a rather boring lecture, because one would have said, "Here we are. We're cruising along at 4% to 5%. This is a formidable rate of growth. It has no precedent in world economic history. There seems absolutely no reason why it shouldn't go on forever."

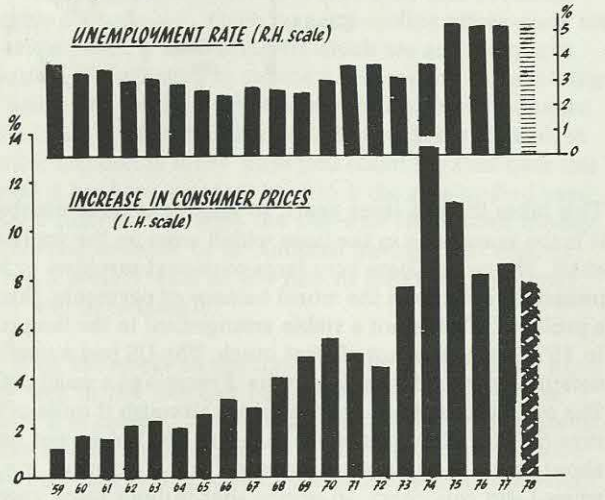
Then in 1973 we get the break; in '74 no rise in output; in 1975 a dip. 1976 was not a bad year, but that did not set off anything like the 5% trend and the gap between the actual and this 5% trend is widening. If anything, we are on 3% growth this year; something of the same order next year.

Here then we pose a question. Whereas in the previous 13 years it seemed more or less foreordained that world economic growth would chug along at a satisfactory 4% to 5% rate, now we have had in effect five years in which the average is about half that; '73 to '78 is 2% to 2½%.

So that poses the question: is this a new trend? Do we now

start projecting for the future at 2% to 2½%? Or do we re-establish 5%? Or do we get back on to the old trend line? There are large numbers of question marks now about what happens to world economic growth. These are questions which do make a difference; the difference between 2½% and 4% growth is the kind of difference which will percolate down all through the economies of the Western world. So that is the first change in the situation which sets the question for the future. We do not, as yet, have to start peering into the future, we know from what has happened that we have here a problem. The Western industrial system which functioned so remarkably well in the post-war period is beginning to show signs of difficulty. So that is the first fact about the past.

Unemployment and consumer price records, 1959-1978 of the seven major industrial countries (USA: JAPAN: W.GERMANY: FRANCE: UK: CANADA, ITALY)



Now two more facts. All these facts are interconnected. Strictly speaking, this second set of figures are just for the seven main industrial countries, but again they form such a large part of the output of the industrial world that it would really be very much the same if one threw in the smaller countries such as Denmark, Greece and so on. The first statement about the past is linked to the one that we have seen in the first chart. Right through the '60s the industrial world ran with an unemployment rate of between 2½% and 3½%. It ran with full employment by any reasonable measure. Of course, that was linked with the fact that they had this rapid rate of growth. It was a rate of growth fast enough to absorb the increase in the labour supply. Indeed, in Continental Europe it brought in a lot of labour from Southern Europe as well, from Yugoslavia, Turkey and Greece. Then with this kink in the growth rate from '73, the unemployment figure bumped up from 3% to 5%, higher in some countries, and has stayed there. So again we have had a shift away from one of the main claims of the success of the Western industrial world, that is established full employment. That record has been broken.

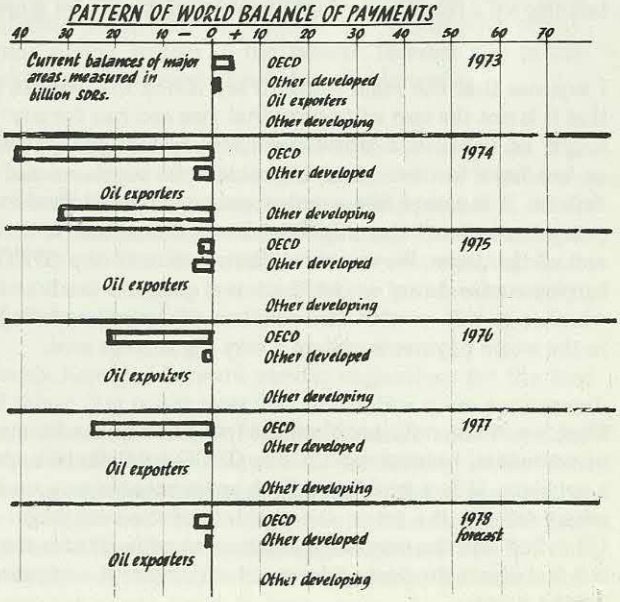
The second main proposition about what has happened is one in which the change in trend is not so particularly marked at '73; it is one where there has been a gradual upward shift. This is perhaps one of the predominant and certainly one of the most interesting questions for the future.

You could still say, however, that in the period from '59 to '69 there was a gradual upward creep in prices, but you were in the 2% to 4% region. This is the average increase in consumer prices in the seven main industrial countries. It is true that in that time people were very much more worried about a 3% or 4% price rise than they are now. If we were to get back to a 3% or 4% price rise, we would think that we had more or less dealt with the problem of inflation, whereas back in the '60s the figure of 3% or 4% was one that made people extremely nervous. But particularly from '69 these figures have gone on up, slightly bumpily. There was the vast figure as a consequence of the OPEC price rise in '73.

But the main point to make is that, in spite of the slow rate of growth and in spite of the rise in unemployment, which means that the demand for labour has eased, the rate of inflation in the industrial world has only come down to something around 8%. Here is a change in trend which poses a problem for the future. We have a figure of inflation which has not been licked simply by a deflationary stance on the part of the industrial world in general. Five years of slow growth and the shift up in unemployment — nearly 12 million in the industrial world — and still here we are with an average rate of price increase in the industrial world of 8%. So there again the questions for the future are set by the trends in the past. Clearly what happens to unemployment will depend on whether one does or does not recover the old growth rate of 4% to 5%.

Here one has to ask oneself what the determinants are of this long upward trend in prices, and whether or not one should start accommodating oneself to an 8% or 10% price rise forever — and we are a very long way from accommodating ourselves to it — or whether or not this is a problem which the main countries in the West will solve. I think that in many ways the question of inflation and the future of inflation is one of the more fascinating questions. It is certainly one of the questions where social issues as well as economic issues come in. It is becoming increasingly clear that the problem of inflation in the West is not a technical, economic problem, it is a problem of developments in those societies. So there again, more trends from the past which set the questions for the future.

PATTERN OF WORLD BALANCE OF PAYMENTS



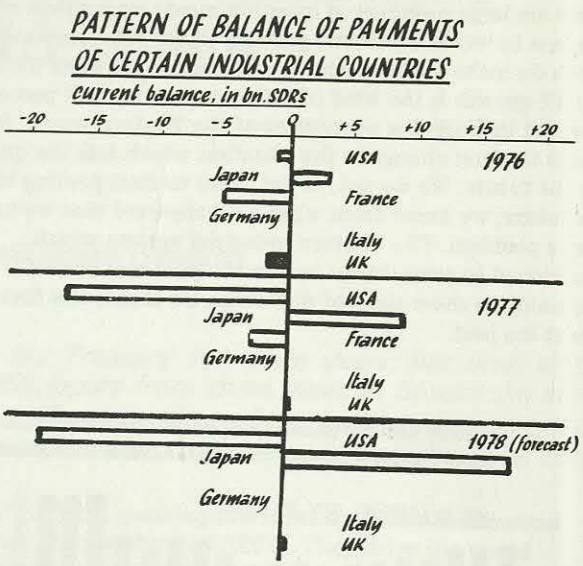
I want to present two more facts about the past which also present problems for the future. This is again a statement about a world problem. This chart presents a set of figures for the balance of payments of the main areas of the world since '73. On the plus side you have the surplus in the current balance, and on the minus side the deficit in current balance. In '73 you had a pattern of surpluses and deficits which was fairly normal. The OECD, the industrial world, had a bit of a surplus; so did other developed countries. I should say that all these figures are strictly speaking in billion SDRs, which is the IMF international currency, but you can count them as being near enough in billion dollars. The oil exporters had a bit of a surplus, but nothing very formidable, only $7 billion. The other developing countries, apart from the oil exporters, had a deficit, which is what one would expect.

This was a viable pattern of world payments. Some capital transfer of resources from the developed countries to the developing countries. The kind of payment system which would hold in the long run. Then we had the fourfold rise in oil prices and the main development was a huge surplus for the oil exporters, and initially a very large deficit for the industrial countries. You can see from the lines that, from then, the world payment system has been saddled with the problem of coping with this oil producers' surplus. It has dwindled a bit. On the '78 forecast it was down to $25 billion. But when any area has a surplus, somebody else has to have a deficit. It is a zero sum game. It is the same statement as saying that each transaction is both a credit and a debit. The problem has been to find any countries which were prepared to carry the deficit which was the opposite of the OPEC countries' surplus; because countries are not particularly keen on running deficits for a long time and we have had quite a lot of 'passing the parcel' as individual countries struggle to get out of deficit and in effect pass this deficit on to some other country.

Up to 1976, Italy and Britain had big deficits. From '77 onwards the United States has carried a lot of the deficit; but a good part of it has gone to the developing countries which consequently are building up very large debts. They are debts mainly to private banks which are, as it were, turning over the petro-dollars that come in; but this is building up a formidable debt problem for the Third World.

I suppose that the main thing to say about this pattern is that it is not the sort of pattern that you can run for any length of time. In a world payments system you more or less have to have some alternation of surpluses and deficits. It is rather like a poker game. If one particular person collects all the chips and keeps them, that is the end of the game. We are stuck therefore until the OPEC surplus comes down — and there is a question mark as to whether it will — with the problem of accommodating in the world payments system a very big surplus area.

That is not the only problem that we have in the balance of payments, because within this OECD total there is also a problem. It is a problem whose consequences you read about daily in the press: the problem of the very large US deficit and the very large Japanese surplus. That is the last fact about the past and present which sets the question for the future.



This takes the last three years. In looking at these numbers, it is the same issue as the issue which arose on the previous chart. Where you have very large persistent surpluses or large persistent deficits in the world balance of payments, this sets a problem. This is not a viable arrangement in the long run. In 1976 there was not all that much. The US had a small deficit, Japan had a small surplus. France had a small deficit. The main thing about France is that although it quite often runs deficits which are larger than the UK, it does not fuss about them in the same way as we do. It surprised me, when I did this chart, to notice that in both these years France was performing much worse than the UK, but for some reason they don't blether about it. Germany has a surplus; Italy a deficit; the UK a deficit.

Well, this is not all that happy. Nonetheless, it was not in any sense cataclysmic. But now we go to '77 and '78, and here the dominant things are the huge US deficits of over $15 billion, SDRs — they would be rather bigger in dollars than SDRs — and the very big Japanese surplus.

So we have Japan moving into an enormous surplus and the USA running an enormous deficit; whereas partly because of the huge US deficit, Germany, Italy, the UK — the UK has just moved into a small surplus in these last two years, nothing very significant. Indeed, one of the disturbing things when one comes to think about the UK is that in spite of the fact that we are halfway into the North Sea oil period, we have still only just managed to creep into a balance of payments surplus.

The conclusion therefore of that presentation, which has the advantage that it is a presentation of fact rather than one of speculation, is that the Western industrial world which ran so well not just from '60 to '73 but from '50 to '73 has problems. It has moved into a period of five years of relatively slow growth. It has shifted up its unemployment percentage significantly. It has a very formidable problem on its hands with the problem of inflation. The balance of payments structure is in a state of fairly considerable confusion.

Now I want to turn from fact to speculation. Please note the point of transfer. Up to now the things that I have said I can validate. I can give sources for the numbers and, although one can quibble about the statistics, I don't think that anybody would seriously dispute that the bars which have been shown represent what has happened. From now on when one starts peering into the future, that certainty disappears. I suppose that it is a slight exaggeration to say that anything can happen, but the record of medium to long term forecasting, particularly when one is in this kind of position of change, is not all that good. So one is in the area of assessing alternative possibilities and trying to stick probabilities on them. That, as anybody who has engaged in betting on the horses knows, is a highly chancy business.

I want first to turn to this question of inflation because I think that in many ways the key question for the West and for the UK is whether or not it licks this problem; because 8% inflation, which means doubling prices every six to seven years, is something to which we are really not adjusted. We still cling to the view that money is something to hold. Our pension systems are inadequately adjusted to it. It has produced in this period remarkable changes in relative income. In many ways you could say that over this period it has been a system by which the able-bodied have robbed the old — at least the old who stuck their money in building societies or in National Savings. Put crudely, to run a society with an 8% rate of inflation is a pretty poor way of running it.

We must remember all the time that the West — as we knew very well in the '30s and have tended to forget in the '60s — is in competition with alternative economic systems. These alternative economic systems in the Socialist bloc have immense deficiencies in things like product development, and they have immense deficiencies in individual freedom. However, they can legitimately claim that they do not have significant unemployment on this scale, and they certainly do not have 8% rates of inflation.

Behind this trend in inflation in the West you have not simply economic forces, you have other forces as well. The kind of forces that I am talking about are best illustrated by pointing out the contrast between those countries, which are relatively few, which have some solution to these problems, and those which have not. The great successful country in dealing with inflation is of course Germany. Here we have 8% for the West; it is roughly 8% for the UK as well; the German figure at the moment is 2.7%. For that matter, Japan as well has succeeded in bringing her rate down to 4%. The Japanese bother less about inflation than we do. Both those are pretty deferential kinds of societies. They are societies in which people accept their relative status to a greater degree than they do in other countries, where the struggle for relative status or relative income is less intense.

I think that in this general development of inflation you have had among many other forces — and there are a multiplicity of forces — some of the intensified battle between individual groups. It is not so much a class war because everybody is in it. For those who may have studied Latin a long way back, it is the *bellum omnium contra omnes*, it is the battle of all against all. The airline pilots are in it, the surgeons are in it. Everybody is trying to question and improve their relative status and relative income.

Given that picture of the main driving force behind inflation — and it is certainly very clear to me in the UK that essentially it is a wage-driven inflation — there is no question that we have lived in a period from '66 in which the share of profits and national income has been trending down and it is quite clearly a wage and salary problem. Given that picture of the main driving force behind inflation, I think the question is whether we do or do not devise some social institutions to cope with the procedures which are driving these numbers up, which essentially are procedures of the collective bargaining system which we have. The big advantage of the German system is that they have 12 or 13 unions. These unions are strong; they are centralised; they have relatively little plant bargaining. Ever since '67 they have had regular meetings with the Government, the Central Bank, and employers, in which they talk about the economic situation.

When you do that sort of thing, when you are fifteen people in one room together, discussing the kind of orders of magnitude of wage increases that make sense, in that kind of situation you do not turn up with daft figures like 20% or 40%. It becomes transparent that when output is increasing by 5%, if you then pay the producers of that increased 5% twenty percent more money, the difference will turn up in the rise in prices. They have a system in which the results of your wage negotiations are clear. I think that is the main institutional advantage. It is the main direction which other countries are groping towards, to find some kind of social contract — the 'social contract' term was essentially a German invention. The question mark over inflation is whether or not the countries which are still wrestling with it, which are virtually all the countries bar Germany and Switzerland, do or do not get some kind of institutional solution.

So in making your forecast, it is in many ways a political forecast. Do we solve this problem or do we not? It is not a question of inexorable economic forces, it is a question of predicting whether we make sense out of what is essentially an irrational social situation.

I will leave the question of inflation there. I want briefly to look at the other trend question. I think this is in many ways the key one, simply because of the feedback from inflation on to growth. I should like to consider briefly some of the factors in the growth forecast and in the problems of the world's balance of payments.

The big issue here is this: behind this deviation are there what one might call 'structural' factors or was it government policies? Was this governments reacting to the oil price, reacting to the deficits that OPEC created, and reacting to inflation, so that they did it? Or is there something which has shifted what has been labelled the 'productive capacity' of Western industry?

People have put forward various suggestions for the kind of things that might have dented this line more permanently, regardless of government action. Research and development expenditures in many countries, particularly in the United States, have been reduced. That is partly because in this period there has been in many countries a significant profits squeeze. There has been the suggestion that there is a shift away from goods to services. Of course, the scope for increasing productivity in many areas of services — hotels

is a good example — tends to be a good deal less than the productive potential in manufacturing.

All I can say is that I do not find any of these propositions very convincing. I certainly do not find it convincing to suggest that in some ways the world has run out of inventions. This is a rather bizarre suggestion, and very curious when you look at all the things that are lying around on the horizon. If behind this line the productive potential (that is the productivity possibilities) are much the same as they were then the main consequence will be continuous, rising unemployment. The rule from '60 to '73 was that you needed in the West a 4% to 5% growth rate to keep unemployment where it was. If that still holds, then either we get back to the old growth rate and we hold unemployment where it is — indeed, in order to bring it down we need to go a bit above the trend rate — or we continue on this low path and unemployment goes trending up. That has social consequences, too. We already have with us the social consequences of the higher rates of unemployment in significant areas of disillusioned youth. Because unemployment turns up first among the young, work forces close up; they say, "OK, if you're reducing the work force, don't recruit. Take it in natural wastage." Hence you get these very high figures of youth unemployment.

If we continue on this kind of trend, I think that the probability is that we would shift to higher levels of unemployment.

The astonishing thing is the amount of social unrest the shift to unemployment has not caused: the dog that didn't bark. If anybody ten years ago had said that in the UK we could run 1½ million unemployed without any equivalent of the Jarrow marches, I think that they would have been dismissed as being hopelessly optimistic. But we have not had it. Of course, at some point one would. One has coped with 5% unemployment, 6%; I think that it is very doubtful whether one could cope with 10% or 12%. So here again behind this growth trend there is a question, in my view: if we do not get back, then we are faced with the probability of that 5% figure going on up and what are the explosive possibilities if that occurs?

So those are two of the main trend questions on the rate of inflation and economic growth. Finally, and very briefly, on the problems of the world's balance of payments, one of the consequences of the payments' disarray and also of the relatively slow growth of world trade since '73 is that free trade has come under increasing question. Here is also another question mark for the future. We have had a really rather remarkable period in which trade has been released both from tariffs and quota restrictions, and most multinationals now function in a pretty free trading kind of world, in which they consider that they can plan their production on the basis of buying subsidiaries elsewhere, on the basis that they will be able to shift their goods from country to country without major restraints.

This certainly poses problems for individual countries, because a complete free trading world in a sense presupposes something which we do not have, which is any kind of centralised economic policy between the main industrial countries. You see this in the Common Market where already very big problems are turning up and where the economic integration has already surpassed the state of political integration. We have all kinds of administrative decisions being taken in Brussels with a pretty remote kind of political check on them.

I think that one of the problems of a total free trading world is what it might do to less successful industrialised countries. I think this is relevant to the UK, because I fear that we fall basically into that category. There is no particular reason why the bulk of the world's manufactured products should not be produced in a small collection of countries, with Korea, Taiwan, Singapore producing the low technology goods, and Japan, Germany and the United States the high technology goods; and various other people falling between the grid.

On the whole it is unlikely that governments would cheerfully accept that prospect of relative de-industrialisation. That means that we must brood on the future as to whether or not one will not find some reaction against a free trade epoch which we have had over the past 25 years. It is not only governments that dislike the phenomenon that suddenly, overnight, one discovered that the industry for producing cutlery has disappeared to South Korea, it is the people who engaged in that process in this country who also dislike it strongly. There comes a point, particularly when other employment possibilities are limited, when governments say, "If we have a choice between moving towards a much less industrialised economy or interfering with free trade, then it's the sanctity of free trade that has to go."

Those are the questions that I pose for the future. They are all questions arising from the trends which we have. They are questions primarily about whether we cope with this 8% inflation rate which we have been left with, in spite of five years of slow growth. They are the questions about whether we get back to that old growth trend and what happens to unemployment if we do not; because I put the tentative view that if we do not get back to it, then that unemployment figure goes creeping up. There is the question of whether or not we are on the edge of a reaction against the long movement towards freeing trade between the industrial countries, and between the industrial countries and the Third World, as people get less and less inclined to tolerate the disappearance of industries and more and more attracted, therefore, to the idea of some measure of protection in which you keep such industry as you have.

I think that those are three of the economic trends with which we shall be particularly concerned in the next five to ten years.

BUTLER: I'm not sure whether the air conditioning in this room is working a little too well, or if it was Frank's words that made me shiver once or twice. If it is the former we will get it fixed during the break; if not, it may take a little longer!

We now have time for a few questions.

QUESTION: Given that we have the problem that governments and people will tend to resist the further erosion of their markets by sacrificing free trade, what is likely to happen in complex, technologically based industries where the complexity and distribution of the industry is already difficult enough to handle?

BLACKABY: I think there is a separate question about what a government can do in a successful trading country where technology reduces jobs. If it is trading successfully, then in my view governments can act to create jobs elsewhere. We do not live in a world in which wants are satisfied. We have very large areas where there is still work to be done. The experience over the long period in which productivity has risen and the share of employment in manufacturing has tended to trend down is that, if you do not have a balance of payments constraint, it is possible to create jobs elsewhere. Either you can create them in the service sector because if you give people more money they will still spend it on something; or you can create them in the public sector.

The difficulty arises in those countries which are not substituting new technology for old, and consequently find themselves with a falling share in world trade; and then governments are incapable of taking any kind of action to replace old jobs for new. So on a world scale I would have thought that one could cope with the employment consequences of new technology. The countries where I think that it will be much more difficult are the less successful countries, where the balance of payments' difficulties may prevent governments from doing what can be done.

QUESTION: Would Mr. Blackaby agree that one of the reasons for the decline in the growth rate of the developed countries is that it is a result of their licensing of technology to the underdeveloped countries and that if there is not a re-think of that licensing from the developed countries to the underdeveloped countries, that trend will continue on an even greater scale?

At the moment it seems to me that we are really increasing the capacity in the manufacturing world, without raising the demand in that area.

BLACKABY: One can do some quantification on this by looking at the share which the newly industrialised countries have obtained in world trade in manufactures. It has risen over the past decade from about 8% to 11%. You can certainly put it in as a factor, I do not think that you can put it in as a major factor; that is, if that share had stayed at 8% and you add back the loss of trade to the industrialised countries on to their total demand, you would not make all that difference to that slow growth trend.

Problems will arise with the newly industrialised countries once they begin to 'do a Japan', that is to export very much more than they import. That is the kind of thing that will dislocate the world payments system in the way that Japan is doing it now. So far, even of South Korea, that is not true; South Korea still runs a deficit. It is still importing from the industrialised countries more than it exports to them.

The transfer of stable technologies to Third World countries is the sort of thing that to some extent one coped with in the period of relatively rapid growth, because of the re-creation of alternative employment opportunities. It becomes much more shattering in a period of slow growth.

I think that this is one of the fields in which what we might call 'protection' or people politely now call 'managed trade' will begin to emerge, as it already does. There will be constraints on this shift. We already have very big areas of world trade which have shifted into the 'managed' category: the whole of textiles, steel, shipbuilding, large slices of Japanese exports. They are all in this category where tactic limits are put on trade. I would expect, certainly so long as we continue with an under-trend growth rate, that that would go on.

QUESTION: Is the country in effect consuming its seed corn? As a result of high inflation is our capital investment being eroded? Far from being expanded, is it not even being maintained? Is it being eroded? How much longer can one go on running revenue-earning businesses from an eroding capital base?

BLACKABY: I think that it is certainly true that many companies were, in a sense, much slower to adjust to inflation than their labour forces were; that is, their labour forces were perfectly ready to put in claims each time which compensated for past rates of inflation plus a bit, whereas the companies tended to announce enthusiastically that their money profits this year were higher than last. There is no doubt that either the share of national income or the return on capital has come down very sharply. This must represent a pricing policy which does not really look properly at replacement costs.

On the second capital stock consequences, certainly I think that there is a significant risk that we do not maintain what you might call an adequate manufacturing base in the field of world industrial production, and indeed over a long period we have not. Our manufacturing performance has been one in which our share in world markets has fallen and imports have increasingly invaded.

This has been partly the consequence of investment decisions, possibly constrained by finance, which have been excessively cautious compared to our competitors. It is certainly a requirement for the UK that pricing policies should be such that they take account of the rate of inflation. That really does mean that the company profit share in the national income needs not only to stop falling but to start recovering again. It is a bit hard to see how that is going to come about.

BUTLER: In connection with the last question, Frank, would you like to comment at all on the recent CBI forecast for investment for next year which seems fairly spectacular?

BLACKABY: It is true that in the last two years manufacturing investment has behaved rather well, that is there was a 14% volume rise in '77 and it looks as though '78 will be quite a good year. But this is from a pretty low base of manufacturing investment. Secondly, it is in a country where the share of total resources devoted to manufacturing investment is much lower than it is in a country like Japan. Our manufacturing investment is a mere 4% to 5% of total national product in this country, whereas the Japanese latest figure was of the order of 13% to 14%.

All right, it is encouraging in that it is going up and not down, but still in orders of magnitude it is not the kind of figure which puts us on a par with our major competitors.

BUTLER: Thank you very much. I know that there are

many other people who would like to ask questions, but one of the things that we try to do, at whatever cost, is to run an on-time conference, and it is time now for us to take a break.

I should like on your behalf to thank Frank for the extremely clear, somewhat daunting, and very stimulating way in which he has attempted to summarise in such a short time some of the principal economic problems of the past few years and the ways in which they are likely to develop and afflict us in the future. Thank you very much, Frank.

USER EXPERIENCE WITH THE ADAM COMPUTER

N. Fox
UI Management Consultants Limited

Norman Fox has been with Unilever since 1948, starting in production management. He has worked in several companies of the Group in the UK and Africa. A physicist by training, he became secretary of Unilever's Organisation Division in 1973. This Division became UI Management Consultants Ltd. in 1977.

BUTLER: Earlier, we heard from Frank Blackaby repeated references to the problem on a world economic scale of increasing and sometimes uncontrollable manpower costs. In the next two sessions we are going to look at approaches to the problems of manpower costs in the areas of systems development: two very different approaches but both with the same aim, trying to increase the productivity and effectiveness of the computer, the programmer, the analyst, the system designer; trying to get more of what the Americans call 'clout for the buck' out of our investment in systems.

Many of you will know that for the past two or three years my colleagues and I have been watching with great interest the progress of a small computer manufacturer in the United States called the Logical Machine Corporation, originally founded by John Peers who is known personally to many of you. Many of us have heard John's very impressive and charming description of his company, its products and the problems that it is seeking to resolve. But we have today for the first time the opportunity to hear from a user of one of those systems, to hear how much of the very ambitious claims and aims that John Peers has described to us in the past have now come close to fulfilment.

Unilever have been carrying out experiments with the product of the Logical Machine Corporation. Here to tell us about the results of those experiments and pilot trials is Norman Fox:

FOX: Good morning, gentlemen. First, before we go any further, I should explain to you that I am not a computer expert as I am sure a lot of you are. So if I use words that sound a little odd to you, just bear with me because I am here to talk about the user experience; and I am certainly a user.

First, some background. My job is that of Divisional Secretary to Organisation Division in Unilever. Organisation Division consists of two companies: UI Management Consultants Limited and UI Management Consultants BV. One is in London, the other in Holland. I am a kind of company secretary to both, which means that I run the administration, choose the secretaries and other interesting jobs like that.

Although it may sound irrelevant, what I am going to say now is really quite important when it comes to thinking about the ADAM computer. First, Unilever is a very big operation. Its turnover is £10,000 million; there are 300,000 people employed; and there are dozens and dozens of computers, all over the place, and we spend a lot of money on them.

So we have a lot of computer experience and people who know a great deal about them. Of course, it would certainly be possible for me or for my people to call on such experience to help us when we get into problems or difficulties with this particular machine. We have not done so because we are trying to act as an independent, small operation. It is sometimes rather difficult, but we are doing our best.

My knowledge of computing is a bit limited. It stems from taking the Open University course on Computing in my spare time last year, so you can see that it is at a fairly elementary level.

ADAM — and you will notice that I say "ADAM" and not "the ADAM computer", which I think is a bit of John Peers' psychology — is used by us principally for an invoicing operation, but has also been used for writing ad hoc, one-off programs by members of the staff. So we have two sorts of things that we are doing with it. One is the ad hoc programs for solving a client's problems, and the other is the routine, ongoing job of carrying out our own invoicing.

Our task, as is obvious from our title, is that of management consultants and we do the sort of things that Urwick Orr and hopefully McKinsey do — at lower fees, of course — for Unilever companies; and a little bit for outside, about 3%, but in general we are an in-house operation.

How did we start with this business? First, the magnitude of the task of invoicing is not enormous. We have 120 consultants, split between the two companies. We have 500 clients; they operate in 40 countries. We get one new assignment per day, on average; and we have 600 to 700 ongoing assignments or jobs. We have different rates for charging clients depending on the countries. We do not have 40 different charging rates, but we do have about 15; and we have many special instructions for different jobs. It is not an enormous task. I am sure that it could easily be done by pen and paper; but it does pose a certain number of problems when talking about computers.

We started the system that we are now using about ten years ago, when it was felt that our consultants — about 120

in those days — should at least complete time sheets. At least we would then find out what they were actually doing. So they started filling in time sheets every month and the analysis was carried out by secretaries. The amount of information which suddenly became apparently necessary to Unilever management increased enormously. One lesson that I have learned is that you should never confess that you have any data at all, otherwise people want it analysed in all kinds of different ways.

However, be that as it may, we had to start carrying out analyses by the type of activity, the company, the country, the type of consultants, the section and so on. It rapidly got beyond the ability of the secretarial staff to cope, so we went to a computer system. First we used our computer operation in Holland — this was seven years ago. They said to us, "We've got just the thing you want. It's an engineering maintenance package, but we can bend it a bit and it will do just what you need."

Well, you can imagine what happened. It did not do quite what we needed and, what is more, we could never get any changes put in. It was a batch operation with punch cards. It became very clear after a couple of years that we were getting more and more confused with the information that was coming out, and so we abandoned it. We went on from then to use Honeywell. This had one advantage, using the Honeywell timesharing system, in that we could access the system both from our Rotterdam office and from our London office. Data could be input from terminals in either office and output as well. So that was rather handy.

We decided to use a freelance programmer to do the programming, having asked a number of people for quotations and found them all far too high. She did a very good job for us. She programmed this in FORTRAN. It was very easy to add new routines, which meant that we added a lot of new routines; and eventually the whole system became top heavy. We started that about four years ago and it operated for two and a half years. At that time all we were using the system to do was to record the information from the time sheets, convert it into money, and then analyse it in different ways. We did not actually send anybody an invoice at all, it was all free; but we used to tell them what it would have cost had they had to pay!

Two years ago, the Unilever board decided in their wisdom that it would not be a bad idea to actually send them invoices. So we were then converted into companies, legal entities, so that we could actually charge our clients. We found that we had to start getting invoice information from this time recording system.

The first problem that we came up against was when I said to the programmer, "Daphne, you realise that we'll have to send credit notes occasionally, because just now and then we might get things wrong?" "Ah," she said, "that's unfortunate because we can't put any negative numbers into the system." She had used something called 'packed binary' and apparently had not put in a sign. So there was a slight problem. So we had to start invoicing manually, just using information from the system. We rapidly ran into problems because we were having to do manual corrections of computer output, which I notice a lot of people still seem to have to do. On the other hand, I did not feel that it was a very sensible way of using a computer.

We decided that we had better do something else. By the end of 1977 we were thoroughly convinced of this, and also the costs of using this timesharing system had escalated and were running at £1,000 a month. I think that is rather high. We are only a small unit, although we are in this very big organisation, and £12,000 a year was a lot of money. So we started thinking about our own machine. We wrote down a very good specification for this, which involved things like it must have a very good, common language that everybody knows and understands; it has to have excellent maintenance facilities, there have to be spare machines about which you can use if yours goes wrong; and it must have free access from Rotterdam and from London to link up with the Honeywell system.

This was all very fine and we started looking at alternatives. I must say that I was very attracted to a visible record computer. I am not a computer chap, I'm just a poor company secretary, and it seemed to me that if you have things on cards you could actually see them. But I was told by our computer experts that that was very old hat and that they almost went out with the Greeks. So that was thrown out of the window and my beautiful visible record computer never materialised. They said, "What you want is something that you can program in BASIC because everybody understands BASIC. All the kids coming from school will know it." At that time I had started taking this course and I was using BASIC, and I thought that it was a wonderful language. But in the end, the whole thing was aborted because, at the end of 1977, one of our other companies in Unilever came to us and said, "Please would you give us some advice because we are thinking of taking the agency in the UK for a computer called ADAM." One of the computer experts in the Division said, "That's marvellous. This is a wonderful new leap forward into space. We'd like to look at it, too."

So we got an ADAM computer, and we got it primarily, I should emphasise, to evaluate on behalf of this company of ours. We ordered it at the beginning of this year. It arrived in March. Then it got to London Airport and somebody dropped it. That delayed matters a little because we had to replace various parts; in fact we had to replace the entire disc. So we did not really start operating with it until July. So my user experience is fairly limited; if we could have delayed the conference for three or four months we would have had a little bit more. On the other hand, we are right in the middle of experience with it at the moment, so I'm hoping that you will all be able to tell me what we are doing wrong.

When we got it, we looked back at our specification and we said, "Ah, we thought we should have something with a common language; this has a unique language. It should have some good maintenance facilities; it was the only one in the country. There should be spare machines around; there are only two others which are locked up somewhere in the Midlands by the chap who used to have an agency years ago. Can we access it from Rotterdam? Not a chance." So it really did fill all the requirements of our specification!

Nevertheless, having decided to help our company out — after all, we were charging them fees for this — we thought that we had better try it out with something practical, and in fact do two things: first, allow our consultants to use it for their own problems when they are working on behalf of a client; and secondly, to put on it a practical operating system like our invoicing system. In my ignorance, I thought

that all we had to do was just to write some different code for this. I was very soon disillusioned.

Before I go any further I had better say what ADAM is, because maybe you have seen it and maybe you have not. When you send for information you get a lovely little brochure with the Chairman's secretary on the front; and it — the machine — is a very attractive looking thing. It consists of two desks at right angles, with a VDU and a printer and some discs stored away in it. I think that the name ADAM is really quite a subtle, psychological ploy, because we all refer to it as 'ADAM'. We do not say, "The computer does this, the computer calculates that," we say, "ADAM computes," or, "ADAM calculates". It certainly does seem to make it more friendly, more comforting at least.

There is also EVE, I should add. EVE stands for Entry and Validation Equipment. There is TINA, which is Tiny Adam, which is ADAM without rigid discs but with floppies; and there is ABEL. ABEL is a multiple ADAM with five or six VDUs. I was reading the other day about the APPLE computer: I suppose we could give ADAM an APPLE.

Technically — I've got all this from my technical colleagues and I'm sure it is right — it has a Centronics printer; there are two 5.3 megabyte discs, one fixed and one removable. It has 32K of memory, although I am told that 64K is possible. It is what is known to them as a bit-slice machine with a 16 bit word length. I am sure that is very important.

It has an interactive language, an interpretive language, rather like BASIC. It looks to me, knowing absolutely nothing about computers, like the sort of things that I see in articles on COBOL; it looks very similar. When you write for information you get this little brochure, which starts off by saying:

> "ADAM is the only computer you can program yourself in English. It eliminates the need for professional programmers."

Perhaps we could just make a note of that remark. The second thing you get is this little book which is "How I compute", and it starts off by saying:

> "I am ADAM. I am a tiny electronic man, created by Lomac. I live inside a computer,"

and that sort of very helpful stuff.

You also get two other books. One is the programming manual and the other is the technical manual.

The first thing that we did on getting the machine and having got it repaired was to find out whether we could get some training. There was nobody in this country who could do it. We could send a chap to America. In fact we did have a chap in the States, but this was mainly when we were talking about early negotiations. The only available training scheme is one run by Roneo Vickers, in Holland — in Dutch, of course. They do have a couple of chaps who speak very good English, so they were able to translate into English for us. Roneo Vickers are the Dutch agents and they have already sold over 40 ADAM computers in Holland.

They run (and I am told this is standard for all agents) a one-week course, which is considered to be all that you need if you know nothing at all about computers. If you do know something about computers, I am tempted to say that you need a two-week course, but that is not true, you are given a two-day course. So it is two days if you have some computer experience, it is one week if you have none.

First, we sent three people on the one-week course because we thought that we ought to try it all out. They reported that it really was rather long, and then we sent six people on the two-day course. So we have eight or nine people — in fact now we have internally trained another four or five, so we have had well over a dozen people given the treatment. Incidentally, Roneo Vickers say that they converted ADAM to work in Dutch in two days. So it does not only work in English, it works in any sort of language provided that it is not Chinese. We found them very helpful and we found indeed that two days was sufficient to get started.

What about the ADAM language? Its advantage to me as a user is that ADAM keeps giving you prompts. It is full of prompts and error messages — usually error messages. The fundamental thing about it is that after every entry you have to press the GO key. Again, John Peers does not like using things like RETURN keys. He does not have RETURN keys, he has GO keys. There is another key which, when you want to stop things, is not labelled STOP, it is labelled START. But I am sure that these little points are quite deliberate to try to get you into the habit of thinking that ADAM is not just an ordinary computer. The GO key, which is really the old RETURN key, must be pressed after every entry.

For example, if I were to type in the word 'add' which ADAM would recognise as a standard expression, I would then have to press the GO key. There would be a pause. I could then type in '2'. Then I have to press the GO key again. ADAM replies, "To 2". I can then type in another '2' and press the GO key, and absolutely nothing will happen, because I then have to tell ADAM to print out the sum. So I would have to type in 'PRINT', press GO, 'SUM', press GO, and eventually end up with 4, which is a terribly tedious way of adding 2 and 2. But you can see that, even to do that, I have had to press the GO key six times. This is part of the tedium of programming this machine. On the other hand, it appears to be essential if you are going to be prompted at the appropriate point.

When you get an ADAM, apart from getting all this wonderful literature, it is fitted up with standard verbs and nouns.

Please bear with me because the terminology of ADAM is not like anything else. It does not use programs, sub-routines, or instructions, it uses verbs, which mean the same thing. It does not use variables, it uses nouns. So I am going to talk about verbs and nouns.

STANDARD NOUNS

The following table lists the standard NOUNS and their abbreviations. Note that there are no abbreviations for the Nouns OBJECT and REF.

NOUN	ABBREV.	NOUN	ABBREV.
DIF	DF	PROD	PD
FRAC	FC	QUOT	QT
HEAD	HD	REF	
INTG	NT	SUM	SM
LENGTH	LT	TAIL	TL
OBJECT			

It comes equipped with 12 standard nouns and 42 standard verbs. This slide shows standard nouns. 'SUM' is quite clearly the variable into which the result of an addition is always put; and 'PRODUCT' is the variable into which the result of multiplication is put.

STANDARD VERBS

The following table lists the standard verbs and their abbreviations

Verb	Abbrev.	Verb	Abbrev	Verb	Abbrev.
ADD	+	GET	GT	MULTIPLY	*
ALTER	AL	GO TO	GO	OUTPUT	OT
BEGIN	BG	IF	IF	PRINT	PR
COMMENT	CM	IF REF	IR	RECAP	RC
CONTINUE	CN	INPUT	IN	RECAP ALL	RA
CUT	CT	$INPUT	$N	RENAME	RN
DELETE	DL	JOIN	JN	REPEAT	RP
DISPLAY	DS	LABEL	LB	SAVE	SV
DIVIDE	/	LIST FILES	LF	SPLIT	SP
EXCHANGE	XC	LIST NOUNS	LN	START	ST
EXCHANGE ALL	XA	LIST REFS	LR	STATUS	
FILE	FL	LIST UNDEF	LU	SUBTRACT	-
FIX	FX	LIST VERBS	LV	TRACE	TR
FORGET	FG	MOVE	MV	VERB	VB

Standard verbs are these things. Again, they are all very obvious, and they are all little sub-routines which are part of the operating system.

Clearly, having got these standard verbs and nouns, you are not going to get very far, so you can make your own verbs and nouns. A new noun, that is a variable, can be up to 24 characters long and it has no limit as to content. This is an advantage because you do not need dimension statements or anything similar, you can just press ahead and put into this particular noun any length of content that you want; 256K is the limit, which is fairly long.

This is very good from an elementary programming point of view because you do not have to remember how long these records or nouns are going to be. ADAM also recognises a new noun. If you are writing a program or creating a verb, in the terminology, and you put down a new noun, ADAM will prompt you by saying, "NEW NOUN?". But at the end of this program it will then list for you all the nouns and verbs that you have not yet defined. So this is another great help. It is also a very great help if you are not very good at spelling, because if you put 'gross pay' and the next time you spell it G-R-O-S instead of G-R-O-S-S, it will say, "NEW NOUN?" and it does remind you that you have not spelled it properly, which for our people is very helpful.

The standard verbs come in 42 different shapes and sizes, but there are no scientific functions. ADAM is a business machine, so if you want to do square roots, you have to write a routine to do square roots, which is quite beyond me. Fortunately we do not have that sort of problem, but it is entirely business oriented.

In addition to the standard verbs and nouns and the fact that you can create your own from then on, it has what are called 'utility' verbs and nouns. One thing that we found immediately was that the manual does not even mention them, so we do have a little problem with documentation. These utilities are extremely helpful. For example, a utility verb called YN stands for 'ENTER A YES OR A NO'. It has an entire sub-routine for deciding whether you have entered a yes or a no. Another utility is DOFL, which stands for Display the Object on a Fresh Line. Having typed in something after this, it will display it on a fresh line on the screen or the printer. That is very useful. In fact there are well over 100 utility verbs in the operating system, none of which is mentioned in the documentation, so you have to find out. Fortunately, when we went to Roneo Vickers, they gave us a list of them. The argument for not having them in the original documentation is a little weak. They said, "Well, of course, new, updated discs are coming out every three or four months and we occasionally add a new one or drop an old one, so we didn't want to confuse you." I think they just forgot to put it in.

To create a new verb and start programming is very simple. We found that all our people could rapidly get into this, including some of our secretaries whom we are also teaching ADAM programming. All you have to do is to type in the word 'VERB' and now we get the prompt system.

Defining a new verb

VERB called CALCULATE GROSS PAY

1 Does MULTIPLY REGULAR HOURS by HOURLY RATE
2 and MOVE PROD to REGULAR PAY
3 and MULTIPLY OVERTIME HOURS by OVERTIME RATE
4 and MOVE PROD to OVERTIME PAY
5. and MULTIPLY DOUBLE TIME HOURS by DOUBLE TIME RATE
6. and MOVE PROD to DOUBLE TIME PAY
7 and ADD PROD to OVERTIME PAY
8. and ADD SUM to REGULAR PAY
9. and MOVE SUM to GROSS PAY

I think that this is really quite good. What happens is that, having typed in the word 'VERB', ADAM prompts you by

saying 'CALLED?' and you have got to call it something. So you call it 'CALCULATE GROSS PAY'. Having pressed the GO key once more, ADAM then says 'LINE 1 DOES' and waits for you to say what it does. In this particular instance 'MULTIPLY REGULAR HOURS' is going to be another verb, that is another sub-routine. Having pressed the GO key at this point, you will then receive a prompt 'BY'; having said 'MULTIPLY', which is a standard verb, ADAM, recognising this as a multiplication, will say 'BY' something. Having multiplied it you have the product in this standard noun 'PROD', so you have to move it again. There is a standard verb 'MOVE' and a noun 'PROD'. ADAM then says 'TO?' and you have got to tell it where to put it.

This is all nice and simple and for each line of this program you get sufficient prompts, provided that you are using the standard nouns and verbs, to make it very simple indeed to produce at least short programs. You are recommended not to use more than between 10 and 20 lines per verb which I think is fairly reasonable but, as we will see in a moment, that does cause some problems.

ADAM uses line numbers, as you can see. They are very useful because you can alter programs using the verb 'ALTER' and specify the line numbers.

Now files. I must admit that I find files rather difficult. I found them very difficult with BASIC. But with the ADAM system there is a simplification in file handling which is good, and there is a problem which is bad. To set up a file you simply type in the word 'FILE'. It is all nice and obvious and straightforward, and ADAM responds with the word 'CALLED'. Again you have got to think of a name and if you think of a name that you have used already, ADAM will tell you that you have used it already and ask you whether you really want to use it again.

Defining a FILE

FILE called INVENTORY INFORMATION

1 uses PART NO
2 and COMMENT PART NO is the reference
3 and PART DESCRIPTION
4 and PART COST
5 and PART PRICE
6 and INVENTORY LABEL
7 and PART ON ORDER QUANTITY
8 and etc.

Here we are defining a file. ADAM says 'CALLED' so we call it something. Then we get this prompt '1 LINE NUMBER USES'. Here is a noun, in other words a variable, and then we can add comments if we want to. Then again further nouns. At the end, when you have defined the file and you want to complete the operation, you simply press the START button as opposed to the STOP button. Now that is fine. File handling in this simple manner is very easy indeed. Each of these variables can be of any length; you have no need to specify a variable length; ADAM takes care of the whole thing.

The records are held on disc in whole numbers of 'units'. A unit is 78 bytes, so if you want to be terribly economical you could start calculating your record length and optimise the file handling and the storage. But there does not seem to be any point in it because we have some very big discs and we are very prodigal with space.

That is fine as far as setting up the file is concerned. Having produced a file, you may wish to alter some of the records. You can use this verb 'ALTER', or if you want to get rid of one altogether, or even get rid of a file altogether, there is a verb called 'FORGET'. This is absolutely marvellous, but ADAM protects you against errors; and unfortunately, once you have got data into a file you cannot alter anything or forget anything. This is a good protection, of course, because you might find some silly programmer wanting to forget something that you are going to use later on; but ADAM does not let you do it.

The only way that you can get rid of a file is to empty all records — that is, write zeros into everything. Then you are allowed to forget it, and that takes quite a long time. Nevertheless, it is a very good protection for the small user, because files simply cannot be deleted, nor can records. Since you cannot use 'ALTER', when you are setting up a file you are always advised to put in a number of other dummy records, like extra 1, 2, 3 and 4, which you can change later into whatever titles you need, because once you have set up this file and you have data in it you will not be able to do very much with it in the way of adding new records. So as a protection it is very good.

There are another couple of protection items. One is the verb called 'FIX', which actually fixes something completely solidly on the disc and you simply cannot get rid of it by any means. Roneo Vickers said, "Well, it's there in the manual. For God's sake don't use it." The other thing is a set of four security buttons, 1 to 4, which when typing in the name of a file, noun or verb, you can add up to 24 characters long with the security buttons in any order; and then you must press the same things again to get the thing out. I said to the Roneo Vickers' chap, "What happens if we forget?" and he said, "You're in very great trouble!" Because although you can get a listing of all verbs and nouns and you can see your verb there, when you come to type it in and say 'TRACE' or 'RECAP' or any of the other ways of getting it printed out, it will say, 'NOT KNOWN'. He said, "The only way is to send for us and we'll bring some little magical machine, and we'll sit in the back of it and find out what you've done wrong." So we do not use them. But I am sure they are very valuable.

The only thing about file handling which we have found bad is that there is no sort routine. ADAM does not believe in sorting things; you should sort them properly first time. So there is no question of inverting a file on to some other reference; you give it a reference and that is it. So the only thing that you can do is to create cross-reference files. In our invoicing we have about four lots of cross-reference files. I am not sure about this, but I do get the impression that it

makes things a bit slow. In fact I am in the process at the moment of trying an experiment, using a two-file system, in which we are creating two completely separate files during the process of file creation rather than using a cross-reference. We are simply going to explore whether one method is slower or quicker than the other.

Of course, ADAM does tend to make you use a lot of space for files, because one tends to think, "5 megabytes. That's an awful lot of megabytes. There must be a lot of space left on the disc." In fact our invoicing system fills up only half a disc. As we have six of them we feel that we can have plenty of space. I think that probably for a small man — for whom ADAM is designed, after all — that is a perfectly reasonable view to take. There is plenty of space. Just buy another disc, it's only £40. Of course, you do have other problems if you have to go from one to the other.

The maximum file data is 3 megabytes. There are two discs, each of 5.3, but they are duplicated. You get 3 megabytes file space, one for verbs, that is programs, and 1.3 is taken up by the operating system.

What have we found out? First, about maintenance. Interestingly enough, we have had only one problem with maintenance since we started at the beginning of July. After about a week, we found it overheating. Things were getting very hot and odd messages were coming up on the screen. So I rang up Roneo Vickers in Holland and said, "It's getting very hot," and they said, "Have you changed the air filter?" We hurriedly looked in the book and it does not mention the air filter. We said, "No. Where is it?" The chap said, "Well, hold the phone in your right hand and lie on your back on the floor under ADAM." So we did. He said, "Looking up there, can you see a white thing, just underneath?" We said, "Yes." He said, "Well, that's the air filter. Take it out, clean it and it will be all right." And it was. I must admit that was the simplest bit of maintenance that we ever had.

We have no maintenance contract because Roneo Vickers said, "It's a terrible long way from Rotterdam. It's very expensive. Do you really need it? If something goes wrong, why not just ring us up and we'll send somebody over? But it's hardly worthwhile coming regularly." So it just goes on.

We are using it every day for four or five hours and so far, touch wood, it has not given us any trouble.

On the programming side it certainly has been attractive to our people, initially purely as an exercise, for fun. They thought up all kinds of programs that they wanted to write and they had a go, and one or two of them have come back. It has distinct problems in use as a machine to help our consultants, because if you have a problem for a client it is much better if you can do the programming on his premises, preferably using his machine so that it does not cost anything; or certainly using a terminal. We have portable Texas terminals that we take around and we hook up to Atkins or other people and, using programs that we have previously prepared, we are able to do a lot of work on the actual premises. You cannot do this with ADAM because it is non-accessible on the telephone line, so it means coming back to the office and doing it. So it is of limited value to us in that respect.

However, we did a quite large program recently, analysing the sales results of about 5,000 shops. For some reason that I really do not understand, the print out got slower and slower and slower. It started off absolutely first class, but then it slowed down. Why this is I really do not know. Roneo Vickers said that it is something to do with having only 32K. "You should have gone for 64K," they said.

But we will obviously have to find out the tricks in using this machine for this long programming problem, and put these tricks in simple language that non-computer people can understand. Clearly there is a lot more to it than simply reading the manual.

The actual invoicing system that we are using, I started to program it in July. I found that I did not have enough time so I asked someone else to do it, and he did not have enough time. In the end, we brought in the professional freelance programmer that we had used for doing our Honeywell system. We said to her, "Daphne, all we want you to do, old dear, is just to convert what you've done on Honeywell. It must be very simple. Just go away and read the book, and come back and do it."

This is really very interesting. The system is virtually finished, it is up and running. There are one or two small points, but we now have 250 verbs and 45 files to do what I consider to be a remarkably simple operation, except that the complexity lies in the special charges and special rates per assignment. I have the feeling that this machine is not really suitable for professional programmers. First, she complains bitterly about having to press this damned GO key, and the fact that you could not do all these little dodges on FORTRAN that she was used to. Weren't we using a lot of file space? Couldn't we do it in packed binary?

I said, "Don't worry about that. We've bought the discs, old dear, you just get on with it." So she got on with it, but we have a terribly complex system. One of our chaps is not able to do a lot of travelling at the moment and he has a couple of months free, and I have asked him to write the program himself as though he were a complete non-user, non-computer expert, and see what the difference is. I suspect that we shall find startling differences. I am not saying anything against our freelance programmer, I am sure she is an absolute expert; I am told that she is by Honeywell. But it is not really a suitable machine, in my view, for use by somebody who knows all the dodges.

Incidentally, I think this is well known by the agents, because Roneo Vickers tell us that they offer 20 days free advice when anyone purchases an ADAM. This 20 days can be taken any way you like. If you take five days training that is five out of the 20. They always say to customers, "When you've written your main program, just let us come along and spruce it up for you." In other words, there are other things to learn about the programming which you cannot get from the manual and which an expert can do. I am thinking of getting them in to do something with ours. But hopefully we will do it ourselves, because our task initially in getting an ADAM machine was to assess it for one of our companies who want to take the agency.

In our view, it is indeed a very sound machine for the small user. It has been very difficult for us to behave as small users because, although we are a small company, we do have a lot of computer chaps milling around, who keep making

pertinent — and impertinent — comments about our use of it. But we plough on. We say, "Never mind, we're trying to behave as though we're a non-Unilever business."

The businesses that have taken ADAM machines in Holland are all in the small area. They are house builders, insurance agencies — Holland is full of insurance agencies — distributors of vehicles, wholesalers, and accounting bureaux, strangely enough. I found that rather unusual. Some standard programs and standard packages have now been written by Roneo Vickers, which seem to me to be entirely contrary to the philosophy of ADAM. Nevertheless, they are apparently all happy in its use. At least half of the 40 people have not taken up the offer of the 20 days. They have had five or ten days and they have just gone on. Roneo go round every three months with a new disc and update the operating system, and that is it; that is all they see of them. So clearly quite a number of people are very satisfied with it.

Undoubtedly it has many advantages for non-computer people. The programming is almost self-documenting. Not entirely, but when you get a print out of a verb it prints out all the line numbers and all the prompts. It is quite simple — just tedious — to go through them and refer from one verb to the next. It is much easier to read a program than it is to read one in, for example, BASIC. I have no experience of COBOL; I should imagine that a COBOL program is very easy to read, too, if you know what you are doing. But of course it in no way reduces the necessity of doing a proper systems analysis before you start. It does encourage you, unfortunately, to sit down at the keyboard and make a start. I do not know whether or not that is a good thing, but if the program is complicated or the system is complicated you can get into some awful messes. But because it is apparently such a simple machine you do tend to sit down and fire away. Then eventually, after an hour, you give up and start down a flow chart.

To sum it up, we think that it is a good machine. It has advantages; it has many disadvantages. But it does seem to be the forerunner of what may well be a new look in computing, particularly for the small user. If I might conclude by reminding you that ADAM played a fundamental part in Genesis, it does not nevertheless mean the exodus of the programmers.

BUTLER: Thank you very much, Norman. I will refrain from capping that last remark with any comment about prophets or kings — or judges for that matter. We have a few minutes left for questions. I am going to abuse my privilege as Chairman by asking the first question myself. Norman, it is this: I guess that the reason why so many of the companies in this room showed an interest in ADAM and the Logical Machine Company right from the start was because it seemed to offer the opportunity for the development of small, stand-alone applications within a large organisation, in a way which could be cheap, brief, efficient and effective, but at the same time retain the ability of those small systems to communicate with large, corporate systems. On the basis of what you have seen, do you think that promise is likely to be fulfilled or not?

FOX: I think there are two problems. First, there is communications medium at the moment. It is a stand-alone system. We have been looking into methods of modifying it so that we can communicate via our own land lines to Rotterdam. For the time being we have abandoned all hope. I am sure that it is possible, but clearly it is something that Lomac themselves are not interested in at the moment. They do not see it as being part of a distributed processing system or a communications system in this way.

The other thing is the language. It is a unique language. I suppose that if you could get one ADAM to communicate with another ADAM they could talk to each other, but I can't see that it will be very easy to use it in other systems using more standard languages. As a stand-alone machine I think that it has a lot of advantages. I am only sorry that it does not have this communication facility, which would be very useful indeed to us.

QUESTION: Could you tell us something about the cost?

FOX: Yes. It cost us something like £19,000; which is not cheap, I think, because you could get the same facilities for probably £14,000 or £15,000 — just talking about the hardware bits — or maybe less. But of course you do get a completely full operating system and your 42 standard verbs and standard nouns. I think that what you are saving is a lot of professional programming time. It sounds a laugh since we are using our professional programmer on it, but that was really because we did not have anybody else spare.

I must admit that £19,000 is not a cheap amount. On the other hand, it is not expensive for the small businessman if, by buying it, he is going to avoid £5,000 at least paid out to a programmer to put his particular systems on, or buying a commercial package.

BUTLER: Let me just get this straight, Norman. You are saying that you bought a £19,000 machine so that it could be used by an unskilled programmer, but you had a skilled programmer who had nothing to do, so she had to work on it.

FOX: Yes. At the same time we did not have any unskilled programmers who did not have anything to do. Undoubtedly it takes a fair time to put systems up on ADAM. Roneo, quoting their experience, say that a small user, a small warehouse man, would probably take one month of programming to get his accounting systems up and running. That is not very long in programming terms, but it is a very long time if he only has ten staff and they are all busy pottering around the warehouse. Our problem was the same. It sounds fine to say that you can program it yourself, but you must have the time. You must have time continuously; it is no good taking a day now and a half a day next week, otherwise it will never get done.

This is a rather practical limitation. I really don't quite know how you overcome it, because the smaller the man the fewer staff he normally has available, sitting around waiting for somebody to buy him an ADAM to program.

BUTLER: Yes, exactly.

QUESTION: I should like to make a comment and then ask a question. The comment is that, yes, I think it was expensive. Last year I knew of a project that went into a small company, a small business machine that had about 12 accountancy functions built into the system. The question is: what's new? Sixteen years ago I had access

to a Pegasus machine which you could just walk in and switch on.

FOX: It could well be. As I mentioned earlier, I am not a computer man. If I in turn could just come back to you and say: most of you here know infinitely more than I do about computing, but are we right in assuming that this is perhaps the first of a new generation of computers? Or is it, as you are suggesting sir, just an old hat turned inside out?

QUESTION: May I elaborate a little on what I meant. All the questions that you have about the equipment, and your statement that there is more to this language business than meets the eye, and why does the printer slow down — all those sorts of questions have been with us since computers were first provided. What you are saying is that the small computers that are offered more cheaply simply present the old problems of computing to a new audience.

FOX: Yes, that's very true. But at the same time, don't you think that as computing becomes more widely used and computers fall rapidly in price, many small businesses are going to use them. Whether we like it or not, they are going to buy a small machine and use it. What they want is some machine which is as simple as possible.

It appears that this particular machine has many simple rules and devices in it, but has not solved all the problems by any means. I do not know whether one ever will, but at least it does seem to have gone part of the way to getting over the problem. Because the points that you mentioned are well known to computer people, but they are not known to the garage around the corner, and he is the guy who will have to solve the problem in the future.

QUESTION: I should like to take issue with the last questioner. I don't know ADAM, but I have worked at Redifon, which is the supplier of one of the other small machines. I thought that the manufacturers had made a conscious marketing decision which was most impressive — to keep the complexity of computer method design out of their particular hardware. This seems to go for ADAM as well. The computer method design and the computer people themselves have introduced a lot of complexity which really has nothing to do with the user's problem.

As far as the Redifon approach is concerned — and I get the same message from ADAM — I think that computer people probably only introduce unnecessary complexity. It is necessary with some of the bigger systems in order to get the throughput. Throughput is an area in which these smaller systems fall down. There is a lot of processing power there, but it is utilised in keeping the computer methods simplistic. I think that ADAM, Redifon and the others seem to me to be bringing something new into the market place, and something very laudable. To have prices coming down the way they seem to be coming down, this is one way of utilising the process . . .

FOX: I quite agree. We are really talking about a very crude use of computing, compared with an expert. This is one of our problems in using this professional programmer, that she feels the whole thing is dreadfully crude and she is worried because 100 invoices take 20 minutes to print out instead of five minutes, and it does not really matter. We are taking a lot of short cuts. We are using a very advanced machine to do things in a very simple and crude way, which must horrify people who have been used to the sophistication built into most modern computing operations. But again, I think that it is a matter of economics. Does it really matter that it takes twice as long?

QUESTION: Have you considered employing an office junior to do any of the work on ADAM?

FOX: That is an interesting point. We have thought about it but we haven't done it, because we haven't got an office junior. But we are now using our secretaries to do all inputting of data. We are getting them interested in programming and one of them has actually started doing simple programming. But they find it fascinating. We have no problems with interest. They have been doing it for six weeks or so, and they find it enormously interesting to use the machine, mainly because of the prompts built in and the fact that, as one girl said, "It's almost human, isn't it?" I do not think that we shall have any difficulty in getting them to learn programming. Whether we should have started off in the first place by using one, I don't know. It is a very interesting concept.

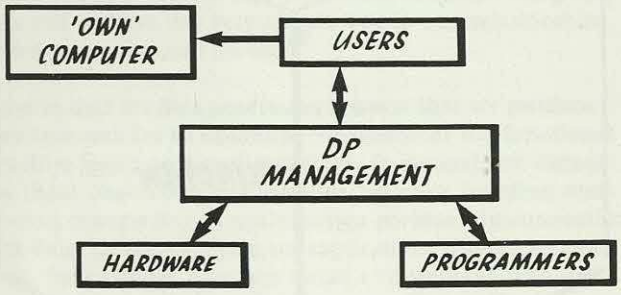
BUTLER: Gentlemen, the time has come to move on to the next session. I know that on your behalf you would like me to thank Norman for his presentation which has been clear and to the point and, if I may say so, invested with a good deal of wit and wisdom. Norman, thank you very much.

SYSTEM DEVELOPMENT TECHNOLOGY– A MANAGEMENT'S CONCERN

Dr R Thurner
Sodecon

Dr Thurner, who is Austrian, studied electrical engineering and political economy prior to entering a consultancy practice in Germany and Belgium. This consultancy work was principally concerned with production, distribution and retailing systems. Subsequently he studied Operations Research and Informatics, becoming a lecturer in these subjects at Zurich University. He then became active in the utilisation of database applications software, and since 1969 has been working in the area of methods and tools for system development. He has successfully developed and marketed several systems, notably a decision table processor and latterly the DELTA preprocessor system.

BUTLER: For the past few years there has been growing interest in tools designed to increase the productivity of analysts and programmers. This interest is bound to increase as labour costs grow and hardware costs decline. There are a number of well-known experiments in this area such as ISDOS at Michigan University and Dr C B B Grindley's Systematics. I am therefore pleased to introduce Dr Thurner to present to us a new approach which he and his colleagues at Sodecon have developed.



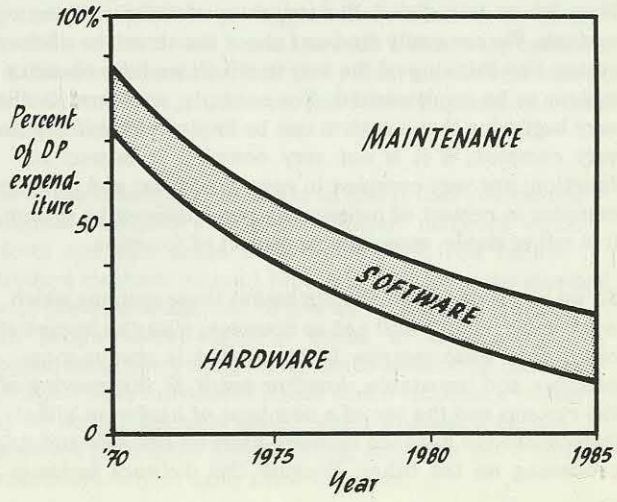
THURNER: It is very simple for me to continue after the speech of Mr Fox, because he said that he is not at all qualified because he is just a user. I can continue because I am not at all qualified to speak about data processing management because I am not a manager but just a programmer. I have found that data processing management is sitting in between the existing hardware installation and the system development hierarchy or institution on one side; and on the other side are the users who want a certain service, and they want to have that service fast.

There are some small computer companies coming along and telling our users, who provide our jobs of course, that these problems can be solved much more easily. So there are two existing situations. On one side our traditional installation becomes more and more complex, and on the other side there are the so-called 'own' computers of user departments which we as professional data processing people regard as a type of sub-culture about which we do not even like to talk.

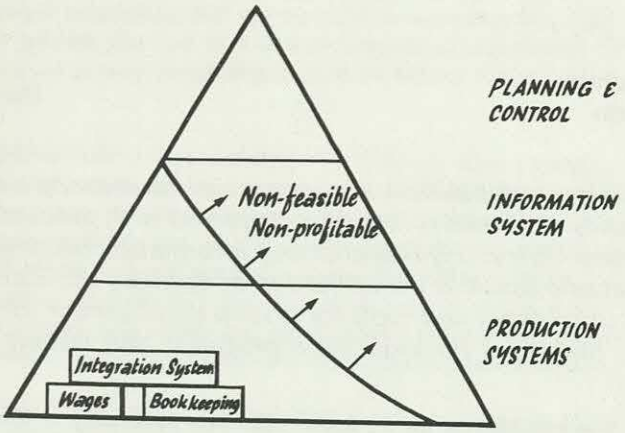
The question is: do we move with data processing in the traditional way, into an elephant's grave? Is there a completely new type of system and system development coming along? Of course, I belong to this latter part, but I think that the reason why this discussion has come along is because we are not able to really provide the software service which is required by our users; and the hardware has already reached a stage which is far ahead of our possibilities to produce software.

Last week we had a conference in Frankfurt about Software Management. There had been an investigation of about a hundred companies about the main problems of data processing. It was concerned about productivity and costs, and it turned out that this is not the main problem. A manager clearly declared that the whole data processing costs are about 2% of the costs, but they turn out to be 20% of his problem. He said, "I don't bother about costs, if it is 2% or 1.8% it doesn't matter; but it should work. I should get my results and I should get them faster. That is my problem."

If we look at these figures we know that hardware is going down; software development is a rather stable percentage; and the rest is built up with maintenance. So we start to think about how maintenance can be improved and how we can reduce the sort of software; and especially how we can reduce the maintenance costs.



The question is: is this change in the structure of the costs of the software budget not just a fever curve of the disease which lies under the things that we discuss, which goes deeper than just the question of cost reduction and productivity?



Professor Nolan has made a very interesting investigation. He said that if you look at all the computer applications that you can think of, you have this very well known pyramid which we can sub-divide in three areas. The first area is the so-called production system. These are the systems that we have produced, the first systems in data processing, for example, wages, book-keeping and so on. In the next step we have started the so-called integration systems. We have just put another system on top of these two ("wages" and "bookkeeping") to link them together. We have not really reconstructed the systems because we were not able to, simply due to the reasons of time and cost of reconstructing the software.

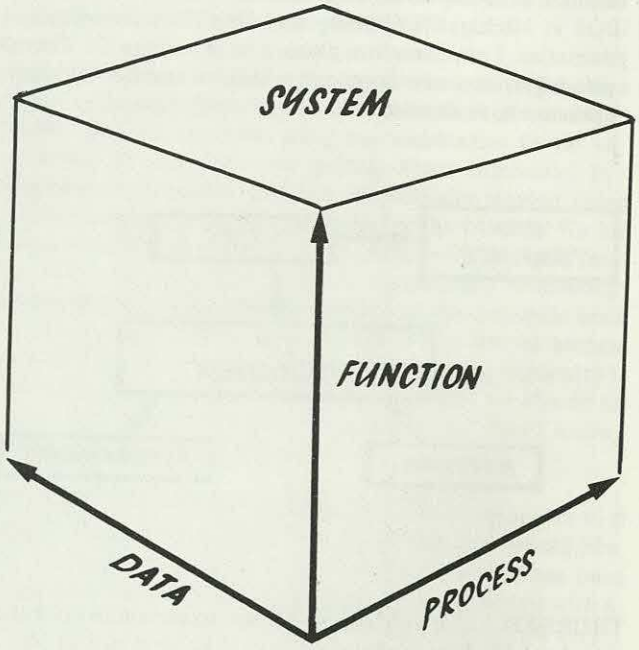
Then he made a comment. He said that there is a curve here. Beyond this curve projects are feasible and profitable, because we have improved hardware, and also because we have improved basic systems software. Thus, this curve is moving upwards. This means that the hardware suppliers try to move these curves because that is where their profits are, their turnover, and the users are pushing the curves as well, because they want to have more service. So we are moving into a new area of data processing which is concerned with information systems. Finally, Professor Nolan said that on top are the systems for planning and control.

Now let us talk about the structure of these different systems. We can easily find out about the structure of these systems by thinking of the way in which we have chosen a system to be implemented. For example, we learnt in the very beginning that a system can be implemented if it is not very complex; if it is not very complex in respect of function; not very complex in respect of data; and not very complex in respect of process. We can implement a system if it is rather stable, especially in respect of function.

So we just took out of the big basket those systems which were stable, simple and not so complex, with the immediate result that what remains in the basket is always more complex and less stable. Another result of this moving of the systems and the use of a new type of hardware is that it decreases the distance between users on one side and data processing on the other. Because this distance becomes smaller and smaller, you are much more directly involved with functional changes that the user requires.

In the old batch systems you had three months or so to implement a new function. But if you put a screen on the desk of your user, then he wants to have the function fast, because he is directly in connection with a certain service. The result is, of course, that he has new requirements, requirements to build systems which are less stable from the functional point of view; requirements to give a better service.

But there is an additional problem, which is that we are moving this data processing in such a way into user departments that they become more and more dependent upon the availability of the service. The damage we can do if our systems do not run is so much higher than the profit that we can produce if they run, that users are very concerned if the systems are not reliable. Therefore, I can understand the priority given to reliability first; maintainability, which is maintenance not just to correct errors but the ability to insert and implement new functions, quickly and efficiently. Only then comes the point of productivity.



If we discuss systems and data processing systems, I think we should try to define what a data processing system is. A data processing system first has a certain function. The function is one dimension of the data processing system, something we want to reach with the system. That is what the user is concerned with. In order to fulfil the function we have to implement certain processes. We run processes on processors. The last dimension is the data.

If you look at the function of processing all data or implementing all data processes which are required for the whole United Kingdom, you would think that it is not possible to put it on one data processing system. Therefore we sub-divide the system into sub-systems, and perhaps this sub-system here could be the sub-system of one company,

with the result that a certain amount of control is lost and data is stored several times.

Just to give an example, if you have two companies, one company sends an invoice and the other company pays, you have to have this information stored twice and processed twice. But of course on this level we are not interested in central control, we are interested in the reduction of complexity. Therefore it is better to implement a separate system for each company. If we continue with this replication of storage we end up with distributed systems, but with the same immediate problem as in the ADAM implementation, that we lose central control by fighting complexity.

Just look at the ADAM computer from the point of view of functional data processing. The ADAM computer does not have a data structure at all. The files are simple because they are self-descriptive. You do not have to bother about language because the file and the data themselves know the language and the implementation. This is very expensive from the point of view of processing. You have a very fast processor for comparatively not very much implemented function. In addition, from the structural point of view, you have a one-to-one relationship between process and function. A function here is implemented in a so-called verb in a one-to-one relationship. What we computer people do when we produce a complicated system is that we restructure the function into processes so that we can no longer identify clearly, for the user especially, where a certain user function is implemented in a certain process. But we do it because we have not enough processing power for certain applications just to be able to access freely all data and to have this very simple one-to-one relationship between function and process.

It seems that the data processing systems that we produce have to search for an optimum conversion of the functional structure into a technical structure. In general, we cannot use these one-to-one relationships between function and process, disregarding all optimisation problems in connection with data. Of course, there are applications where you can do it, for example, in a very small environment with a computer that is faster than necessary. This is the essence of the ADAM implementation.

I think that this is the background of the discussion about how we can implement functions for users, faster and more reliably, into processes in such a way that the system is feasible. I do not think that the discussion is any longer that the system is optimal from the point of view of processing power. It should just be feasible; it should just be a reasonable solution — not more than that.

We have started to develop systems to support system development. I must say that I am a programmer and I have developed systems of medium size — half a million COBOL statements — and as a project leader the problem was always: how can you get half a million COBOL statements working that are maintainable? One of the difficult problems is that the production of half a million COBOL statements is often regarded as a purely technical problem. If we speak of system development, then we speak immediately of analysts and programmers. If you speak of producing software, then you regard it purely as a problem for some technical people. I think that programmers are able to produce programs around the size of 2,000 to 5,000 statements. If you have a technology to produce bricks and this technology turns out to be very helpful to produce bricks, it is not true to think that the same technology can also be used to produce houses, just because houses are made of bricks.

I think that in system development technology we are really stuck, because the whole discussion of system development technology is a discussion among programmers, among inventors of methods; and data processing management does not participate in these discussions. What is missing to break this circle is to put in management power to combine the new technologies which are more or less available but not used appropriately, because people in data processing development are much too short sighted to decide what really should be done.

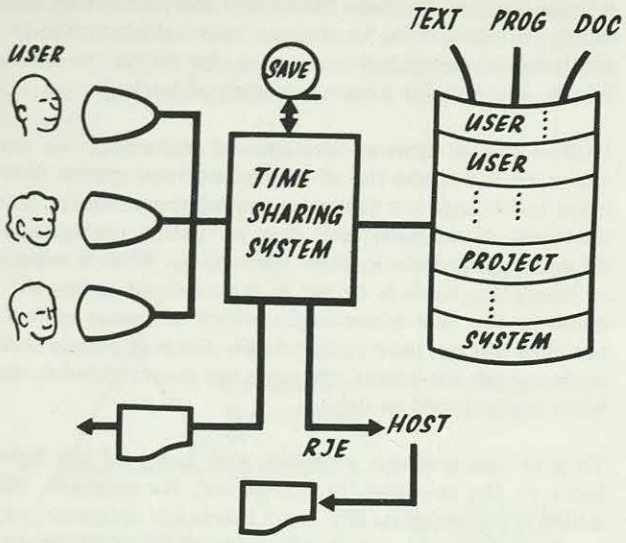
To give you a simple example, you know of the fight between the so-called 'functionalists', for example, IBM which is proposing its IPT and a functional approach; and, on the other hand, the so-called 'data' approach, which is proposed by Warnier and Jackson. Jackson argues that the functional approach never leads to real programs, and the functionalists outline that this data approach is just a technical approach and does not link systems to users. Then you have the process approach of the structured programming people. Everybody is looking at the whole system just from one side. I have never seen anybody who was able to combine these different aspects of a system, to really build what we need — an overall system.

The production of a data processing system is based on four elements. The first element is a proper organisation. The size of the systems is so large that they can no longer be produced by a number of individuals. We have to set up an organisational structure and allocate functions to people in order to get cooperative system production. I do not want to say anything about this because it is not my subject.

The next thing is that we have to have standard procedures. If, each time we start a system, we have to invent what we should do next, then each system will look different from the previous one. We cannot move to a certain standardisation of the production process. Even this standardisation of procedures and setting up and combining individual tasks with people is one of the management problems in system development.

In order to achieve this goal I think that you must apply appropriate methods and support these methods by tools. Personally, I am a tool man. I am not linked very much to any method because I have not yet seen a method which is able to cover the whole area, and I have implemented tools to support methods.

One of the messages that I want to give is that you cannot introduce standard procedures without methods which enforce and standardise these procedures. You cannot introduce methods without tools which enforce the standard use of these methods. Just to give an example, if you talk with people about decision tables or structured programming, everybody understands something different. But if you have introduced a tool which enforces a certain way of writing decision tables, which imposes a certain syntax for structured programming, then you get a more standardised way of using these methods.



Which are the elements of a system development tool concept? I think that the first element is the hardware. If we look at the way that users use the machine and programmers use the machine, we will find that many more programmers work with punch cards and in a batch service than users. Users have very reliable software. They work on a screen. They are protected against errors; they cannot just delete a file. The structure of the problem of a user is represented in the data structures of the data files that the user has. If you look at the structure of our files, programs and projects, we have huge libraries, and libraries are not protected at all. The utilities that we have to maintain our files are so poor in comparison with the utilities that the users have.

About 18 months ago, we started an experiment. In our group of five people, we bought a stand-alone computer just for system development. It is a small machine, a PRIME 350, costing about £80,000. We use this computer only for the purpose of system development. We have a library structure which fits much better than a partition data set structure, because we can organise libraries in hierarchies like the project is organised. We have all our timesharing service on our machine, all editing work, and even the pre-processors are running on this stand-alone system. This system is linked by remote job entry to the batch system, to the mainframe. We are producing programs on this system and passing through the written programs to the productive system; and there they are compiled and finally tested.

We found out that in a classical timesharing environment about 80% of the TSO service is used only to edit files, to copy files, to update program files. So we ended up with this front end computer for programming. The experience is that the costs are much less and the service is much better in comparison with a timesharing on the host computer.

Of course, you require some utilities. Beware that there are quite a lot of solutions of front end programming computers which are not appropriate because they are too small.

The next very interesting object in this context of using a front end computer is to put everything, all products that you produce in a system development process, on to file. This means that you use your libraries like a warehouse for intermediate products. We have all documentation, all programs, and especially macros on this system. The result was not only an improvement in productivity, it was much more of an improvement in quality. The quality of the programs and the quality of the documentation has greatly improved because it gave people the possibility of really improving the quality of the documentation. If you have written the documentation by typewriter you can never improve the documentation. It will be the first guess, and the first guess is usually partially a bad guess. By the ability to restructure documentation, software and code using an efficient timesharing service, we found that the quality of the programs and the quality of the systems have greatly improved.

We speak of a system development library here. A system development library consists of semi-finished products.

This could be a file description or a report description, a piece of code or documentation. The problem with our development work is that we have not yet found a technique to produce programs and system in parts, by specialists for certain parts, and by assembling these programs in an automatic way.

If you look at the way a house is built you can see that the first thing they have done is to put up a framework. The specialists come and put up a structure of steel. The next step will be to insert some walls, then later come the specialists for electricity and so on. The telephone man comes along, and everybody is inserting some function or some hardware to fulfil a certain function into this overall structure. If we built a house like we build programs, first we would build a cellar; then when everything is finished in the cellar we would move on to build the first floor — because we have not yet found a solution to how to separate program structure, like the structure of a house, from function code. We think of both things as being one unit. As long as we are not able to separate these different functional elements of a program we cannot separate the writing of a program from one person. It means that the relationship of one programmer/one program cannot be broken as long as the possibility of subdividing a program according to the production process does not exist. If we have one programmer/one program, one programmer can never appropriately write the program; because if a programmer writes, say, 30 or 50 programs a year, which is already a lot, he makes 30 or 50 times a year what we call a 'program design'. Program design of a medium size program requires perhaps two hours. If you do something 30 times a year, you do not have the ability to do it very well. Because we are not able to separate program design from implementation of code, we have no specialists for program design.

There is another aspect of the problem. If you want somebody to write a program which is an on-line program, which requires a certain program design and has access to a database, you must have education for this man which is very high in comparison with what he is really producing, because we cannot have a specialist for database, a specialist for on-line interface, and a specialist for program design and, finally, the one specialist the user requires to implement the functions into a certain framework. The concept of what a system developer should know is that of a man who

knows so many different things, who is precise in his words and bright in design. He knows about applications, he knows about on-line systems. Just consider that we have to push somebody into a three-month IMS course just to be able to access a simple file to retrieve a customer's information.

The most interesting product that we have produced is a type of macro processor which, besides the well-known functions of macro processors, has two main instructions. One instruction is to define a node in a structure; the other is to allocate code to this structure. It means that we can write empty structures which just process the input without doing anything with the input, and later allocate code to this structure.

We have two different types of code: one which comes from the function, the other which comes from the technical side. For example, if you want to access a file as a master file — we call it a 'reference' file — you need a file definition somewhere. Somewhere the file must be opened and somewhere the file must be read, and at another point the file must be closed. That means that you require a certain code in this structure in order to fulfil the requirement of having a reference file. This code is highly dependent on the way that you access the file. The function is completely independent. Whether you use an index sequential access method, or IMS, or if it is a sequential file you have a certain procedural and data interface to another file system.

Of course, you can say, "It's very simple. I have a copy statement. Then I can copy the READ statement, then copy the file description, then copy the OPEN and CLOSE."

But that is exactly the point. You would require such an amount of copies in your program, and the knowledge to determine where a copy is required is the problem. It is not a problem of syntax, it is a problem of the knowledge that at a certain point in the structure a certain code is required to fulfil a certain function. We have separated this knowledge from this so-called 'macro processor'. It is actually not a macro processor, it is more of a language to access a system development library; and to copy code from the system development library to assemble a program and put code in different places — the places where the code is required. This becomes the basis of the system that we have developed.

What we can see in the picture of the three dimensions of an overall system applies as well to a program. If you process certain data — Michael Jackson shows it with great brilliance — you can produce a process structure from a data structure. If you have a certain data structure to process in a program, the process will be more or less independent of the function which should be fulfilled in this program. Therefore the first idea is to use, for example, Michael Jackson's method to generate from the data structure a process structure.

This process structure does not contain any functional code, it is just an empty framework containing nodes which have names, to later allocate code to these nodes.

Let us look at a simple example where you have a file. The file consists of several orders; and one order consists of several items. If you want to print the total of all items per order, then of course you have to specify somewhere a data element which is the total. You have to initialise the total at the beginning of the processing of the order with zero. You add up when processing the items that amount to the total.

At the end of the order you can print out the total of the order. At the beginning and at the end, when processing, these are certain points in time of this program. Certain points in time are certain nodes within a program structure. We do not discuss whether this file here is an IMS file which is read in a certain way, or whether it is a sequential file or card reader. It does not matter. It only matters that if you have such a file structure you need apparently certain places in the program — at the beginning and the end of each node, two places, and at the end, when processing a record, one place.

This structure allows you to allocate code for all the required functions to this program. I hope that you can distinguish between the example that I outline and the rationale behind our system. The reason is not to have a new programming language or a new function for the programmers, the reason is to be able to separate the program designed, the description of the program structure, on one side and the allocation of function code on the other side.

Just to give you another example, if you have to print a report in this environment, a report consists of lines. Each line contains several elements. But we cannot just develop a report as a separate entity, because the fulfilment of this report requires the insertion of the code which is connected with the report at a lot of different places in the program. But of course we are very interested in developing a report as a separate entity, because reports are developed at a different point in time in the program structure. A report is developed at the very beginning where a user specifies that he wants to have some information printed. Therefore, if we develop a certain convenient language for a systems analyst to gather information about what should be printed, then we have a description of a report. This report description, the different lines, can then be allocated to the program structure, to the framework which is built above this brickwork.

So finally we have a program text which is produced by a text processing system, and assembled from different elements which come from this system development library.


```
. SL=WORK77
  77 STATOUT-#FI PIC S9(4) COMP VALUE +0.
. IF-SB.CO.C
. ADD DC101,#FI/RECORDS SORTED, DX-#FI-C#P1
. SET-01=ADD 1 TO DX-#FI-C#P11.
. IFEND
. SL=FILE-ROUT
  PUT-#FI.
. LOC=PUT
    RELEASE #FI-REC. #01
  PUT-#FI-EXIT. EXIT.
. DT                              --X-,          INPUT
. SL=WORK77
  77 STATIN-#FI PIC S9(4) COMP VALUE +2.
. SL=SD
. LOC=RD
. SL=FILE-ROUT
  GET-#FI.
    RETURN #FI
      AT END MOVE EOF TO STATIN-#FI
      GO TO GET-#FI-EXIT.
. LOC=GET
  GET-#FI-EXIT. EXIT.
```

In order to support these functions we have implemented a preprocessor which supports structured programming in COBOL. This is a print out of this processor. You can see that there are some statements which are not COBOL, for example, the DO statement and the IF END. We have other statements, such as ADD and MOVE, which are COBOL.

The first thing we developed was the library access language. On top of COBOL we have built a structured programming code which allows us to use Michael Jackson's concept and support it by automatic translation. This includes not only the translation of the pseudo-code, but at the same time automatic program inversion.

"Program inversion" is one of the key words of Michael Jackson. It is one of the most interesting concepts of Jackson because it allows us to break down one complex program into a lot of simple ones and interconnect these simple programs as pseudo-code routines. To do this concept manually would be very difficult and it is a big problem to do it appropriately because the linking of different processes by interfaces is very dangerous if you have any minor errors. Here we use again our library access method which defines the interfaces in such a way that they are once and for all correct.

We have some experience with this structured code because we have written the whole system ourselves in this structured code. The result was not only an incredible reduction in costs, but the immediate result was that in the whole system in the last release we have 72 errors. I think that 72 errors is quite something in comparison to other systems of this size.

EXAMPLE DECISION TABLE PROCESSOR

```
DETAB-PREM.
*   AT LEAST 1 YEAR WITH THE FIRM                                  1-2-3-4-5-6-7-8-9----
    IF YEARS-EMPL> 0                                    01:  - Y Y N Y Y Y N -
*   AT LEAST 3 YEARS WITH THE FIRM
    IF YEARS-EMPL> 2                                    02:  - Y - - Y Y N - -
*   LESS THAN 22 DAYS ABSENT
    IF DAYS-ABSENT > 22                                 03:  - Y Y Y Y Y Y Y Y
*   LESS THAN 10 DAYS ABSENT
    IF DAYS-ABSENT > 10                                 04:  - - Y Y N Y Y Y
*   LESS THAN 2 DAYS ABSENT
    IF DAYS-ABSENT >2                                   05:  - - - Y - - - Y Y
*   PRODUCTIVITY-INDEX GREATER THAN 14
    IF P-INDEX> 14                                      06:  - - - - - Y - Y Y
ACTION.=================================================================
*   NO PREMIUM AWARDED
    MOVE ZERO TO PPRES PYEARS PPROD EXPAY TOTP
    COMPUTE PERC = SALARY-A / 100.                      07:  X X X X X X X X X
*   AWARD 15
    COMPUTE PYEARS = PERC * 15.                         08:  - X - - - - - - -
*   AWARD 20
*   10 OF SALARY)
    COMPUTE PPRES = PERC * (20 - 2 * DAYS-ABSENT).      09:  - - X - - - - - -
*   AWARD 6
    COMPUTE PPRES = PERC * 6.                           10:  - - - X - - - - -
*   PRODUCTIVITY-BONUS IS PRODUCTIVITY-INDEX PERCENT
    COMPUTE PPROD = P-INDEX * PERC.                     11:  - - - - X X - - -
*   PRODUCTIVITY-BONUS IS PRODUCTIVITY-INDEX
*   MULTIPLIED BY 1/2 %
    COMPUTE PPROD = P-INDEX * PERC / 2.                 12:  - - - - - - X - -
*   PRODUCTIVITY-BONUS IS (PRODUCTIVITY-INDEX - 15)
*   MULTIPLIED BY 2%
    COMPUTE PPROD = PERC * (P-INDEX - 15) * 2.          13:  - - - - - - - X -
*   EXTRA-PAY IS (PRODUCTIVITY-INDEX - 15) * 4%
    COMPUTE EXPAY = PERC * (P-INDEX - 15) * 4.          14:  - - - - - - - - X
$-------------------------------------------------------------------
TABLE STRUCTURE ANALYSIS

                                                    RULE 02:  . . X - > > - - X
                                                    RULE 03:  . . . - > - > - X
                                                    RULE 04:  . . . . - - - > X
                                                    RULE 05:  . . . . . - - - X
                                                    RULE 07:  . . . . . . . - X
                                                    RULE 08:  . . . . . . . . <

COMPLETENESS ANALYSIS
    IF YEARS-EMPL > 0          01  - N N Y
    IF YEARS-EMPL > 2          02  - - - N
    IF DAYS-ABSENT < 22        03  N Y Y Y
    IF DAYS-ABSENT < 10        04  - N Y N
    IF DAYS-ABSENT < 2         05  - - N -
    IF P-INDEX > 14            06  - - - -
```

A function which we found very helpful was to support decision tables. Here is a listing of a decision table processor function. Again, it is just an extension of COBOL. You use decision tables within the COBOL program and they will be translated and printed. Not only that, but in addition we analyse the decision table to find out about the logical interrelation of the rules, and at the end the processor prints the missing rules. For example, it specifies here in the second and third rules that if years employed not greater than zero and days absent less than 22 but not less than 10, the processor found that this is a rule that is not specified in this decision table.

Again, the idea is to get this information about what should be done at the user's side to verify the decision table, to put this decision table as specified by the user into the program and to add the appropriate COBOL statement to fulfil the function of the decision table.

We had long discussions between the so-called structured programming and the decision table people. There was a long fight over the question of what is better: structured programming or decision tables. This fight is just one of the many fights that we have in system development technology.

We have found the solution by saying that the construction of structured programming is, first, the sequence — the sequence with the DO statement and then a selection. You have the one-to-one selection IF END, the one-to-one selection IF ELSE END; the one-to-N selection, SELECT CASE ELSE END; and N-to-N selection which is the decision table. So all this discussion among decision table people and structured programming people has ended because it is just a part of structured programming. I think that there are quite a lot of discussions in this area where people are fighting for methods which are not conflicting but rather combined in an appropriate way.

But again, if you discuss structured programming with IBM then you get the proposal of pseudo-code. If you discuss structured programming with Michael Jackson, you get a completely different syntax. He has invented his own syntax which he calls "schematic logic." I cannot see why we should use two different syntactical concepts for the same object. Michael Jackson attacks very often this so-called structured programming. I do not see the reason for it, because we can merge the concept of pseudo-code and structured programming on the one side, and Michael Jackson's concept of generating a process structure from a data structure on the other.

Continued next page

```
* IMPLEMENTATION OF THE FUNCTIONS
*
* The implementation of the functions requires the allocation
* of code to the locations of the program skeleton
*
*
* (1) Count the records of the PREPART
*     Ausdrucken am Ende des Vorspanns.
*     print them at the end of the prepart
.SL=WORK77
77   A PIC 9(5).
.SL=0-PREPART
     MOVE 0 TO A.
.SL=P-NOTT1
     ADD 1 TO A.
.SL=C-PREPART
     DISPLAY ' NR OF RECORDS IN PREPART ' A.
*
* (2) Print the first T1-Record
.SL=P-FIRSTT1
     DISPLAY ' FIRST T1-RECORD  ' F-REC.
*
* (3) Print the last record (T2)
.SL=P-T2
     DISPLAY ' T2-RECORD  ' F-REC.
*
* (4) Count the number of batches and print the number
*     at the end of the BA-PART
.SL=WORK77
77   B PIC 9(5)
.SL=0-BA-PART
     MOVE 0 TO B.
.SL=C-BATCH
     ADD 1 TO B.
.SL=C-BA-PART
     DISPLAY ' NR OF BATCHES ' B.
*
* (5) Count the number of T1-Records and print them
*     at the end of BA-PART
.SL=WORK77
77   C PIC 9(5).
.SL=0-BA-PART
     MOVE 0 TO C.
.SL=P-T1
  ADD 1 TO C.
.SL=C-BA-PART
     DISPLAY ' NR OF T1-RECORDS  ' C.
*
* (6) Count the number of T3-Batches and print the result
*     at the end of BA-PART
.SL=WORK77
77   D  PIC S9(5).
.SL=0-BA-PART
     MOVE 0 TO D.
.SL=C-T3-BATCH
     ADD 1 TO D.
.SL=C-BA-PART
     DISPLAY ' NR OF T3-BATCHES  ' D.
```

```
* IMPLEMENTATION OF THE FUNCTIONS
*
* The implementation of the functions requires the allocation
* of code to the locations of the program skeleton
*
*
* (1) Count the records of the PREPART
*     Ausdrucken am Ende des Vorspanns.
*     print them at the end of the prepart
.SL=WORK77
77   A PIC 9(5).
.SL=0-PREPART
     MOVE 0 TO A.
.SL=P-NOTT1
     ADD 1 TO A.
.SL=C-PREPART
     DISPLAY ' NR OF RECORDS IN PREPART ' A.
*
* (2) Print the first T1-Record
.SL=P-FIRSTT1
     DISPLAY ' FIRST T1-RECORD  ' F-REC.
*
* (3) Print the last record (T2)
.SL=P-T2
     DISPLAY ' T2-RECORD  ' F-REC.
*
* (4) Count the number of batches and print the number
*     at the end of the BA-PART
.SL=WORK77
77   B PIC 9(5)
.SL=0-BA-PART
     MOVE 0 TO B.
.SL=C-BATCH
     ADD 1 TO B.
.SL=C-BA-PART
     DISPLAY ' NR OF BATCHES ' B.
*
* (5) Count the number of T1-Records and print them
*     at the end of BA-PART
.SL=WORK77
77   C PIC 9(5).
.SL=0-BA-PART
     MOVE 0 TO C.
.SL=P-T1
  ADD 1 TO C.
.SL=C-BA-PART
     DISPLAY ' NR OF T1-RECORDS  ' C.
*
* (6) Count the number of T3-Batches and print the result
*     at the end of BA-PART
.SL=WORK77
77   D  PIC S9(5).
.SL=0-BA-PART
     MOVE 0 TO D.
.SL=C-T3-BATCH
     ADD 1 TO D.
.SL=C-BA-PART
     DISPLAY ' NR OF T3-BATCHES  ' D.
```

I have tried to show how a certain function — here this function is to count the number of records in the PREPART — requires code within the program. The problem is that if you omit all these arrows and you read the text of the code, and then you can find somewhere 'ADD 1 to C' and you wonder whether it is in this program, because you no longer have the link between the functional structure which is shown here and the procedure structure.

Continued

DELTA PROCESSOR 2.0/5 ON 23.09.78 AT 16:23 PAGE 1

```
********  DELTA>DELTA, IN CBATLOC
00000001  . PROG-BATCHCNT
00000002  . SL=P-PROG
00000003  . SPP-CDIPT
00000004  0       GET F
00000005  0   ->  LOC 0-CDIPT
00000006  0       DO PREPART.
00000007  1   ->  .     LOC 0-PREPART
00000008  1       .     DO NOTT1 WHILE RTYPE NOT = 'T1'.
00000009  2   ->  .     .     LOC P-NOTT1
00000010  2       .     .     GET F
00000011  1       .     END NOTT1
00000012  1   ->  .     LOC C-PREPART
00000013  0       END PREPART
00000014  0   ->  LOC P-FIRSTT1
00000015  0       GET F
00000016  0       DO BA-PART.
00000017  1   ->  .     LOC 0-BA-PART
00000018  1       .     DO BATCH WHILE RTYPE = 'T1' OR 'T3'.
00000019  2   ->  .     .     LOC 0-BATCH
00000020  2       .     .     SELECT.
00000021  3       .     .     .     CASE RTYPE = 'T1'.
00000022  3   ->  .     .     .     .     LOC 0-T1-BATCH
00000023  3       .     .     .     .     DO T1 WHILE RTYPE = 'T1'.
00000024  4   ->  .     .     .     .     .     LOC P-T1
00000025  4       .     .     .     .     .     GET F
00000026  3       .     .     .     .     END T1
00000027  3   ->  .     .     .     .     LOC C-T1-BATCH
00000028  3       .     .     .     CASE RTYPE = 'T3'.
00000029  3   ->  .     .     .     .     LOC 0-T3-BATCH
00000030  3       .     .     .     .     DO T3 WHILE RTYPE = 'T3'.
00000031  4   ->  .     .     .     .     .     LOC P-T3
00000032  4       .     .     .     .     .     GET F
00000033  3       .     .     .     .     END T3
00000034  3   ->  .     .     .     .     LOC C-T3-BATCH
00000035  2       .     .     END
00000036  2   ->  .     .     LOC C-BATCH
00000037  1   .   END BATCH
00000038  1   ->  .     LOC C-BA-PART
00000039  0       END BA-PART
00000040  0   ->  LOC P-T2
00000041  0       GET F
00000042  0   ->  LOC C-CDIPT
00000043  .END    CDIPT
```

Apparently, if you look at this program, some code is lying here in these lines which have no arrow. These lines are just for the process. Then we have some other lines which are to fulfil a certain function. If we reorganise our code and we put this "MOVE ZERO to A" and "ADD 1 to A", and "DISPLAY NUMBER OF RECORDS IN PREPART A" here on top then we have a functional structure including the COBOL statements which are required to fulfil the function. But we cannot use this structure because the COBOL compiler would not like such a structure.

Now we have a problem. Apparently if you look at the program as a piece of data, a set of data, each line of this program has two keys. One key is the key in column 1 through 6 of a COBOL program; that is the number which a COBOL compiler requires — I would say the source key on process. Then you have another key — the source key on function; why this statement is there and what this statement is for. Because our program files are sorted in one way we can look at our program from only one point of view. That is not only true for a program but we can move back for a system.

If we have a certain function in our system, usually this function will require code in different programs. All our maintenance problem is, if we have a change in function, to find out in which program, which lines of code are implemented to fulfil this function. When we have finally found

out this information, to change the program is very simple. All the errors that we make when we change programs are because we did not find all statements which are related to a certain function. We do not find them because we lose the information that we have when we develop the system. Therefore, instead of writing a program in such a way we have replaced it here in a standard way by so-called location definitions.

What does this all mean for program organisation? It means that you can completely separate the structure description from the function implementation. If a certain function does not work, you have your functional structure 1, 2, 3 and so on, and you can access in your program file your functional structure.

One of the main problems that we have in system development is testing. In order to be able to test more efficiently with the decision table processor and also the structured programming, when generating the program we introduced some test facilities.

This means that when a program runs actually on the machine, at the end of the program it will print how many times each rule was executed. Then you can find one rule or one branch of the program which was never executed and you know about the quality of your test data.

```
DELTA PROCESSOR 2.0/7 ON 28.10.78 AT 18:45 PAGE 2

00000051 . FILE-P, REPORT, PAGE-SIZE 50, LINE-SIZE 80,-
00000052 .     PRINT  (1,2,3*3,4,8*3,4,2*3,4,5,6,7,8,99)
00000053 . *
00000054  '-P1, PAGE-HEAD
00000055  *- - -  LINE 1 OF PAGE-HEAD - - - - - - - - *
00000056        10, 'MONTHLY SALARIES'
00000057        68, 'PAGE'
00000058            75,P-PAGE-COUNT,Z(4)9
00000059  L-P2,PAGE-HEAD,A2,B2
00000060            ,'DEPT NAM'
00000061            18,'PNAM PNR'
00000062            36, 'LK'
00000063            39,' STD-L STD-LOHN ZULG-1 ZULG-2  TOTAL '
00000064  L-P3,R6
00000065            ,/TITLE (WZ-DEPT,DEPT),XX
00000066            5,PS-NAME,X(12)
00000067            18,PS-VORNAME,X(4)
00000068            23,PS-PERS,X(12)
00000069            37,PS-LK,9
00000070            39,PS-STD-L,ZZ9.99
00000071  P         MULTIPLY W-STD-TOT BY PS-STD-L  GIVING STDLOHN.
00000072  W77       STDLOHN PIC S9(5)V99 COMP.
00000073            46,STDLOHN,ZZZZ9.99
00000074            55,WZ-ZUL1,ZZZ9.99
00000075            63,WZ-ZUL2,ZZZ9.99
00000076  W77       STOTAL PIC S9(5)V99 COMP.
00000077  P         ADD STDLOHN WZ-ZUL1 WZ-ZUL2 GIVING STOTAL
00000078            72,STOTAL,ZZZZ9.99
00000079  L-P4,P-1-DEPT,B2,A2,GRU DEPT
00000080  *- - - - - TOTAL FOR DEPT - - - - - - - - - *
00000081            ,'DEPARTMT'
00000082            12,WZ-DEPT,XX
00000083            15,'TOTAL'
00000084            46,/TOTAL(STDLOHN,ADD  P-1-PERS),Z(4)9.99
00000085            55,/TOTAL(WZ-ZUL1,ADD  P-1-PERS),Z(3)9.99
00000086            63,/TOTAL(WZ-ZUL2,ADD  P-1-PERS),Z(3)9.99
00000087            72,/TOTAL(STOTAL  ,ADD  P-1-PERS),Z(4)9.99
00000088  L-P5,P-1-FILE,A2
00000089  *- - -  GRANDTOTAL - - - - - - - - - - - - - - - - *
00000090            'GRAND TOTAL'
00000091            46,/TOTAL(/DEPT-STDLOHN),Z(4)9.99
00000092            55,/TOTAL(/DEPT-WZ-ZUL1),Z(3)9.99
00000093            63,/TOTAL(/DEPT-WZ-ZUL2),Z(3)9.99
00000094            72,/TOTAL(/DEPT-STOTAL  ),Z(4)9.99
00000095  L-P6
00000096  *- - -  ERROR-MESSAGES - - - - - - - - - - - - - - *
00000097            ,'- - -> STD-RECORD MISSING FOR '
00000098            50,WZ-KEY,X(12)
00000099  L-P7
00000100            ,'- - - -> SEQUENCE ERROR STD-FILE '
00000101            50,STD-KEY,X(12)
00000102  L-P8
00000103            ,'- - -> INVALID NUMBER OF ZUL-RECORDS '
00000104            50,WZ-KEY,X(12)
00000105  LEND
```

Perhaps one last example which is a description of a report, consisting of a page head, another page head and some lines, with the column position and the name which should be printed, and the format. This line here (number 0051) is connected to a node in our skeleton. The preprocessor reads this report description, generates COBOL code, and allocates the COBOL code to this node, with the result that when this node is passed, this line will be printed. But again in order to be able to judge the report that you have specified in advance, the preprocessor prints a pseudo list so that you can find out if that is really the report that you want.

```
DELTA PROCESSOR 2.0/7 ON 28.10.78 AT 18:45 PAGE 3

1...5...10....5...20....5...30....5...40....5...50....5...60....5...70....5...80

      MONTHLY SALARIES                                    PAGE  ZZZZ9

DEPT  NAM          PNAM  PNR            LK  STD-L  STD-LOHN  ZULG-1  ZULG-2  TOTAL

XX XXXXXXXXXXXX XXXX XXXXXXXXXXXX 9  ZZ9.99  ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99
XX XXXXXXXXXXXX XXXX XXXXXXXXXXXX 9  ZZ9.99  ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99
XX XXXXXXXXXXXX XXXX XXXXXXXXXXXX 9  ZZ9.99  ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99

DEPARTMT  XX TOTAL                                    ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99

XX XXXXXXXXXXXX XXXX XXXXXXXXXXXX 9  ZZ9.99  ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99
XX XXXXXXXXXXXX XXXX XXXXXXXXXXXX 9  ZZ9.99  ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99
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XX XXXXXXXXXXXX XXXX XXXXXXXXXXXX 9  ZZ9.99  ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99

DEPARTMT  XX TOTAL                                    ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99

XX XXXXXXXXXXXX XXXX XXXXXXXXXXXX 9  ZZ9.99  ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99
XX XXXXXXXXXXXX XXXX XXXXXXXXXXXX 9  ZZ9.99  ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99

DEPARTMT  XX TOTAL                                    ZZZZ9.99  ZZZ9.99  ZZZ9.99  ZZZZ9.99

- - ->STD-RECORD MISSING FOR              XXXXXXXXXXXX
- - - - ->SEQUENCE ERROR STD-FILE        XXXXXXXXXXXX
- - -> INVALID NUMBER OF ZUL-RECORDS     XXXXXXXXXXXX
```

Not only when the program is running, but in the very early analysis stage when you specify your report.

Another very essential function is that all preprocessor functions produce documentation, because when you specify a report the processor knows that you need in a certain line of a certain report a certain data element. This information is put onto a documentation file and can be retrieved and processed, and can therefore support the definition of files.

I have shown you a small subset of the functions which are implemented in our preprocessor system, but the most interesting idea of the whole thing is that we should regard the development of data processing systems as a data processing process itself. We should look at programs as files. We should process files and apply the power of the computer to develop systems. We should not introduce isolated methods and function. In my opinion, it will be one of the major concerns of data processing management to combine the different elements which are available to produce systems; to see that the right man does the right work at the right point in time, applying the right methods and using the right tools. That is no longer a programmer's problem, that will be your problem for the next five years.

BUTLER: Thank you very much, Dr. Thurner. One thing that I am not clear on at a very banal level. Could you explain breiefly from the point of view of the individual system designer how working with the preprocessor is different from working without it?

THURNER: We try to split up the work onto different system designers. For example, there is somebody who

defines a report and when this report is defined it will reside in the library. When the program finally is written he will just call this report description. So we no longer have this relationship of one programmer/one program, but different people contribute to the different programs.

To give you an idea about what the system is for, right now we have 30 customers, from very small to very large ones. The first really big system which was implemented was made by Univac — a banking system. It is about 300,000 lines of code, written in COBOL, using this report writer. It was written for the 1930 series. It is 60% on-line programs and 40% batch programs. It took them exactly one month to move the whole system from the 1930 to the 1980 under a different operating system, because everything which is machine dependent is on this development library.

So the influence of the system on the system developer is that he can forget about quite a lot of technical things if he is an application programmer, because all these things are taken from the library and are developed by a technically oriented programmer. The main problem that we have with the system is that we do not yet have the management people who are able to control these people. It is no longer a technical problem.

BUTLER: Thank you very much, Dr. Thurner. I think that we will have to break at that point. I should like on your behalf to thank Dr. Thurner for his very comprehensive explanation. I detect, from your reaction, that the concept which he has put forward is an interesting one to you in principle, but that you have not been able to grasp fully in the time that we gave him just how it affects the job of systems development. That does not surprise me, because I think that the concept that he has put forward is a very all-embracing one. We might perhaps think about how the members of the Foundation might, at some later date, have an opportunity to gain a more detailed understanding of the possible impact of Dr. Thurner's system.

Thank you very much, Dr. Thurner.

COMPUTERS, PRIVACY AND EMPLOYMENT

P. Hewitt
National Council for Civil Liberties

Patricia Hewitt has been General Secretary of the National Council for Civil Liberties since 1974. Prior to this she was public relations officer for Age Concern, and women's rights officer for NCCL. She is the author of 'Privacy: the Information Gatherers', a survey of personal information-gathering and the law in the United Kingdom and abroad. Other publications include 'Rights for Women'; a guide to social security and tax for pensioners; and a Penguin Special, the NCCL 'Civil Liberty Guide'.

COX: Welcome to this next session of our Conference. I am George Cox, of Butler Cox.

Quite clearly, many of the technologies which concern us will have quite profound social effects, both within our organisations and within society in general. One of the clear effects that it will have concerns storing data on people. The enormous power that we have now, with the technologies which we are aware of here to collect data, store it and analyse it, raises a number of problems; problems not just concerned with how much we know about an individual, but problems concerned with mass information on the way that people react, what they buy, how they behave and so on.

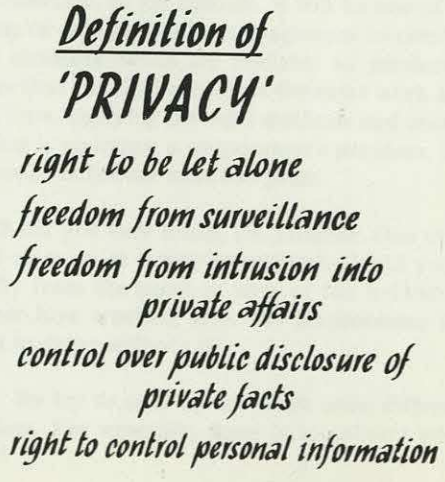
The question of protection in this area, the question of ensuring the rights to privacy that we have tended to take for granted, in the past have been largely protected by inefficiencies or inadequacies in the system, becomes a real consideration. One of the dangers in this area is that because the question of computers and privacy has been around for some time, so far in most cases with very little real impact on us in our businesses and our systems, we tend to think of it as a little bit of a non-subject. It is important conceptually, but does not have much in the way of practical effects.

I really do not think that is the case. Some of the legislation that will be enacted and some of the social forces that are likely to grow we need to be aware of. So we are devoting the next session of our Conference to this subject. I can think of no better speaker to talk to us about what is happening in this field than Patricia Hewitt, who is the Secretary of the National Council for Civil Liberties.

HEWITT: It seems to me that the kind of organisations which you all represent, major organisations, whether in the public sector or the private, have at least a dual responsibility if not a threefold one for the development of individual privacy in this country. As large employers, you have a responsibility to ensure that the privacy of your employees is respected. As businesses in a wide range of fields, you have a duty to the different sections of the public with whom you deal. If you are involved in manufacturing or designing any of the equipment or systems which are used in data processing, then the decisions you make and the advice you give will have a most profound effect on the way in which information privacy develops in this country.

I am planning to talk, first, about a definition of privacy. It is a widely used and sometimes abused term. I will give you a necessarily brief survey of the law on privacy in this country such as it is at the moment. I will look more specifically at privacy and employment, because it is a specific application of the kinds of principles which are involved in a definition of privacy and which will be involved in the privacy legislation which is coming. I will then turn to the legislation on information which has been introduced in other countries, particularly in the United States, Australia and Sweden. Finally, I will look at the kind of law which I think will be here in the next couple of years in the United Kingdom.

I want to make it quite clear from the outset that I am not simply talking about computers. Those of us who are concerned with individual privacy have been presented by the media as being simply concerned with computers — as being against computers. We are not. We have always said that although computers dramatically change the scale of the information privacy problem, they do not create it. We were very strongly opposed to the terms of reference which the Government gave the Data Protection Committee, which as you all know restricted it to "computerised and other mechanised systems", and which therefore stopped it looking at some of the most sensitive collections of data in this country which are still held manually. Those terms of reference are in striking contrast to the parameters of the United States legislation because that legislation is concerned — we think correctly — with information privacy and not simply with computers.



If I can start with the definition of privacy, the first one there — the right to be let alone — derives from an American judgment by Judge Cooley, in 1888, quite some time back and only a few years before two American lawyers, Warren and Brandyke, published a famous article which argued that the American Constitution and Bill of Rights, although it did not specifically protect privacy, could in fact be used to do so. They used what we would now regard as a fairly crude definition, simply your right to be let alone.

The next three, dealing with surveillance, freedom from intrusion — a somewhat broader context — and control over public disclosure of private facts, are taken from the Nordic Conference on Privacy in 1967 and from American legislation which has developed since. I have selected only three out of a very wide range of definitions of privacy which have been particularly developed by that Nordic Conference, just to give you an indication of how the concept of privacy has developed since that first, fairly crude, concept of the right to be let alone. Because what has developed in the thinking about privacy over the last decade is the view that it is all very well to be let alone, it is all very well to have your home as your castle and not to be intruded upon; it is all very well to have some control over what the Press publish about you; but none of that means very much if every intimate detail about your own private life is known by other people, used by other people to make decisions about you, in a way which you cannot control and indeed may even have no knowledge of. Because of that thinking, we came up with the final definition: the right to control personal information, which was originally formulated by Professor Alan Weston in Columbia, and which has formed a very important basis for work on privacy legislation in the United States. It is that right to control personal information about ourselves that it seems to me now forms the heart of any thinking about privacy, even though privacy goes so much further. It is this concept which can be summed up as being information privacy.

English law on privacy

No legal right to privacy
Law of defamation
Breach of confidence
Rehabilitation of Offenders Act
Official Secrets Act
Disclosure of personal records in other proceedings.

To look at the English law on privacy, first, there is none. There is no legal right to privacy in this country. If your privacy is invaded, if the Press publish facts about you which you thought were private, if your credit rating is damaged because of inaccurate information, you cannot sue in the civil courts for redress. You might, in a small number of cases, be able to sue for trespass, breach of copyright, or for nuisance, but any protection for privacy is quite peripheral and accidental.

The law of defamation has been used, or people have tried to use it, to protect information privacy, specifically as a redress against inaccurate or irrelevant information. In my view it is not a particularly effective remedy, first, because most communications of the kind that we are concerned about attract qualified privilege. For instance, we dealt the other day with the case of someone whose career was extremely badly damaged by a wholly inaccurate reference. References are covered by qualified privilege, so he could not bring an action for defamation unless he could prove malice; and in this particular case he could not do so, so he had no redress under the law of defamation despite the damage that undoubtedly had been done to him. Since there is no legal aid for a defamation action, there is in practice very little for which you can use that law.

The third heading that I have put down is breach of confidence and I also mention breach of contract. I think that this is relevant to you in the sense that these are the only laws at the moment that can be effectively used to protect trade secrets; they have very little relevance to personal information as such. But I would mention the Law Commission's recent report on breach of confidence law. They are proposing a major overhaul of this area of the law. They are proposing a new civil action for breach of a statutory duty of confidence. What this means is that if one of your organisations is given confidential information by an employee or by a customer, and you then disclose that information in such a way either as to cause monetary loss to the person who gave it to you, or to cause him distress, you will be able to be sued. It will also provide you in a sense with a protection against third parties to whom you pass on information which you originally received in confidence, because if you pass on that information you can place the third party to whom you gave it under a duty of confidence and if they then disclose the information you can sue them. That development, although it has nothing to do with computers, will be applicable to personal information stored on computers, just as it is to information held in a manilla file.

I mention the Official Secrets Act partly because at the moment it covers all information held by government of which they have not specifically authorised disclosure, but more importantly because the White Paper on Section 2 of the Office Information Act, which was published about a month ago, specifically proposes that it will be a criminal offence for a Crown employee to disclose personal information about a citizen. I think that this stems very much from the commitment of the present Home Secretary to ensuring that the confidences of the citizen are protected, but it is something that I suspect will be relevant at least to some of you.

Rehabilitation of Offenders Act

Spent convictions

do not have to be revealed in job applications
cannot be used as grounds for dismissal
except in certain jobs including
lawyers
chartered or certified accountants
some insurance and unit trust work

Let us take a slightly more detailed look at the Rehabilitation of Offenders Act which provides some protection for information privacy. Spent convictions do not have to be revealed in job applications and cannot be used as grounds for dismissal, with those few exemptions which are provided for in detail by the regulations. The point that needs to be mentioned here and one that we have come up against is that dismissal for a conviction which is not spent is still quite lawful. We had a case of someone who was employed for 18 months by British Rail as a guard, quite satisfactorily. But he lied when he got the job. He said that he had no previous convictions when in fact he had a fairly serious previous conviction, for an offence of dishonesty. It was, however, quite some time ago, and by the time that it was discovered he had worked entirely to the satisfaction of his employers. They sacked him and the dismissal was upheld. They also prosecuted him for obtaining pecuniary advantage by deception, that is to say, for actually earning his wages. He was in fact convicted, although the sentence was minimal. So we would regard that as a not entirely satisfactory area of the law, particularly since the man in question, after his dismissal had been upheld in the Employment Appeals Tribunal, was in fact taken on by British Rail and re-trained for the job that he had originally done for 18 months.

There is a practical point of importance when you are reviewing employee records, that a conviction which is not spent at the time that you hire somebody may well become spent at some point afterwards. That fact, the actual timeliness of the information, must be entered on the record, because if information later about a conviction which has become spent is disclosed, say, in a reference to a future employer, you may well find yourself open to an action for defamation.

Disclosure of employee records

by management decision/ agreement with union

actions for unfair dismissal/ redundancy

actions for sex/race discrimination

defamation proceedings

personal injuries cases

Just to mention my final point there, disclosure of personal records in other proceedings, which I plan to go into in slightly more detail. There are various ways in which employee records, specifically here, may become known to the subject: clearly, if you yourself decide that part or all of an employee record is to be opened or you negotiate such a decision with the union. Secondly, in actions for unfair dismissal or redundancy, you may well find an employee using provisions for disclosure of documents to obtain information which you originally thought was confidential. Similarly, in actions for sex and race discrimination; although there is a recent, extremely important decision by the Court of Appeal which now says that if someone who was refused a job and believes that they have been discriminated against on grounds of sex or race decides to bring an action against you, they are not entitled to confidential information about the other applicants or about the successful applicant. Before that decision the Employment Appeals Tribunal had been insisting that such information should be given anonymously. Clearly this created problems where it was a promotion that was at issue rather than a mere application for a job, because the unsuccessful candidate for promotion would probably know who the other candidates were and would be able to identify the information even if it was given in terms of A, B, C and so on. That is no longer required, and I think that it will have a fairly significant impact on the problems of the complainant in sex or race discrimination cases.

In defamation cases you may occasionally get an order for discovery, but there is an important point there, which is that you have to have already seen the published information on which you are bringing the defamation action before you can get an order for further discovery. You cannot use the disclosure provisions as a kind of fishing expedition to see whether or not you have a basis for defamation. But you can do that in an action for personal injuries, because the Administration of Justice Act 1970 says that if you are likely to bring an action for personal injuries or an action in respect of somebody's death, then even before you start the legal action you can get any information which might be useful to your case from maybe a previous employer, it may be the doctor or the hospital, in order to see whether or not you have a legal cause for action. So medical records are open to disclosure, whether they are held by a hospital or by a company doctor. The House of Lords has recently ruled — quite clearly in line with the law — that such disclosure must be directly to the individual concerned and not simply to his legal or his medical adviser.

The one point which I have not mentioned there and which I want to say a bit about is the law — again such as it is — on the actual collection of information. Some of you probably remember that in 1969 the directors of Tracing Services Limited, which was a fairly large credit reference agency, were prosecuted and convicted and received a fairly substantial fine, for conspiracy to effect a public mischief. They had employed people to go round impersonating Inland Revenue officials, DHSS inspectors, gas inspectors and so on, in order to get information for their credit reference files. TSL went bust soon after that and it was their files which NCCL bought for a penny early in 1975, after the company who bought them up decided to sell them off. What is important there is that conspiracy to effect a public mischief was about the only bit of the criminal law which the Inland Revenue and the authorities generally could use against the directors of that company, who had obtained information by clearly improper and objectionable means.

Conspiracy to effect a public mischief does not exist any longer, because at the end of 1974 the House of Lords, in its widsom, decided that it was not an offence known to law, despite the fact that it had been used quite successfully to prosecute people for the previous ten years. They did so in a case relating to a couple of private detectives, Wither Brothers, who had been using bugging devices in hotel bedrooms to get evidence in divorce cases. They were clearly rather better legally advised than the directors of TSL; they

went up to the House of Lords and they were acquitted on appeal. So conspiracy to effect a public mischief does not exist any longer and, as far as we can see, there is no effective law, and certainly no law designed to deal with this problem of shady, objectionable, dubious methods of collecting information.

This is important, partly because although the Younger Committee recommended that there should be such a law, it has not yet been introduced; and partly because the Law Commission has recommended a new civil offence of misusing information that has been criminally obtained. At the moment, there is virtually no way of obtaining information that is in fact barred by the criminal law.

But it seems to me that, regardless of this hole in the criminal law, large organisations such as yourselves have a responsibility to look at the sources of your information and to see whether those sources measure up to acceptable standards. For instance, we were recently approached both by the Post Office and by the Post Office Workers' Union, because of a proposal to use credit reference agencies. The practice until very recently has been for sections of the Post Office to black certain areas. If somebody living at a certain address wants a telephone, they will have to pay a deposit, quite regardless of their individual creditworthiness, simply because a particular area is poor or has been found to have a large problem of debtors within it. Fairly obviously, we are not happy about that method of credit control which does not look at individual circumstances, but simply blacks everybody because of a general characteristic of an area. We said to the Post Office and to the Union, "We would be much happier if you used a reputable credit reference agency," that is, one which gets its information from public sources such as the judgment debtors' list which the Lord Chancellor's Department produces and which keeps that information up to date, and which of course is now bound by the provisions of the Consumer Credit Act. And that is what the Post Office has now done. Had they some years ago taken the same step in principle, but gone to an organisation like Tracing Services Limited, we would have been entirely opposed to the decision.

Information on employees may be :

secret

inaccurate

irrelevant

out of date

I want to turn to employee records and references. This does not just apply to information on employees, it is a general characteristic of personal information. These four points I would regard as the core of the information privacy problem.

Many employee records, many employee references in particular, are secret from the person they concern. For instance, the chief executive of a local council was sacked last year on the basis of secret reports received from four other senior managers within the department, three of whom had been after his job and failed to get it. Not surprisingly, he brought an action for unfair dismissal and claimed disclosure of those confidential reports — what I would regard certainly as a fairly clear case of injustice.

There is a problem with references here. We have had a number of complaints — to give you one example — from a security officer, who says that he resigned because he was dissatisfied with the extent of petty theft inside the firm and he had not been able to control it. He claimed that he had been promised good references. He got another job as a security officer, subject to the production of decent references. About a month later, when the references came through, he was sacked; and from there on he found it impossible to get a job within a security firm.

Now we do not know the rights and wrongs of that case. It turned out that the reference made a number of allegations about this man, none of which, he said, had been put to him when he was at work and none of which had been mentioned to him when he resigned. In fact the employer was claiming that, far from resigning, he had really been pushed into sacking. The point that I am trying to make is not that he was necessarily the victim of an injustice at all, but that there was no way of establishing whether there had been any injustice. He had no legal right to see the references. He might have considered bringing a defamation action but in practice, specifically because of the unavailability of legal aid and the problem of qualified privilege, that was not open to him either. There had been no unfair dismissal action, so the allegations that were made about him after he left were never tested and the evidence was never examined anywhere else.

One of the problems created by secrecy is not just actual unfairness, but in a way more importantly, a real sense of unfairness which may not necessarily be justified. Secondly, the records may well be inaccurate. We had a problem which I mentioned earlier of a man who had fairly recently left college with quite good qualifications and tried for 94 different jobs before he finally got an appointment. He got fairly near to quite a large number and had never succeeded in getting one. He was getting fairly depressed by the time that he finally did get a job. He then received an extremely oddly worded contract of employment which said, "We understand from your references that you have a history of mental illness and we will wish to be satisfied that you are entirely recovered before confirming your appointment on a permanent basis."

Now that appeared quite fair. The problem was that the man had no history whatsoever of mental illness, and his professor and his tutor, who had given the reference, had simply muddled him up. He had done a thesis on mental illness because he was interested in the subject. He had been 'depressed' in the sense that most first-year students get depressed, but he had never been treated for or suffered from mental illness in the sense in which that phrase was meant.

The problem only came to light because of a very odd practice on the part of the employer, which was to disclose the contents of the reference in the actual job contract. Most employers that I know would never have employed him, and that was precisely what the other 94 had done.

He was the one who was unable to get any redress for the fact that quite clearly this reference had seriously damaged his job prospects, up until that 95th job that he finally got.

Thirdly, information may be irrelevant. I should like to throw in what will probably be a fairly controversial example here, which also relates to mental illness. The National Association for Mental Health has recently brought a case on behalf of a Mr. O'Brien, who was employed by Prudential Assurance and worked for them for over a year, entirely to their satisfaction. He had declared on his application form that he had no history of mental illness. He had suffered from mental illness and it later came to light. He was dismissed not because there was anything wrong with his work at all, but simply because he had a history of mental illness and they were worried that it might recur.

There are very large numbers of people in this country who have a history of mental illness, and certainly for an unqualified person, which it was in this case, to make a judgment about somebody's employment prospects on the basis that at some time in the past they have had a nervous breakdown, been treated for 'nerves' or whatever it was, in our view is a quite unsatisfactory state of affairs. That case was originally heard and dismissed by an industrial tribunal. It has been taken up to the Employment Appeals Tribunal, and we do not yet know the results. But whatever the results of that case, it will have major implications for a large number of employees. Clearly, if Mr. O'Brien's complaint is upheld it will have major implications for personnel policy and record keeping.

The other problem with irrelevant information comes with job application forms. I am sure that your being large organisations, this problem does not occur. I hope that it does not. But the kind of application form that we get worried about is one from a finance company which includes such questions as "Describe what you do each evening of a typical week." "In what respect, if any, do you lack confidence in your ability?" "What things have caused you most humiliation or sense of failure?" "In regard to your problems, were your parents sympathetic and understanding?" "Which of your parents was most understanding?" and so on.

A whole lot of information, clearly from an amateur psychologist, which as far as one could see would be quite useless, but which one would have thought quite irrelevant to the job in question. A lot of other information, which is much more commonly used than that kind of thing, may also not necessarily be relevant to the actual process of filling the job with the best person available. Marital status I sometimes wonder about. Address can be used in funny ways. We had a complaint the other day from someone who had given her address when she applied for a job and was turned down, rather like the Post Office used to turn people down for telephones, simply because some people in the same street as her were squatters and they did not want to employ any squatters. The fact that she was not a squatter was quite irrelevant. She lived in the wrong street and she did not get the job.

Details about drug taking, which appears to me an invitation to somebody to incriminate themselves in an illegal act, I would not have thought were relevant to the information which a personnel manager needs about a job.

Finally, the information may be out of date. I have mentioned this problem already in relation to old convictions. It came up in another case that we dealt with, where someone who had started work was approached a couple of weeks later by the store manager who said, "We know all about you." She said, "Really?" He said, "Yes. Ten years ago, when you were a teenager, you had a conviction for shoplifting." Now a) that conviction was spent, b) it was a long time ago, c) it was not relevant, and d) one wonders where they got the information. Criminal records are confidential to the police, and although there are certain exceptions, for instance, for social workers and people working within the law where the information has to be disclosed to the professional organisation or the employer, the job that this woman was doing did not fall into that category.

Employee privacy: Good Management Practice

REVIEW

1. *Application forms*
   Personnel records
   for *relevance*
   accuracy
   timeliness
2. *Employee access*
   entire record
   factual record
   assessment forms
   references
3. *Use of blacklists*
4. *Use of surveillance devices/photographs, etc.*

I want to suggest some considerations which would form part of a management review of employee privacy. I think that there are three reasons for conducting this kind of review. One is that it is fair to your employees, and clearly fairness to your employees is part of good industrial relations; secondly, that this kind of exercise improves the quality of the information and the records that you keep; and thirdly, that the new Data Protection Act will certainly cover those firms which keep computerised employment records and may indeed be extended to cover others.

It is fair to say that the law and the kind of standards which the Data Protection Authority sets will be based to a large extent on best practice within existing firms. Whether you want to be the basis for the new law, or to be dragged, kicking and screaming, into compliance with it, is a decision for you. I think I know which one I would choose.

It seems to me that within that kind of review you need to look at application forms and records; for relevance, the kinds of things that I have already mentioned; for accuracy — I would suggest that a good policy would involve factual information on a personal record being signed and dated by the person who entered it, and checked and signed at least annually by the individual subject. It involves a check for timeliness, and that is important about the dating of the information; destruction of unsuccessful applicants' application forms; reviewing it for spent convictions and so on.

Secondly, the problem of employee access. I believe that there are a few firms who allow their employees to see the entire file. That is clearly one possibility, although a lot of managers argue that it is then impossible to be frank in your assessment of people. My own quite strong feeling is that it is preferable to try to encourage honesty on the part of the people who are making the assessment of the individual workers. That is something for which you do not set standards in legislation, but it is something to which managers need to direct their attention.

You can open up simply the factual record, which is a very good way of ensuring its accuracy. You should as part of a good industrial relations policy, if not open up assessment forms, at least conduct a review of the employee's assessment and allow the employee to register his objections, if any, to the kind of assessment which has been made by his immediate superior. References. There are a few firms, not many, who allow employees to see references on them. We are very strongly in favour of open references, precisely because of the kind of case that I mentioned earlier, but again we are well aware of the problems that causes.

Third party access is another problem where you need to consider both the standards of confidentiality observed by the staff maintaining the records and the actual physical and technical security of the records themselves, however they are kept. Various forms of surveillance and the use of blacklists to which, for reasons that I need not go into in any detail now, we are opposed, must also form part of a review of management practice on employee privacy. I would simply say that photographing of people, identity cards, bugging devices within the workplace and that kind of thing causes, if nothing else, enormous damage to working relationships within an organisation. Our general principle on that is that if any kind of video camera, bugging device or whatever is going to be used as part of a security policy, people should know that it is being used. They should know that they are under surveillance, because that in itself will reduce crime at least in the places where those notices and where those machines are being used, and I think that it is only fair to the people involved.

In ending this section, I should like to quote from a letter concerning a review which was conducted by a large organisation, about 100,000 employees, of their employee records.

> "The items on the master file are dated at every time that they are last changed. The data items are the minimum necessary for the defined purpose. Irrelevant archives are purged, or only kept on archive. Every access to the file as well as every update is logged."

Certainly within other kinds of record, that kind of log may well form part of the individual subject's access to the contents of the record.

> "Accesses are analysed for possible violation. Clear policies are in place for segregation of both medical and management opinion, which you may well want to keep confidential, from factual information which is signed off by the employee each year. All employees receive a lecture on record policy as part of their induction. Risk analysis is performed regularly, supported by attempts to penetrate security by specialist organisations."

That is the kind of detailed policy, specifically in relation to employment records which I think needs to form part of a policy on the more general issue of employee privacy.

I have gone into that in some detail because I think that it is a good, specific example of the kind of exercise that will need to be undertaken when we get privacy legislation in this country.

Privacy Principles:
Government White Paper

1. *Existence and purpose of all data banks should be known.*
2. *People should know the use to which information will be put.*
3. *Information given for one purpose should not be used for another without subject consent or other authority.*
4. *Information should be : necessary, relevant, and timely*
5. *Statistics must not be published in a way which could reveal individuals' identity*

There is a set of privacy principles taken from the Government's White Paper. Those principles are not in fact adhered to by the Government itself in every respect. The first one is broken for national security databanks and it is fairly clear that those at least will be exempted from the new law. The second one is really not observed. I think that very few people know, and they are certainly not told by the Government, that the information which we all, as drivers of cars, supply to Swansea is also made available to the Inland Revenue, to the Home Office, to local authorities; it is transferred to the police national computer and it is given to every other government department which wants it. Our view is that that principle is best observed by having on a form which is requesting information a red box of the kind that is now on hire purchase forms which say, "This information is required for the following purposes. It is compulsory to give it under the following Act," or "It is voluntary to give it." "It will be stored in the following method and it will be made available to the following sets of people." I think that if that were done, people would have a much better idea of the extent of government information gathering in particular.

The third point is that information given for one purpose should not be used for another without the subject's consent or other authority. The Government manages to observe that principle only because of the phrase "other authority". With Swansea, for instance, all the transfers of data are authorised by legislation or by Minister, they are none of them authorised by subject consent.

The fourth one is that information should be necessary, relevant — to which I would add "accurate" — and timely. Again I do not think that the Government entirely sticks to that, but the principle itself is quite correct.

The fifth one is that statistics must not be published in a way which could reveal individuals' identity. There are problems there with Government statistical databanks, particularly in the medical field. It is suggested that those principles in the White Paper will not be directly enforceable by law. They will be contained in the new Data Protection Act, but they will simply form the basis under which the Data Protection Authority acts, but they will not themselves be directly enforceable.

Data Protection Authority

Terms of reference will include:

- *Government and private sector*
- *Private agencies*
- *Computerised data banks*
- *?? non-computerised data banks*

Duties will include:

- *?? Licensing*
- *Registration*
- *Individual complaints*
- *Supervision*

The Data Protection Authority itself which this Government is committed to establishing . . . just one point there. I do not think that a possible change of government will alter the likelihood of privacy legislation or, in particular, the establishment of the Data Protection Authority. I think that there is so much pressure on this country from the OECD, from the Common Market, from the Council of Europe which is now preparing an international convention on data processing abroad and transfer of data between countries, that the United Kingdom, which has lagged very far behind on privacy legislation, will be forced — even if the Government does not want it — to catch up.

The Data Protection Authority's terms of reference will include both government and the private sector, in contrast to the Younger Committee which could only look at the private sector. It will include computerised databanks and possibly a slightly wider definition. The Data Protection Committee has been having difficulty coming up with a definition of a computer, but clearly it will cover various forms of mechanical processing of personal information. Question whether it will include the non-computerised databanks, the simple manual collections of personal information. It looks as though the Data Protection Authority's brief will be restricted to the mechanical and the computerised system. The present Home Secretary at least has said that he will look at the possibility of parallel legislation for the non-computerised system. Both the NCCL and, more importantly, the bulk of the computer industry have strongly taken the view that legislation should be directed towards information privacy and not specifically towards the computer. I think that will be one of the battlegrounds when the actual Data Protection Bill comes before Parliament.

The duties of the Data Protection Authority may include licensing, although that looks increasingly unlikely, will certainly include registration, although I understand that it is possible that there will be different registration standards and requirements for databanks in the public sector and those in the private sector, with compulsory registration for the public sector databanks and a narrower procedure for the private sector ones.

It will deal with individual complaints about the databanks and it will be responsible for supervising them. I gather, although the report of the Committee has not been published, that the detailed supervision and the detailed standards for information privacy will be left to guidelines issued by the Data Protection Authority, possibly given the force of legislation by Statutory Instrument but not specifically contained in the legislation.

Privacy Principles 2:

Dept. of Health, Education and Welfare, U.S.A.

1. *The existence of every personal data record system must be known.*
2. *Individuals must be able to find out <u>what information</u> is stored and <u>how</u> it is used*
3. *Information obtained for one purpose must not be used or made available for another purpose without subject consent.*
4. *Individuals must be able to correct or amend information in their records.*
5. *The organisation maintaining, using or disseminating personally identifiable data is responsible for <u>reliability</u> of data and for <u>preventing misuse</u>.*

I think that it is interesting to compare that with what is happening abroad. Those are the principles which were set out by the Department of Health, Education and Welfare in the United States, which has conducted the most detailed survey of this. The existence of every personal data record system must be known. They go beyond our Government here. Individuals must be able to find out what information is stored and how it is used. Again, a more specific and tightly drawn principle than that in the White Paper. Information obtained for one purpose must not be used or made available for another purpose without subject consent; in other words they have not accepted the let out that this Government has, of other authorisation for secondary uses of data.

Individuals must be able to correct or amend information in their records. We would say that is the most important omission of the Government's White Paper which — and I believe this is backed up by the Data Protection Committee — regards individual access as simply a way of

ensuring accuracy but not a right which, in fairness, the individual should have. Finally, the organisation maintaining personally identifiable data is responsible both for its reliability and for preventing misuse. Something very similar to that is likely to be in our legislation.

U.S.A. : PRIVACY ACT

APPLIES TO: Federal Government and agencies
Computerised and manual systems holding information on individuals

PROVIDES FOR: Federal Register of record systems
Right of access and amendment
Moratorium on use of social security number

EXEMPTIONS: States and local government
Private organisations
CIA and some FBI files
Some law enforcement files
Some testing and investigatory material used in employment and promotion decisions

Those principles, more or less, were translated in the United States into the Privacy Act which applies to Federal Government and agencies with both computerised and manual systems holding information on individuals; in other words, they do not cover firms or small partnerships, individuals only. It is interesting that in France, which has just passed a new Privacy Act, there was a considerable battle about the original proposal which was that the law should apply to all firms as well as to individuals. Apparently when IBM realised that this would mean that all their competitors could get to the files which IBM hold on them, they kicked up an enormous fuss and that was deleted from the French law, which now again only applies to individuals.

It provides for a Federal Register of record systems, which is something that we certainly want to see in this country specifically in relation to government records. It provides an individual right of access and amendment in enforcement of the Health, Education and Welfare principles. It provides for a moratorium on the use of the social security number, which was becoming a universal personal identifier in the States and clearly posed a threat because it was the method by which a whole series of different files could be linked.

The exemptions were the states and local government; private organisations — the law in the United States still covers only the Government; the CIA and some FBI files, although fewer than you might expect because most people can actually have access to at least part of their file if not the whole; some law enforcement files — clearly if you are about to take a criminal to court you do not disclose your file to him; and finally some testing material used in employment and promotion decisions. But all of those exemptions are quite narrowly drawn, and the law is clearly much stronger than that which is being suggested for this country.

U.S.A. : Information Privacy Standards

Information on individuals must be:

accurate
relevant
timely
complete
necessary

NO information may be held on:

Exercise of 'First Amendment' rights, i.e.
religious } beliefs
political } activities
associations
unless voluntarily given by subject.

One of the jobs of that Act was to set standards for information keeping, of the kind which I was trying to describe earlier in specific relation to employee records: accurate, relevant, timely, complete, and necessary. Then there is a specific bar on what the Americans call 'First Amendment' information, that is information about religious or political beliefs, activities or associations unless it is volunteered by the subject. I thought that was the only country which had a law protecting the collection and storage of that kind of information, but I see that in fact the French law prohibits the collection or storage of information on racial origin, politics, religion or philosophy— trust the French to put in philosophy — or trade union membership. So France clearly has set as tough a standard — in some cases I would say too tough — as the United States.

Australia : Information Privacy Standards

Draft guidelines by New South Wales Privacy Committee

1. Data bank must be for socially acceptable purpose
2. Information must be relevant to decision being made
3. Minimum necessary data
4. Fair collection methods
5. Appropriate sources
6. Data bank holder must ensure data integrity and security
7. Individual access and amendment
8. Public knowledge of data systems
9. Access to data must be:
   consistent with socially acceptable uses
   by subject consent
   by authority of law

In Australia the New South Wales Privacy Committee has enunciated fairly similar principles. Interestingly enough, they have worked almost entirely on a voluntary basis, without criminal or civil sanctions to back them up; and they have been remarkably successful. The one interesting difference between this set of principles and the other ones that we have been looking at is Number 4 — fair collection methods. It is about the one area of the law which quite specifically has brought the law relating to how you collect information into the controls about privacy of that information.

The next country which is interesting to look at is Sweden, where the basic premise has always been that public information is open, and under the Freedom of the Press Act you can get information about your neighbour's tax files, and privacy has been a very recent development, growing out of a complete, almost total availability of information, much of which we would regard as actually private. They have a new Data Act which, perhaps a little surprisingly, applies only to computers, but again covers both the public and the private sector. They provide for registration by the Data Inspection Board, which has a duty to register a databank unless it knows that there will be undue encroachment on privacy. They registered about 15,000 databanks of which 80% were quite routine registrations.

They have special higher standards for any databanks which include medical or political information. They have a legal provision for access every 12 months by the individual to his or her file, again with a very few exemptions, and correction of the file. The Data Inspection Board has produced a series of much more detailed guidelines on processing of personal information, on the ways in which you should inform the subject that you actually have information about him.

Sweden has pioneered legal controls over transborder data flows. You have to get special permission in Sweden if you are going to transfer data abroad, and the Board will give permission only if the country to which you are proposing to transfer the data or where you are proposing to process it has legal standards which match up to those in Sweden. This is something of great importance to the multinational companies because, as you can see just from the few examples that I have given, the standards and the details of legislation on privacy vary enormously from country to country; and on a couple of occasions Sweden has refused permission to companies based in Sweden to transfer or process data in this country because we have no legal standards whatsoever.

They back up their law with criminal penalties for data trespass, that is unauthorised access, or unauthorised alteration or use of the information; and they also provide for civil compensation for incorrect information which has been used against an individual. It is interesting that the French law provides extremely tough criminal penalties. They appear to have a provision which says: "Prison sentences of up to five years and/or a fine of up to £200,000 for maintaining an unlicensed databank or maintaining personal information beyond its statutory time limit." So if you are worried about the costs and sanctions of legislation in this country, I suggest that you have a look at France because I do not think that we will get anything as tough as that.

Sweden has also pioneered quite a tough approach on commercial organisations. They are permitted to keep records on their actual customers, their employees and their members. They are not allowed to build up market research or mailing list files for potential customers, because the Data Inspection Board discovered that this would mean virtually every large commercial organisation keeping its own entire population bank file; and what they are moving towards — which I am not entirely happy about — is a single population bank file, a single accurate, up to date name and address list which will then become available to the commercial organisation.

I think that the most famous case in this connection was the Readers Digest one, where the Data Inspection Board refused registration to Readers Digest who proposed precisely to build up an entire population file.

Now a few conclusions. There will be a new Data Protection Act and a Data Protection Authority within the next two or three years. It may take a little time to appoint the Authority. It will cover all large private organisations, and specifically all private organisations holding computerised databanks; and it will cover computerised or mechanised databanks in the public sector. It will provide at least for the registration of sensitive databanks, and probably of all databanks in the public sector. It will probably not include actual licensing of databanks. In other words, you will be required to register with the DPA the fact that you maintain a databank of certain specified parameters, but you will not have to get permission to operate that databank. The DPA will then be responsible for issuing guidelines for the detailed control over databanks holding different kinds of personal information, and criminal and civil sanctions will probably come into play only when those guidelines have been given statutory force and become binding on specific databanks.

The new Act is likely to include some kind of control over transborder data flows in anticipation of the new Council of Europe Convention. It seems possible that at some point the Data Protection Authority will have to take on board the question of harmonising our laws with those of other member countries of the EEC, which will be an extremely difficult job because, in striking contrast to France which has a very tough law, West Germany has recently introduced an extremely bureaucratic and apparently highly ineffective law.

On a more general level, I think that there is an increasing awareness of the way in which the computer has made possible control over personal information and widespread use of personal information in a way that would not have seemed possible a decade ago. But at the same time as that, and in a sense contrary to it, the public have an impression of computers as really a rather inefficient, bumbling, Heath Robinson affair, which for me is epitomised by the media attacks on Swansea. Swansea has become the epitome of the bureaucratic, computerised state, and to that extent has contributed to an actual underestimate of the problems and the dangers.

I think that legislation of the kind that is being proposed will mean greater public confidence in the kinds of records that are held, but that probably will not become immediately obvious because what it will do first is to increase public awareness about the extent and the problem of information gathering. At least to begin with, I think that one can expect a flow of complaints as people discover what is going on. We may have known it for some years, but a lot of the public have not.

If we look at the example of the Consumer Credit Act and the credit reference agencies, there is no doubt at all that the position has improved enormously in the last six or seven years, and that the number of requests for access to those files, and indeed the number of corrections is a very small percentage of the total held, and the number of

complaints that come into bodies like ours are by now very few indeed.

The final point that I want to make is that privacy problems in employment, which include the specific problem of employment records, will only be tangentially affected by the new Data Protection Act, simply because it is confined to the computerised systems. I would hope that there is a responsibility on management in big firms to consider employee privacy, quite regardless of the obligations that will be placed upon you by the new law, as part of a policy for good industrial relations.

COX: We have time for one or two questions from the floor.

QUESTION: Will there be a big problem for organisations such as mine which have large payroll and employee and credit reference files in allowing the data processing staff access to test files where you are testing out the application of privacy legislation and standards?

HEWITT: I think that there is an enormous problem — and I do not know whether the Data Protection Committee has considered it in any detail — about the standards and the integrity of data processing staff. One unexpected problem which has been created in the United States has been that every credit reference agency now has a fairly large department which is responsible for correcting the files, following a law which gave people access and the right of correction. Those departments have become a new source of corruption and crime; because you can now buy yourself a glowing credit reference by corrupting a member of the correction department so that you file an entirely mendacious correction request which is filed as if it was an accurate one. So someone with an absolutely gruesome credit reference ends up with an absolutely glowing one. There is a fairly major series of prosecutions resulting from that.

So it seems to me that, yes, there is a potential problem both on that level and of giving data processing staff access to individual records. I do not have a solution for that. I think that is a problem for you. It is a problem which you will presumably need to meet by choosing very carefully the staff who will be involved in that kind of test file process. It is presumably something which, if the Data Protection Committee has not considered, the Data Protection Authority will have to give very careful thought to. But I assume that in the new law there will at least be criminal sanctions for a deliberate passing on of confidential information to someone who is not authorised to have it, whether or not that is done for gain; there will have to be certain kinds of criminal standards which would become applicable to your employees in the situation that you have described.

QUESTION: In view of the fact that there is legislation which means that you have to disclose your chairman's salary, are salaries an item which ought to be kept secret?

HEWITT: I must say that I have never regarded salaries as one of the most sensitive items of information. That is a personal view, and I know that there are a lot of people who regard it as highly sensitive and do not want it revealed. I think that in that case it is something where I would come down on the side of allowing individuals — back to my basic principle that individuals ought to be able to control personal information about themselves — to decide for themselves whether or not to make that information available. In other words, it should not be a legal requirement that companies publish that kind of information, but clearly if you or I wish to disclose information about our own salaries, that is up to us.

QUESTION: Does that include the chairman?

HEWITT: Sometimes I think that chairmen's salaries are so large that they barely come within the definition of a salary. I suppose that is personal prejudice. That is a borderline case and I am not sure that it matters very much on which side you come down.

QUESTION: You used the phrase "spent". What does it mean?

HEWITT: Yes, I'm sorry — spent records under the Rehabilitation of Offenders Act. There is a very complicated table which says roughly that if you were sentenced to three months' imprisonment, X years after you have served that sentence of imprisonment it becomes a "spent" conviction. If you go for a job and you are asked if you have any criminal convictions, you can honestly say no; and it cannot be held against you that you have failed to disclose a "spent" conviction. It is wiped off the record, at least for certain purposes. If you are an insurance agent or a social worker, that does not apply.

COX: Does that put your mind at rest? It is quite clear that we could go on discussing this subject for some time. However I must end the session now, and would like to thank Patricia Hewitt for a very informative and stimulating presentation on a subject with which we, in management services, must come to grips in the near future.

DEVELOPMENTS IN OFFICE COMMUNICATIONS SYSTEMS

B. Cartwright
Post Office Telecommunications

Brian Cartwright is a member of the Long Range Studies Division of Post Office Telecommunications, responsible for studies concerned with the demand for new services. He is also Chairman of the CEPT Group. Previously he worked for the Royal Mail for eight years where he was concerned with studies on the future of the postal service, including the impact of teleconferencing and electronic mail.

COX: We now come to our next session of the day. As many of you will be aware, when Butler Cox and Partners was formed we defined the area of our interest as being the area of information technology which is concerned with computers, telecommunications and office automation. To many people at the time the first two were obvious areas of interest, areas between which there was obvious and very strong convergence. But they said, "Office automation? What exactly are you talking about there? It really doesn't fit into the same high technology pattern."

I think that since we have been in existence moves in that direction have shown why our interest is so strong. Progressive integration of our communications systems, our data processing systems with the every day work of the office is becoming more and more apparent. It is an area which we need to monitor and track very carefully over the next few years.

So to bring us up to date and give us some views on what is happening and certain directions which are being taken we have invited along this afternoon Brian Cartwright, from the Post Office Long Range Planning Division at Cambridge. Mr. Cartwright.

CARTWRIGHT: May I correct you? I am not Planning, I am Studies; there is quite a big difference.

Perhaps I should begin by explaining that my Division within the Post Office is concerned with trying to understand users' communication requirements and in using that knowledge to identify promising new telecommunications services. What I should like to do this afternoon is to briefly describe some of the results and implications of some work that we did on the probable pattern of use of various advanced message communication services by business customers in the coming era of cheap computing and data communications.

OFFICE COMMUNICATIONS SYSTEMS

Although a lot of people refer to this question of new services to replace postal and telex services as 'electronic mail', I preferred to call this presentation 'Developments in Office Communications Systems'. I chose this title because it seems to me rather more appropriate as it emphasises the link between the choice of communication system and what is actually going on inside the office.

When one is analysing communication services, there is a great danger, particularly if you work in a telecommunications business, of focusing narrowly on the transmission switching aspects rather than on the wider, end to end communication process. We have found in several areas that the pressure or need for a new telecommunications service is less due to the inadequacy or high cost of the existing service than to the inadequacies of the office or the need for improvement in some of the activities which are supported by the existing services. Thus we often find a crucial factor in the choice of a communications service in the future is likely to be the office technology that is being used.

This is not really news. A lot of you are familiar with computing, and there is evidence of a strong link between communications and office technology in the history of the computer itself over the last decade. It is the application of the computer to clerical office activities which has stimulated and driven the growth of data communications. Thus the focus of this presentation will be on choices about office technology as the computer expands into hitherto untouched areas of office activities and the implications that this will have for the use and management of communication services.

As I come from the part of the Post Office that is concerned with user requirements, I must of course begin by discussing the office environment and the user requirements where some of these new technologies are likely to be introduced.

What are the key problems that need to be tackled in the office today? Much to the surprise of some of my postal colleagues, the cost and performance of mail services in the UK are not in general seen by most people as the key problems. Of much greater significance are the scale, cost and poor productivity of office activities, and also what is often referred to as the 'information explosion', that is the need to talk to more people about an increasing volume of new information.

TODAY'S KEY OFFICE PROBLEMS

Scale, cost and productivity of office activities

Need to cope with an increasing flow of information

CAUSES OF INCREASING FLOW OF INFORMATION

rapid rate of technical change

scale of modern business

impacts of change

worker participation pressure groups

creation of specialist functions

Let us look at each of those in more detail. First, the causes of the increasing flow of information. There is an increasingly rapid rate of technical change which means more research and development, more new products, more market research. There is the scale of modern business which means that there are more people involved in each decision.

The impacts of change within business. There are more people who are impacted by any changes introduced; more people to agree, more people to inform. Also, in the area that I am particularly talking about, there is more impact on the social climate. The Goverment is very interested and is demanding more information.

We are seeing the growth of worker participation, pressure groups, consumer groups, who all want to be involved in decision making processes and need to be involved in this flow of information. To cope with the increasing flow of information one sees the creation of lots of specialist functions: industrial relations, public relations, all of whom need to be linked into what is going on inside the modern business.

OFFICE ACTIVITIES

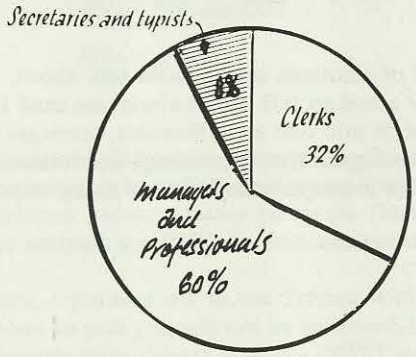
accounts for half of UK GDP

poor productivity record

accounts for increasing proportion of business costs

How about the scale of office activities? As I am sure you must have heard by now, certain OECD studies and work done in the USA have shown that in most countries, certainly in the UK, office information processing activities are now accounting for about half of our Gross Domestic Product. Also, this particular area has a poor productivity and poor investment record. The average office worker has an investment per capita of about £500 compared to £5,000 in production industry. The last one about the increasing proportion of business costs comes from some work that was done in the USA rather than the UK. If you look at the US situation the proportion of business costs there is even higher than it is here. So one can expect that, unless something is done about it, this will become an even more significant area of cost in the UK than it is already.

BREAKDOWN OF UK OFFICE STAFF COSTS



This is one of the things that is not generally realised about office costs. I must confess that I did not believe it myself when I saw it, so I checked it out on the Post Office and it really is true. When you look at office costs, that is the sort of breakdown that you get. Clerical activities about 32%, secretaries and typists about 8%, and managers and professionals — which certainly in the Post Office example included everybody except first line supervisors on the management side, professional engineers, software people, researchers like myself — was about 50% to 60% of the total office or desk space, or office cost.

Until now, most of the effort in improving productivity has gone into clerical activities. This is one of the traditional areas of the application of computing. Currently, one is seeing a lot of discussion and activity in the area of typists and secretaries. However, the real problem and the real challenge are in this area (managers and professionals). How does one increase managerial and professional productivity? This is vital not only to reducing costs, but it is vital to the success of your firm. If your managers spend more time thinking about how to make the business successful rather than worrying about their paper work or their IN tray, then you are likely to become a more successful company, assuming that you have good managers, which I am sure you have.

IMPLICATIONS

Business needs improved tools to:

- *reduce office costs*
- *serve managers, not just secretaries*
- *improve effectiveness of communication*

Just to summarise, what business seems to need is improved tools to reduce office costs, serve the managers not just the secretaries and clerks, and improve the effectiveness of communication to cope with this increasing information flow.

There are a lot of solutions that I could talk about. As I was originally asked to talk about electronic mail I have chosen two that fit into that area. However, there are things like teleconferencing, information storage and retrieval, store and forward voice messages which all have a very important part to play.

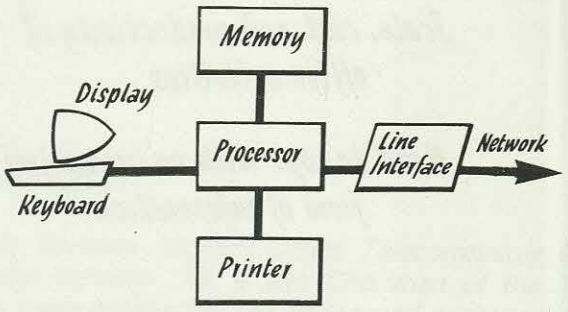
SOLUTIONS

Wordprocessing and electronic mail

Computer based message services

But the two that I will briefly talk about this afternoon are first, word processing and the influence that it will have on electronic mail. My definition of electronic mail is person to person asynchronous message services. I have never found two people yet who agree on a definition of electronic mail, but that is mine. The second one that I want to talk about is the computer based message services which I will define more precisely later, as an example of how you can begin to introduce the manager to some of the new tools which are becoming available for him and the professionals to use.

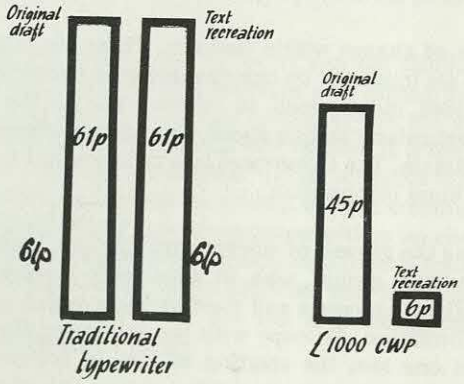
THE COMMUNICATING WORDPROCESSOR



Let us begin with the communicating word processor (CWP). It is essentially a device that combines the typewriter with a telex terminal, but with all the benefits of a computer processor which enables you to do editing, correcting of the text, and also allows you to use rather cheaper and higher speed data communications.

The CWP seems likely to become a key element of new message or asynchronous communications services. The reason for this lies in its ability to justify one of the more significant elements of the cost — the terminal cost — by improvements in office productivity.

Impact on preparation costs - 1986



If we look at the cost of creating an A4 page of text, the left-hand block shows the cost of typing and correcting the original draft. The right-hand block shows the cost of re-creating that text, assuming that you change about 12% to 20% of it. It has to be re-typed with traditional technology. If we look at the costs of creating this typewritten page in 1986, when the £1000 communicating word processor should be widely available and, I suspect, widely used, we will find that the provision of a terminal is justified for most secretaries in large businesses, purely on the grounds of the productivity improvement that it makes possible.

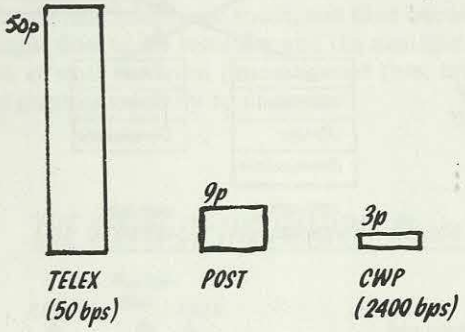
Why is the CWP so important?

- Keystrokes capture information in processable form
- Information transmitted in processable form
- Allows evolution to computer-based storage and retrieval systems

The CWP is also important because, by capturing the information in a computer processable form and also allowing it to be transmitted in that form, it allows you to evolve towards computer based storage and retrieval or advanced office systems.

Comparison of transmission costs

One A4 page - London → Birmingham



The series of pluses continues when we start looking at transmission costs. Transmission cost is quite complex because it all depends on what you are sending where, at what time of the day, and how much of it there is. But I think that this slide gives you a flavour of the savings that are possible. Telex is very expensive, but of course it goes the same day. Post is cheaper but you only get overnight delivery. But the CWP, because you have justified a terminal cost, is very cheap; 3p and you have got rid of one A4 sheet. Of course, if you are doing it over a private network the costs will look very different, but the same sort of picture will emerge.

Obviously the attraction of the CWP to individual firms will depend on their volume of typing and the type of mail that they are sending. Super telex systems cannot cope with all kinds of mail. So it will depend on the characteristics of an individual firm. A recent market analysis suggests that there is a very large market indeed for these kinds of devices, even if the preparation economies which are the most significant thing are ignored.

However, at the moment the word processor is not really able to provide the basis for a public communications service because of the lack of compatibility between the existing terminals. Discussions are going on within CCITT to establish the necessary standards for a public communications typewriter service. Keen interest is being shown in this not only by the PTTs but also by the key computer manufacturers.

TELETEX

Communicating Typewriter Service

- CCITT Standard
- Text-editing facilities in basic terminal
- Interworking with Telex
- Simultaneous local mode and reception
- Lower case characters
- Transmission at up to 2400 bps
- Use of PDN and PSTN
- Network storage

Unfortunately, the service is known as Teletex which is rather confusing for us British, because even if the guy on the platform knows whether he means Teletext with the "T" or without the "T", the audience generally does not.

However, I promise not to use Teletex with the "T" this afternoon so that you will not be confused. Let us quickly run through what Teletex is. It is a CCITT standard, which means that it is usable anywhere in Europe but probably not in the United States. However, if you want to talk to the United States, Bell's Advanced Communication System will probably sort that out for you, at a price of course.

There will be text editing facilities in the basic terminal, but the whole thing is being organised in such a way that you can have a 'virtual' terminal so that if you have a fairly complex system of your own, you do not necessarily need to buy in to the PTT terminal, unless they insist that you do. Interworking with Telex is almost mandatory, because as you know new communications services always suffer from this snowball problem if there are no compatible terminals out there. The first person who buys a Teletex terminal should be able to talk to every Telex terminal in the world. There will be simultaneous local mode and reception. That means that you can use the basic terminal as a typewriter and also receive messages at the same time.

It has lower case as well as upper case characters. It will also probably have a very wide ranging international alphabet, which means that you can actually send letters to France in French, with the accents and so on.

Transmission at up to 2.4 kilobits on existing networks. The speeds may be lower, they will probably vary from country to country. There are also options for using public data networks and public switched telephone networks, again varying from country to country throughout Europe. There will also be some facilities for network storage and

the possibility of intelligence in the network. This is one of the as yet unresolved areas, the debate about whether these terminals should be acting back to back, or whether one should use a store and forward or mail box type concept. I think that what is likely to happen here is that a whole variety of things will emerge, because it seems inevitable that, in addition to there being Teletex, there will also probably be Videotex terminals which may not be compatible and may not be capable of automatic reception. So there will be a need for some intelligence in the network for these storage, forwarding and code conversion functions, even within Europe.

It is hoped that the Teletex standard will be agreed by 1980. However, there are a few unresolved problems. But my feeling is that, because of the interest of several PTTs, some sort of service is likely to emerge in the early '80s; even if the Teletex standard is not actually agreed, some countries are likely to go it alone.

Some of you may be surprised that I have managed to get 15 to 20 minutes into this presentation without mentioning the word "facsimile". That is my record, I have never managed that before. This is really because, although facsimile has a number of advantages which give it very good prospects for growth in the short term, it also has several disadvantages which limit its potential market, at least in my view, although not everybody agrees with me about this. So facsimile seems to me to be likely to do very well out of special applications, but not really to become a substitute for conventional mail on a large scale.

FACSIMILE

ADVANTAGES

existence of standards

compatibility with today's office

can handle pictures, graphics

DISADVANTAGES

not compatible with Telex

information is not transmitted in processable form

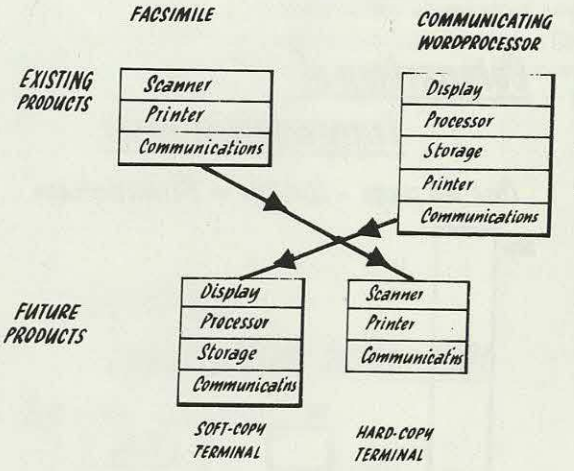
higher transmission costs than CWPs

Let us look at some of the advantages and disadvantages of facsimile. First, the standards are already there, you do not have to wait two or three years for them. It is compatible with today's office, so you do not find severe labour problems if you try to introduce it. It can handle pictures, graphics, and handwriting, which the communicating word processor, in its first generation at least, will not be able to handle.

However, it also has a number of disadvantages. It is not compatible with Telex, so it suffers from the snowball problem. Somebody needs to be out there who actually has a terminal that you can talk to. Compatibility solves one problem but you still have to get them out into the field in large numbers. Another disadvantage is that the information is not transmitted in a processable form. You can handle it in a computer but you cannot search it and pull out key words and things like that. It has higher transmission and storage costs than the dense code of CWPs. In some cases it does not actually cost more to transmit, but you can always transmit more for the same money with a CWP than with fast facsimile.

There has been a lot of debate about the competition between facsimile and communicating word processors. That is quite an interesting discussion, but it is one that is becoming less and less important. Let us say that the facsimile market as an independent service has a limited life with the suppliers. In fact the potential for facsimile is actually increased by word processing rather than reduced.

INTEGRATION OF FACSIMILE and WORDPROCESSING

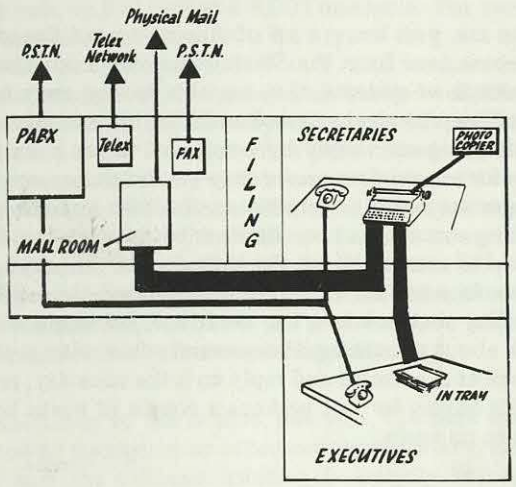


At the moment we have two terminals which have these elements and they are isolated from each other. However, the communicating word processor needs a printer. Facsimile also has a printer. So by combining the two we can produce a soft-copy terminal which has the display, the processor, the storage and the communications, which allows you to do text entry, editing and retrieval of the information; and also a hard-copy terminal. With these two things we have the opportunity for sending both facsimile and word processing type documents, and also merging the two so that we can send a document which is a combination of facsimile for the letter heading, perhaps the pictures and the graphics, and the signature if you want it, plus the text encoded in the traditional Telex type way.

This integration can go further. If the slide had been larger I could also have put on there the photocopier and probably the OCR device, so the hard-copy terminal's scanner is not only used for facsimile but it can also be used for local photocopying if you want it. Similarly, the scanner can also be used as input to a microprocessor to encode the text that has just been scanned. There is already a product on the market in America which does that.

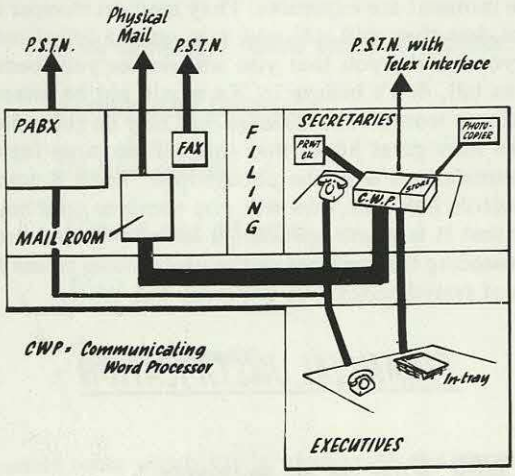
The CCITT discussions on this kind of hybrid text and graphics service have already in part begun, but there is still quite a long way to go in deciding how to organise and handle these kinds of mixed messages. There have been a couple of papers already from one large computer manufacturer on the subject.

THE OFFICE NOW



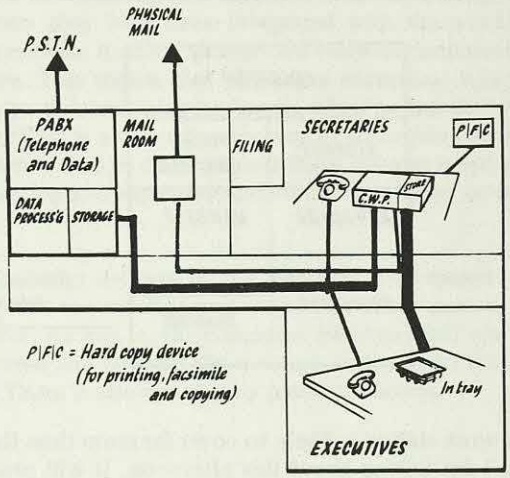
In this first slide I have shown the office today: the telephone and information flowing through on paper, some of it coming through to remote terminals, the Telex or facsimile terminal in the mail room, and then becoming part of the paper flow to the secretary and the manager. Let us just look at what the word processor and then integrated text and graphics are likely to do to that.

THE OFFICE OF THE FUTURE - Phase 1



The first thing that will probably happen is that the typewriter will be replaced by a CWP and you will get rid of the Telex terminal. However, the PABX is still as it was and you are probably going out into the PSTN directly. At this stage it will probably not have much effect on the mail volumes, but will initially be used for urgent communication.

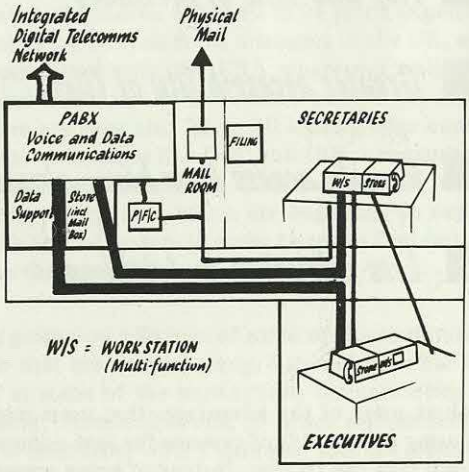
THE OFFICE OF THE FUTURE - Phase 2



At the next stage one starts to provide more of the whole system that is necessary, so the PABX now has integrated in it or attached on to it the data processing and storage functions that are necessary to support the word processor, give it the information storage and retrieval functions, and also provide the storage and forwarding of messages. At this stage a lot of the mail is now beginning to get transferred over, where that is possible.

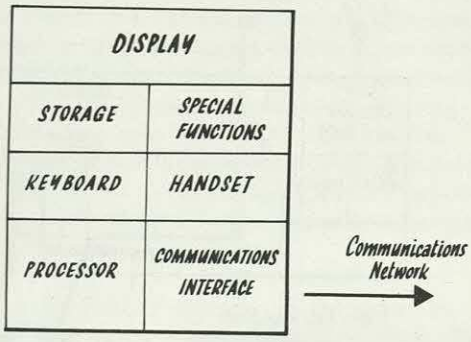
Up till now, the poor executive has been largely unaffected by what is going on outside his office. I have drawn this slide assuming that this guy has a secretary. If he has not had a secretary, he is probably not noticing that much difference at all. He may be getting his mail through a little faster. That just means that his IN tray is likely to be piling up even faster than it was before. All the internal mail within the building, which is by far the bulk of it in large companies, has not been affected at all by this development of word processing and combined facsimile and word processing systems.

THE OFFICE OF THE FUTURE - Phase 3



To make a serious impact on the majority of managers and professional staff, you must get some sort of work station located on the professional or executive desk. Some of the elements of this work station are shown on this next slide.

MULTI-FUNCTION WORKSTATION



The work station is likely to cover far more than the area that I am talking about this afternoon. It will probably have a handset or desk top loudspeaking telephone functions built into it. It could well be a small computer or access a timesharing computer. It could also have a voice storage device built into it. However, through this kind of device it is possible for a large number of people to become relatively independent of the clerical and secretarial support staff, if you supply the kind of networks and data processing capabilities that are necessary to support this kind of terminal. I am not suggesting that everybody will do all their own typing, but it seems to me that people need some subset of these functions which will depend on what they are actually doing. The managing director who spends most of his time talking to people will be far more interested in the conferencing aspects than in the ability to type his own messages. However, the more junior guy who does not have a secretary of his own will perhaps be more interested in the clerical and secretarial support functions which can be provided by this sort of work station.

USER ADVANTAGES

- List and title of messages
- Greater accessibility of files
- Remote access from home, abroad...
- Less intrusion by telephone

Let us look at some of the advantages that users might get out of using these kinds of systems for text communications. First, take the IN tray. Instead of being presented with a pile of unopened envelopes, the system can give you a list of all the messages that you have received since you last looked in your mail box, and also a title for each message. You can then select for yourselves the highest priority items without having to open them all.

Greater accessibility in the files. A lot of paper, once it goes in a filing system, is often dead, because once you have forgotten that it is there you are unlikely to be able to find it. At the moment you are tied to your desk. With this sort of system you can access your desk in your office from wherever you happen to be, as long as either you carry the terminal with you or you have acquired a viewdata terminal in your home. I had to get viewdata in somewhere; it is mandatory on Post Office staff at the moment!

If, like me, you know a lot of Americans and Canadians who come over from the States, who play around with these kinds of systems, they are able to stay away from their offices for weeks on end and keep in close touch with what is going on, simply by being able to log in on a computer terminal whenever they get the chance, see what messages are being sent to them, and then respond to the incoming communication. Another advantage is that it is also possible to start reducing the intrusion of the telephone and the face to face encounters — your subordinate who, on the day that you aren't in the office, just has to see you to talk about something. He can send you a message and you can look at it at home and reply to it the same day, rather than his having to wait perhaps a couple of weeks before you turn up again.

The systems may be there and they may have advantages, but there are some obstacles in the way of people using them. The first one is acceptance, both by the staff affected or displaced by the use of such systems, and also the managers and professionals who have to use them. Not everybody, I am amazed to learn, likes the idea of doing some of their keyboarding. Apparently this is particularly true of female executives. Their status symbol is not having to type. You suggest to them that they may have to type again! You are not too worried about the reactions of certain male executives.

The other problem when we start talking about high penetration of terminals is cost justification. These systems at the moment are expensive. They may get cheaper in the future, but they will still cost you quite a lot of money. If anybody tells you that you will reduce your communications bill, don't believe it. We would not be interested in it if you would! The message cost may be going down, but we have great hopes that this will do more for office communications than the photocopier. When it comes to the bottom line cost, how will you convince your management that it is worth spending a lot of time and money in persuading the manager or the professional to use these kinds of systems.

FINANCIAL JUSTIFICATION

- How do we measure managerial productivity
- Citibank solution - increased span of control

A good example is provided by a unique trial that is going on at the moment in America. Citibank are playing around with rather expensive systems which include executive terminals. Their approach is: how do we measure managerial productivity? The thing that you can actually put a number to is the span of control, how many people you have reporting to you. I will give you some figures about Citibank because I think that they are quite striking.

Citibank have 40,000 staff and 8,000 managers. The average span of control at the moment is 6 to 1, and they aim to increase it with their system to 7 to 1. This increase in the span of control they estimate would save — well, they say "save" but what they actually mean is avoid increased expenditure because I do not think they intend to sack anybody because of this — would avoid the expenditure of $35 million in 1986. Their estimate of the system cost for 1986 is $23 million. In addition to saving or avoiding managerial costs, they also expect to save about $15 to $20 million on clerical costs and also mail costs, because in the USA they have to avoid the postal system and it costs them quite a lot of money to do that.

The consequence of this is that, last year, Citibank spent $1 million on managerial or office communication systems. I think that the Citibank solution is actually rather expensive. Certainly this is a direction in which to go, but I do not think that it is the way to start. I think that one has to get the manager and the professional using some of these systems and begin to make them aware of what is possible. I think that at the moment more of them are aware of the disadvantages than they are of the advantages. So where is there a cheap entry providing the manager with some of these tools so that he can learn and also so that the guy making the decisions about these systems can begin to learn what is in it for the company?

COMPUTER MESSAGE SERVICE

Mini-computer based message system

Simple user language

On-line editing

Storage and retrieval

Mail-box delivery of messages

Password access

One possible route which fits in nicely with the approach that seems to be emerging for word processing is to go to what is called a computer message service. Examples are things like PLANET and SCRAPBOOK. Essentially, this is a sophisticated message switch. It is mini-computer based; however, it provides a lot of additional intelligence and storage. There is a simple user language — simple English commands on the best of them so that a non-expert can rapidly acquire a working knowledge of the system. There is on-line editing so that people can input their own brief messages; and most messages on these things are quite brief, they are not used for report creation or report sending, except where they have been integrated with the word processing system. It offers storage and retrieval documents or messages. This means that when the supervisor tells somebody to do something he knows when he has the reply back. That is a very effective way of controlling people. The problem is that to do it without these systems is rather time consuming and expensive and you always forget to do it.

You get mail box delivery of the messages. This means that to deliver the message you do not need the person to be on line. He logs in, the computer tells him what has been delivered and he takes the messages in the order that he wants. There is also security by password access.

SYSTEM USES

Information distribution

Status reports

Meeting agendas and minutes

Inquiry/response

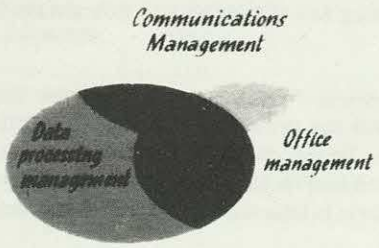
Informal discussion of issues

The sort of things that these are being used for are things like information distribution, status reports, meeting agendas and minutes, simple enquiry and response which cannot be done on the telephone, and informal discussion of issues — the so-called computer conferencing application which started this whole computer message service off on the ARPANET, five or six years ago.

At present, there does not seem to be much experimentation with that kind of system for managers in the UK, especially when compared with the USA where not only are the computer freaks in the universities using it on ARPANET, but there are now also 20 to 30 leading edge companies, computer companies like DEC and IBM, companies like Shell Canada and a whole host of non-computer, non-data processing companies, which are beginning to experiment with this sort of system in order to try to find out what its value to them might be.

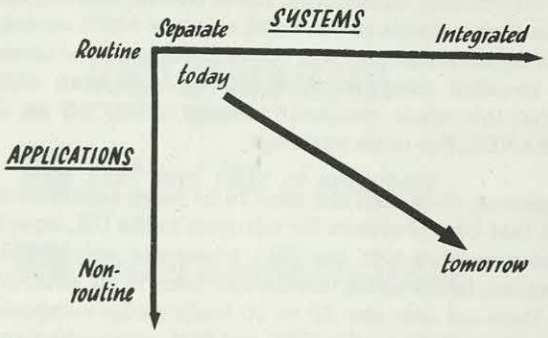
Having given you a flavour of some of the communications services that are coming along, I should now like to look briefly at some of the implications for yourselves as data processing, communications, or office management. I hope that it is clear from what I have said that the selection, introduction and justification of the new office communications systems — be they word processing, facsimile, computer message services, or offices of the future, for managers or secretaries — will create a lot of new problems for you. One of the key ones comes from the fact that it will not be quite clear who is responsible for it.

Breakdown of traditional boundaries



For example, is the word processing terminal the responsibility of the office manager who currently buys the typewriters, or the communications manager who at the moment is dealing with the Telex and message transmission side of things? Similarly, some data processing functions are performed perhaps inside the PABX itself, or indeed with intelligence within the network. Who will be responsible for the design and management of that network? Which of these three people?

GREATER COMPLEXITY IN SYSTEMS DESIGN



Another problem is the greater complexity in systems design and systems choice. Things that were once separate and could be dealt with on an individual basis will become integrated and you will have to make choices about total systems which allow those bits, if you buy it in bits rather than a package, to be integrated.

I have not talked about the software at all, which is unfortunate, because when the terminal has arrived on nearly everybody's desk and he is using it for his simple message communications, there are also then opportunities for using it in a rather more imaginative way to support his real job. That will create a whole new set of problems in software, in coping with increasingly complex and non-routine functions.

RESPONSES TO THE CHALLENGE OF OCS

Creation of 'OCS Function'

Representation at high level

Better understanding of users

Evolutionary approach

Some of the ways in which one might deal with these kinds of problems with this phenomenon of the convergence of office computer and communications technology are, first, the creation of an office communications function. That means that you must integrate communications, office management and data processing under one person, so that joint decisions can be made and the whole thing can be organised in a sensible systems way. You avoid the problems of incompatible systems and equipment that can talk to each other only by the provision of very expensive and specialised black boxes.

Secondly, we are talking about spending large amounts of money and impacting areas of the organisation which might prefer to be left alone. That means that you need representation at high level because they will be affected as well. If your senior management do not want anything to do with the systems, do not approve of them, and do not use them, you may as well not bother because it is then a status symbol not to have a terminal, so that everybody spends his time not getting greater intelligence on his desk but in getting less. So you must be represented at high level.

You must have a better understanding of the user, what he wants and what he will do, because in the future you will not be dealing with a clerk who will do what he is told, you will be dealing with a manager who, if he does not like the system, will pull the plug out and throw it through the window.

Lastly, one is in what one could rightly call a revolutionary situation. However, I think that if one adopts a revolutionary approach, disaster awaits. What you will probably succeed in doing is destroying what social fabric is still left in your offices. One has to move forward in a sensible, evolutionary way so that the users understand what is going on at each stage, and you test and prove the systems before you make your whole organisation dependent upon an inadequate system.

HOW NOT TO INTRODUCE OCS

Don't tell senior management

Ignore the user

Avoid flexibility

Minimize training and support

Avoid experienced consultants

Tongue in cheek, I will leave you with a few suggestions about how you should not introduce an office communications service. First, don't tell senior management about the high costs or the benefits. Surprise them — they will enjoy it. Secondly, ignore the user. He does not know what he wants anyway and you, unlike us, can always make him use the system by taking away his secretary and his IN tray. Thirdly, avoid flexibility. It costs a lot of money, and I am sure that you are all so good at your jobs that you can be sure that you will get it right first time. Minimise training and support. If you make the system simple to use, I am sure that the users will be able to learn it on the job in a matter of minutes or hours. Lastly, avoid experienced consultants or anybody else who can give you unbiased advice about what to do and how to do it. Rely on your friendly local equipment manufacturer to send you in the right direction.

COX: Thank you, Brian. Questions from the floor please.

BUTLER: Aren't you selling facsimile short? You mentioned it as being unable to handle processable information, yet there are devices available in America which do precisely that.

CARTWRIGHT: Yes, perhaps in a sense I am selling facsimile short, but I am actually talking about unintelligent standard facsimile devices which are merely remote photocopiers. The device that you describe is getting very close to one element of the hybrid text graphics service, and that is certainly the direction in which facsimile ought to go and will go. As a consequence, it will be integrated with the word processing revolution. I think that we are just talking about names rather than disagreeing about what is likely to happen.

QUESTION: Would you care to comment on the idea that the work station will reduce the IN tray?

CARTWRIGHT: No, I don't think it will reduce it. It will make it easier for him to get rid of the things that he does not want to read. I think that one problem that people have is who to send documents to. When somebody gets them, he has to open it and decide whether or not he wants to read it. I think that with some of the systems that I was describing, it makes it very cheap and easy to send people documents, for them to look at what it is and, if they do not want it, they can get rid of it immediately. You have not incurred all the costs of photocopying and transmitting it and the paper, merely for them to throw it in the waste paper bin. So I think that it makes it easier to cope with a larger IN tray rather than reducing the existing one.

COX: I should like to thank Brian very much indeed for his presentation. Although Brian has come along as an individual speaker, giving a personal view, he speaks from a wealth of accumulated material and corporate experience which resides in the Post Office unit in Cambridge. I am extremely grateful to him on behalf of you all for giving that very authoritative view of the way that the whole scene is going. Thank you very much indeed, Brian.

ADVANCED COMMUNICATIONS SYSTEMS – THE OFFICE TELEPHONE OF THE 1980s

J. H. Stoffer
Delphi Communications Corporation

Jay Stoffer received his BBA in Economics from Upsala College in New Jersey. His career in the computer industry began when he joined IBM in 1961 where he represented the Data Processing Division to the Communications Industry dealing principally with New York Telephone, Western Union and ITT. After seven years with IBM Mr Stoffer joined Scientific Data Systems as Manager of Market Planning. In 1972 he founded Delphi Communications Corporation and made key contributions to the development of the business and product strategies for this corporation.

COX: Gentlemen, it is quite clear when we look at future developments in information systems that the telephone and developments in the telephone system will play an enormous part in enhanced voice communications and various forms of data communications. So one of the things that we have been doing in Butler Cox is monitoring a number of developments worldwide, seeing some of the advances and new uses made of the telephone system.

We came across a very interesting new business operated in the San Francisco area, by the Delphi Communications Corporation which is an affiliate of Exxon. As you are probably aware, Exxon represents a major new force moving into the field of information systems and communications. We thought that it would be most interesting if we could bring along a representative of that company to describe what is taking place.

We are very privileged that we have been able to get Jay Stoffer, who is the founder of Delphi Communications, to come across to our Conference and describe what is going on. Mr. Stoffer.

STOFFER: I should warn you in advance that I thought that I would be able to communicate in this forum with no difficulty at all, because my mother was born in London and lived many years in this country. I was born and brought up on the East Coast of the United States, in an area called New Jersey. You may be familiar with the film "On The Waterfront", in which Marlon Brando popularised the speech of that territory with guttural sounds passing for speech and communication. I was unique in that area because no one could figure out what part of the country I came from. Then some ten years ago I moved to the West Coast, to California, the land of sunshine. I moved out to the Wild West, and find sitting in this forum today that my speech obviously has deteriorated. I did not think that paucity of vocabulary was a problem that I would have, but I have heard words, phrases, sets of alphabet soup, as we call it, with which I am totally unfamiliar. I am sure that in the course of my talk I will move off into areas that do similar things.

ADVANCED COMMUNICATIONS SYSTEMS

Advanced Communications Systems is the topic of the discussion. It is not the name of something. I did not borrow it from our colleagues at AT&T, and that is not the subject that I am going to talk about. I am going to talk on the general topic of advanced communications systems. It is rather a presumptuous topic because it is all-encompassing. In fact we at Delphi have developed a system that covers an extremely broad range of those things 'communications'. In fact almost every topic that has been covered here today is within the compass of that system. I cannot possibly cover that in the time allotted, so I will try to limit it to a little bit. I will also limit the commercial message.

I spent the weekend in London. I went to Hyde Park, to Speakers' Corner — a delightful experience which I have never had before. I listened to that and it occurred to me that in the process of this talk there was one part of the art of communications and the system of communications that I had not addressed: that is to make sure that the content is relative, relevant, and meaningful. What I heard there, in the words of one of your countrymen, was "full of sound and fury, signifying nothing". So that is part of the problem of communications systems we have not dealt with, at least not very effectively.

Another thing that has happened that is very fortunate, and gives me a beautiful lead in to something that I want to say, which has been said here in a slightly different way this morning. There is a slight mis-spelling of my name, a typographical error; it has no "L" in the spelling of it. However, if you remove the "S" from the front of the way that it is spelt in the programme, it comes out "Toffler". You may well remember that there was an author of a book by the name of Alvin Toffler, and the name of that

book was "Future Shock". The theme of that book is, as has been expressed today very effectively, an accelerating rate of change. But I do not think that any of us have a real feel for the amount of change that we are going to find in communications systems.

Many of the things which I have heard discussed here today have been discussed in the terms of evolution of what is. I believe that we can get there through a process of evolution, but I think that the rate of the changes that will hit us will find us absolutely and totally unprepared. The reason for it is that we have borrowed substantially from computer technology. We at Delphi are not using conventional computers to do what we are doing, but all of us in the communications industry have borrowed substantially from the technology of computers. As a result, we will be on a much steeper part of the technology curve than would normally happen in a changing process. I think that should become a little clearer as I go through it.

Mr. Blackaby this morning also took part of my speech. I have been sitting on the back bench — I have been a back-bencher all my life — and throwing out the slides that have already been given. Mr. Blackaby pointed out extremely well, much better than I could, that there will be a shift from the area of goods to services, and that in this shift it becomes that much more important for us to increase the productivity with which we perform those services in order to move some of those bars, on the charts that he showed us, in opposite directions. Sitting back there, I concluded that one of the ways that I could solve the United States' balance of trade was to quadruple the price of the system that I am talking about and sell it to the oil sheiks, and dispose of the problem in that way.

MANAGEMENT PRIORITY FOR THE 1980'S

- MAINTAIN COMPETITIVE POSITION
- MANAGE CHANGE

It is also to the topic of this Conference that within the context of that rapidity of change it will be incumbent on each and every one of you, those of you who provide services to the public and those of you who provide services in-house to your own organisations, to maintain a competitive posture within this fast-moving atmosphere, to enable your overall organisations with a greater dependence on services to maintain a competitive position and potentially improve that competitive position. The difficulty facing you in the near term, and in particular in the first half of the '80s, will be to manage to establish the base for those changes and then to manage the introduction of those changes, and do that intelligently.

DELPHI

COMMUNICATIONS

A little plug for the mother company. Delphi Communications was formed in 1972. None of you has heard of us, and that is very deliberate. In fact when the representative from Butler Cox came to visit, he told us that he had heard something from one of the major communications companies in the United States, that there was a company in California, some place, they did not know where, which was doing something very exciting; and that if he could get to see them they would not talk to anybody. In fact Roger Camrass was so charming on the phone that we met at eight o'clock at night and went on until two o'clock in the morning, talking about a wide variety of subjects, some of which we can talk about at the moment.

But the name "Delphi" came from the Delphi Rand developed technique, which is an iterative process for taking people of multi disciplines and having those multi disciplines in this iterative process forecast what the future of technology will be in a set of given areas. We have taken that name for ourselves since 1972. That is relevant only because in 1972 I can tell you that none of the technology that is implemented in the operating system that is in San Francisco at the moment, operating in a commercial environment for the past two years, was at that time available. It was a duck-hunting process having to figure what would be available. In fact the system has been designed so that it can adjust to those changes without massive upheaval in the process.

We were unable to find a general purpose computer system on the market place at that time, nor would we be able to find one now that met the requirements that we established for a real communications system. This is not a general purpose computer that has been adapted to that purpose with black boxes hung around it in all the traditional ways, to make it think that it is a communications system; it was designed for that to start with. Because of the amount of time and effort that it has taken, it reminds me of the Labours of Hercules. Even with his limited intelligence, he realised that in spite of his prodigious strength a shovel was going to be the wrong tool with which to keep up with the output of the large stock of the stables that he was given to clean. So he used the old tool, the shovel, to build a conduit from a river which, in turn, cleaned out the stables. Gentlemen, it may be necessary for you to discard some of the old tools in coming up with what is a real communications system.

COMMUNICATION SYSTEM REQUIREMENTS

RELIABILITY/AVAILABILITY/MAINTAINABILITY

HIGH BANDWIDTH
EXPANSION TO ULTRA-LARGE SCALE
MAXIMIZE PROCESSING POWER UTILIZATION
ADD UNIDENTIFIED APPLICATIONS
ADAPT TO CHANGES IN TRAFFIC MIX
INCORPORATE NEW TECHNOLOGY

Let us take a look at the requirements that we laid on a communications system in 1972. Recognise that our objective in building this system was not only to, as it is crudely called on occasions, "peddle iron in the market place" — sell this system to other people. That was one of our objectives. A secondary objective is for us to use that system in our own communications systems that will be wholly owned by us, providing service to the general public. One takes a rather different approach in building a piece of equipment where a major portion of your long-term livelihood is going to be involved in the process.

These words have become hackneyed: reliability, availability, maintainability; but I am talking about a 24 hours a day, seven days a week operation, providing services to emergency organisations, dispatching doctors, ambulances, fire trucks, in addition to plumbers, TV repairmen, lawyers and other such people. We felt that it was absolutely necessary to be able to deal not only with the storage and retrieval of data and to be able to have people talk to each other in a normal switching mechanism, but to be able to store the spoken word, retrieve it on a random basis, with all of the security and privacy that I think Patricia Hewitt would be happy with; also to be able to store data in conventional forms on random access bases, and facsimile and video. We were looking not for a single facet of the communications industry, but all facets of it.

It was necessary to be able to go from an intermediate sized system, because communications load does not stay static as you all know, to ultra large scale, and be able to do that without taking the system off the air, without stopping it, either for maintaining it or any other purpose. It needed just to be able to grow, assimilate; throw away your thoughts of SYSGEN, you plug in a piece of this system and it generates its own tables automatically, knows it has a new resource and uses it immediately.

We also wanted to do something that I am calling by a very positive term here, because once upon a time I used to be a salesman and I was told to do everything positively. What that says is "minimise the overhead". I operated in the IBM framework for a number of years. I was around during the 360 and 370 era. I had the honour of destroying the Model 67 as a product because it could never reach the objectives that it was set; then I had to go around and tell people why I did it, including the chairman of the board, who was rather interested in what was happening to those hundreds of millions of dollars that had been thrown down the tube. That one was a particularly bad example of overhead functions. But in terms of overhead I have seen operating systems in the past where, in an interactive communications environment, the system has spent 75% to 80% of its time in its housekeeping, in deciding what it is, who it is, what it has to control, and all of the rest of the things that it has to do, and 15% to 20% of its time in doing real processing work towards getting an application done. Some of those problems have been solved in the meantime, but we certainly were not going to design a system that made that happen.

We also know that in the realm of communication systems you will have to add unidentified applications at some period of time, because as clear as my crystal ball has been over the years even I have made mistakes. I am sure that all of us in this room have failed to see something that was going to happen at some point in time, particularly when governments get involved. It is absolutely necessary to be able to adapt to changes in traffic mix, that is at one period of time you are dealing with facsimile, another with data, another with voice, another with video; and the system needs to be able to deal with all of those. They can be changing on a slow, evolutionary basis; they can be changing dynamically; or they can be changing minute by minute. In terms of this future shock situation that we have seen coming down the path for some time now, because of borrowing from computer technology we felt that it was absolutely necessary to be able to incorporate new technology. At the moment, we are going to the 16K chips from the 4K chips, and are expecting to go ahead into the 64K chips or the 256 when those come down the pipe, as they undoubtedly will, given that the laws of physics do not change in the meantime.

SYSTEM APPLICATIONS

- HIGH VOLUME TRANSACTIONS
- DATA BASE MANAGEMENT
- SIGNAL PROCESSING
- MULTI-MEDIA MESSAGE SWITCH
- OFFICE AUTOMATION

Some of the system applications, and here I will finish with the system. I love this system — I guess you can get the feeling for that — and I would love to spend three or four hours going into the architecture of what makes this go because, as much as I hate the words because they have become hackneyed and over-used, it is an elegant solution to a problem in a fashion that I have been wanting to see used on systems for an awfully long time, and so have a lot of other architects. There just was never a reason for doing it before in quite this way. I did not do it; I am not nearly intelligent enough to do this.

System applications cover a broad range of things like this. We have heard a lot about office automation here today. I view the office as a system. I do not see it as a bunch of unrelated black boxes that somehow communicate with each other. Some day we will get to the situation where we do have all kinds of interesting text review terminals sitting on our desks, but that is the subject of another talk.

TELEPHONE ANSWERING (FIRST APPLICATION)

- SERVICE TO PUBLIC
- IN-HOUSE

What I am going to devote my time to today is discussing one tiny aspect of advanced communications because that is all that time will allow. I am going to discuss the application that we are doing up in San Francisco at the moment. It is telephone answering. That sounds very simple. It looks like using an elephant gun to kill flies. Why would one spend six years in developing a completely new computer architecture in order to be able to answer a phone? People do it all the time. In the United States, at least in service to the public, telephone answering service has been going on for 50 years. It is a very profitable industry, but everybody hates it. It is terrible. We have roughly a million subscriber accounts in the United States who have their phones answered off-premises, and that is just one interesting aspect of it. However, you will notice below that the same problems exist in-house, and some reference was made to that in one of the earlier talks this morning. I will make a lot more reference to it.

The telephone in itself is a marvellous invention. It is absolutely magnificent. Without a telephone I do not think that I could function as a businessman. If you were to take a week out of your time and decided to operate without a telephone, I submit that you would not be able to function. It is a superb invention. What is wrong with it is the way that we use it. I make a telephone call. I pick up the telephone. It rings and continues to ring. My first reaction is that I misdialled. I hang up and I dial again. It rings again and I get no answer. So I figure that the other party may not be at home. I call again a little later, if I remember. This time I get a busy signal. So I put it down on a piece of paper to say that I am going to call again. This process keeps going on.

The next thing that happens is that I get an answer and it is from a switchboard message desk. I ask for the gentleman that I want to talk to, and she says, "Well, I don't know, I'm at the switchboard. I don't know whether he's in, but I think his secretary goes to lunch from one to two. Why don't you try then?" So I figure I will give her time for a second Martini at lunch and I call back at 2.30. She gets back and says, "Well, he's been here all the time but he was in a meeting." I say, "Will you please have him call me back?" He calls me back and, unfortunately, when he does I am in a meeting. We have now both of us spent an inordinate amount of time in a communication which has gone absolutely no place.

My people at the repair desk at the operating telephone companies tell me that they get telephones that are literally ripped out of the wall; they are thrown in the trash heap; they are drowned in bath tubs; they come back totally melted into one piece, obviously part of some pagan fire ritual. This is the frustration that we all feel about one of the most marvellous inventions that has ever been delivered to man. It wastes an inordinate amount of our time because of the way we use it.

There was a mention made today by Mr. Cartwright in a study about office communications.

SRI INTERNATIONAL

- **COMPUTERIZED MAIL**

Let me take off on that subject for a few moments. The study to which I am referring has numbers that are very similar. They are slightly different so I presume that they came from a different source. Stanford Research International made a presentation at Kyoto, Japan, some time in the past 30 days, and a gentleman by the name of Jim Bear was talking about computerised mail in much the same way as Mr. Cartwright did today. He used slightly different numbers. I am very familiar with the project that Mr. Cartwright was talking about. He left out a couple of the more esoteric aspects of it in that they developed at Stanford something called the Mouse by which one directs data on a screen. You have to see it to believe it, I could not describe it if I tried; but it is an interesting input/output device and selection device rather than making menu selections. But sometimes universities get carried away and do things like that. I could not for the life of me see the use in it.

U.S. BUSINESS LABOUR COSTS

- **SECRETARY TYPIST — 6%**
  (TYPING TIME — 20%)

- **NON-CLERICAL — 66%**

But in the US, business labour costs that I think were being referred to are slightly different. Mr. Bear quoted secretary/typist time as being 6% in the article that I read. This was in the October issue of "Computerworld". If you are interested in reading it I am sure that I can get some copies for you. Of that 6%, he said that 20% of it was typing time. Those figures are fairly close, I think that Mr. Cartwright used the 8% figure for secretary/typist time. The number that was used in the article was 66% for non-clerical time.

I was going to give you my own numbers which are not much different, but getting some outside expert to give you the numbers lends weight and credibility and I do not have to defend the numbers at all. They now come from two sources and I am delighted by that. He goes one place further, which was not mentioned today, although the two solutions that both men were talking about are identical. 28% of the phone calls in a very large population study done in the United States connect with the called party. That frustration scene that I was talking about is not apocryphal: 72% of the calls do not get through.

INTERPERSONAL COMMUNICATIONS SYSTEMS BENEFITS

- 28% PHONE CALLS CONNECT TO CALLED PARTY
- MESSAGE QUEUEING—ELIMINATES INTERRUPTIONS
- AUTOMATION OF ROUTINE FUNCTIONS
- REDUCE MEDIA TRANSFORMATIONS

My friends at AT&T tell me that Centrex makes that even worse. There is a corporate executive at Exxon who is particularly frustrated by that. He comes to Europe frequently and tries to get somebody back in New York. He knows that the man is there but he cannot get through because the switchboard is closed down. He is looking for a solution to that particular problem.

These are what are called in that article "shadow functions", taking messages, getting busy signals, trying to decide to call back again. The second aspect which was touched on today but from the opposite direction is message queueing. When any one of us is working on something that takes thought, concentration, creativity, the last thing I want to do is to have somebody call me up and ask me if I am free for lunch. But that is what happens. Invariably when I want to work on something useful, something that is creative, I call the office and tell them that I am staying at home. By the way, Mr. Cartwright's idea of my taking a terminal with me to find out whether I have any messages—if it is important they will find me, they know where I am. I am not going to look for trouble!

The third item is automation of routine functions which I thought was very important. This is the addressing, routing function that takes part in any kind of communication system, hard copy or any other. The fourth one is the reduction of media transformations. I think that we do not give this nearly enough credit in the process. I have a tendency to write things out, write an outline of what I want to do. I will then potentially flush that out or dictate it; or dictate it to a secretary and have her do a rough draft, get it back, correct her mis-spellings which are invariably there despite the fact that she is a very good secretary — going through that whole process of media transformation. I always lose something in the process. After I have read it in hard copy it never says what I want it to say anyhow, and I have to do it again. That was one of the other items that he was talking about.

Mr. Bear's premise, like Mr. Cartwright's, was to train us to do things with typewriters and to learn how to keyboard. Once upon a time I could play a piano. I don't do that very well any more either. But I doubt very much whether I will be interested in dedicating a lot of time to learning how to type 60 words per minute, to become an effective typist. It is not my vision of myself. It is not the way I see my job. I am obviously a verbal person; I do not write well at all.

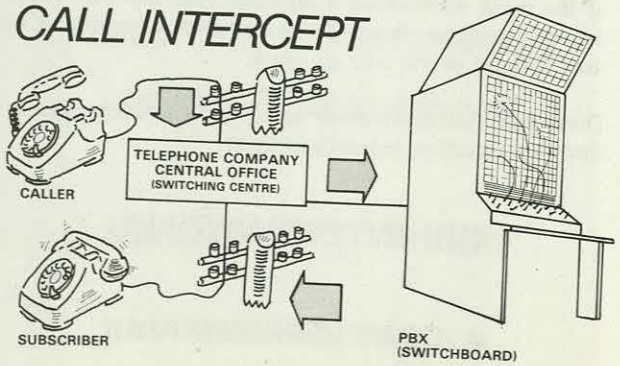
IBM — SPEECH FILING SYSTEM

IBM recently went a little further. Since Mr. Cartwright has covered the area of the difficulty of introducing the concept of typing to the general office operation, IBM did an interesting thing, on an experimental basis, for the past couple of years, and with some success. It is called the Speech Filing System. This has also been written up in some of the journals and talked about at some of the recent shows.

It takes the "inter-office memo". It is not universally useful. It is not a panacea in that it can be used for all kinds of communication. But there are types of memos where there is no reason in the world to write them, to have them typed up, sent to the mail room, delivered to 40 people, and all you are doing is reminding everybody that there is a meeting at such and such a time. It is an extraordinary waste of money. IBM has gone significantly further. The last experiment with which I am familiar was at the Watson Research Laboratories, where they had about 100 professionals who had access to the machine. They used touchtone as their control device because it was simpler to do. These gentlemen would be able to dictate inter-office communications on a given subject, mail box them to individual people who could then get access to those recordings. I did not participate in that experiment, they threw me out of that company 12 years ago; but it is my understanding, from friends that I have there, that wherever the experiments have been done they have been extremely successful. They have had good user acceptance and they have been very useful.

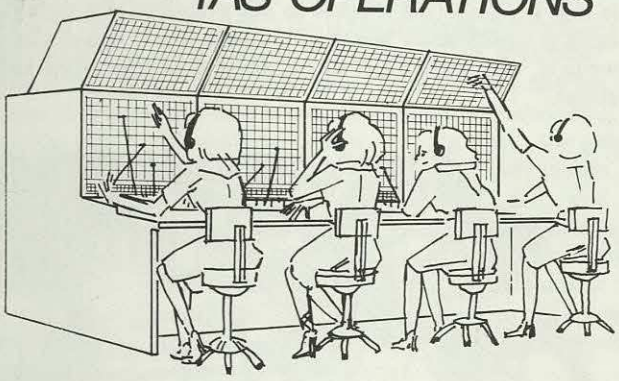
This is for data that does not have a long life. Let me not suggest that this be used for everything, it is not that kind of a solution. But for temporary kinds of data it is very useful, because the disc storage is there and it can be used very effectively. I am sure that they will not offer this as a product because of its cost, but on an experimental basis they hooked together an IBM System 7, a Model 168 with an enormous amount of core memory on it, several multi hundred megabyte drives of one kind or another, and some special analogue to digital conversion and switching gear that went with it.

I think that they are on the right track. They are thinking about this — and they freely admit it — for office automation in the office of the future. I am not on commission for IBM, but I think that it is an interesting development. My guess at the moment from the time that I was inside is that it will probably run something like four, five or six years before a product like that comes to market. I am not suggesting that you wait, because obviously the reason that I am here is because an infinitely superior product is available now.



I am going to look at the services side of this business at the moment because that is exactly what we are doing, and the translation to the in-house application of this is not at all difficult. Within the United States a subscriber to an answering service which is a private company has his subscriber telephone connected to his telephone company's central office (local exchange). He attaches to that through a normal pair of wires. When a caller calls up that pair of wires is attached to another physical pair of wires, which acts as an off-premises extension which goes out to a switchboard. It has a termination at one of approximately 100 to 120 positions on that switchboard, where there is a young lady sitting at that switchboard and she can intercept that call as if she is on the physical premises of the subscriber to the primary station. There are about a million such activities in the United States at the moment. God knows why but it is a profitable business. They normally operate 24 hours a day, seven days a week.

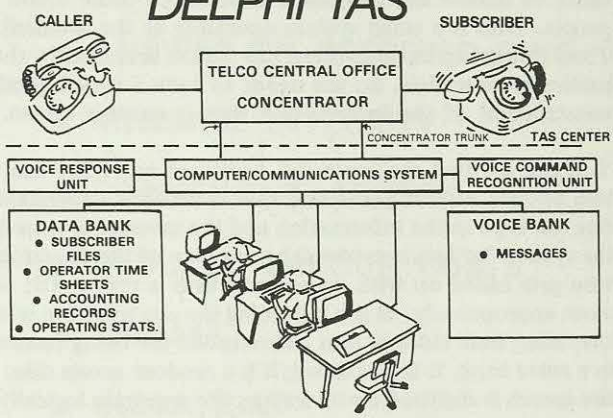
TAS OPERATIONS



An answering service in an idealised form has three or four switchboards in it. Each one of those telephones comes into a given position switch. She has a one-inch card there which gives her the name and telephone number of the person whose telephone she is answering. It has been like this for about 50 years. She then takes the same kind of slip that your secretary does, writes down the name of the caller, your name, the telephone number of the caller, and a cryptic message which could not be deciphered by anybody because she handwrites it. I am sure we go through that whole process every day. It has all of the normal problems of the handwritten message. You get the transposition of numbers; you get a wrong name; you get a wrong spelling of a name. In addition, she puts it into that mail box slot; she frequently puts it in the wrong one and you get somebody else's messages.

The worst part of it is that the switchboard acts as a single server queue, so while the girl at this switchboard is handling seven or eight transactions at the same time because of normal queueing theory, the girl sitting right next to her can be filing her nails and doing nothing, which does not do an awful lot for productivity. This is multiplied an astronomic number of times within the office environment itself. But this is a laboratory place where you can study it close up and see what you cannot see in your large thousand, two thousand, three thousand man organisation. That is efficient compared to the way that phones are answered in any large organisation. Your secretary goes away for a cup of coffee. It is incredible. At this point I wonder that we ever get any calls through; I think that 28% is probably an overstated number.

DELPHI TAS



Let me go to the Delphi solution for just a moment. We built a piece of equipment which is called the concentrator. It is not a unique name but it is a unique box. It will connect up to 640 subscriber individual lines to that one box. We built that some years ago. We now sell it to PT&T, Pacific Telephone and Telegraph, which is the California arm of AT&T, the operating company. They have those installed in their central offices in San Francisco. There are half a dozen installed in the San Francisco area at the moment. That concentrator has a ring detector for each one of those lines. It has all the normal things that you would expect: redundant processors, redundant power supplies and so on. We will not bother going into the technology at the moment.

It has redundant data paths coming out of it. When a line rings, it identifies the line that is ringing, sends a data stream to the centralised system, which is the one that I described to you before. That centralised system takes a look at that line, pulls its line record out of the databank and says, "Should I answer this phone? If so, on what ring should I answer the phone? What kind of an operator should I give it to?" and some other things about the class of service which would take us a little bit of time to get into — for this day of the week, or this time of the day, or is it a holiday and so forth — so we can make an intelligent decision as to when to answer the call.

On the assumption that it has to, it sends a message back to the concentrator. A voice connection is made over high activity voice trunks, thereby reducing the amount of traffic coming out of this central office to the main system, and creates a voice path between the system and that concentrator. It then searches out from any number of operators, who are all seated at CRTs, an operator who is qualified to handle the particular call that is coming in. She has the materials at her work station, or by training she has been taught to handle that kind of a customer's call.

When that happens, a tone goes on in her ear. The screen with subscriber data comes up on the screen, giving an infinite amount of information about that particular customer.

Recognise that in the answering service business at the moment we are dealing with 2,000 separate organisations, with an average of 2½ personnel per organisation. You have an operator sitting here in an automatic call distribution mode, who needs to be able to talk intelligently to the

caller on almost any subject to any one of those 5,000 people. That is a small system operating at the moment. They will go up to something like 8,000 accounts in that particular operation. So she needs to have a very logical construction of the information that is on this screen.

You can see that she has a full keyboard here. She has two options at that point and that is account dependent. She can type in the information and the message is stored in the system for future retrieval by any one of the operators who gets called up with an account with a proper ID; or, more appropriately, as she is holding the conversation with the caller, both sides of that conversation are being recorded in a voice bank. It is not taped; it is a random access disc; the speech is digitised on its way in. We segregate logically the portions of the conversation which are the operator-generated portions and the caller-generated portions. We can also take, of those caller-generated portions, those which contain information which are on her message information check list, the questions she was supposed to get answered, flag only those, and they are all recorded in a single stream, but they can clearly be picked off randomly, selectively. It can be just the message segments that were flagged. It can be just the caller segments, all of them, flagged and non-flagged; or both sides, which can be done immediately, no rewind time and no special waiting.

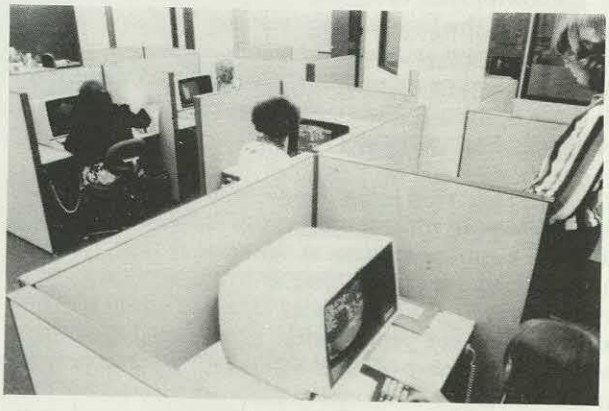
The caller calls in to retrieve his messages. He calls in on a standard telephone line. In order to retrieve his messages he speaks a four-digit code, 1, 2, 3, 4. The system says, "Good morning, you have three messages." You will notice that I say "the system", there is no operator involved in the process. "You have three messages. Here is message Number 1. It came in at . . ." and it time stamps the message and gives you a verbal date and time if the date was different from today's date, otherwise it just gives you the time. Then it plays back, according to your code, just the segment that you want played back, the information segments are the normal method of replay.

The caller calling in to retrieve his message has the ability to use six control words as well. He says the word "stop" in between segments so that he can write down any information, and the system stops. He says "go" and it will go ahead. He says "back" and it will replay the segment that it just played. He says "skip" and it jumps to the beginning of the next message — because you had a call from your mother-in-law and you do not want to listen to the rest of that anyhow. He says "begin" and it will go back to the first message, with no rewind time at all and start the entire process again. Or fall-back position, you can call the word "operator" and it will route you to the next available operator and handle whatever special request you have.

I think you now have a feeling for how that goes. I wish that we had more time to dig into some of the interesting parts of it. But let me point out one thing. Within an in-house organisation substitute that word concentrator in the central office for a computer-controlled PBX, and not only can all of those functions be replicated, but they can be improved upon; because I can make a determination within an organisation that the call is coming in-house. It is not coming from an executive, it is coming from two intermediate level people. I need not put an operator in that booth at all. I can have a recording that says, "Jay Stoffer is out of the office at the moment. Would you like to leave a message?" You are familiar with the Codaphone machine and so on. It will record that message and it will go into the same stream with the other messages, although they can be prioritised, and you can put that portion of the information in there. So since we have a lot more communication peer to peer than we do from the outside world or from top down, in terms of telephone communications, the secretary can be eliminated in a large number of cases.

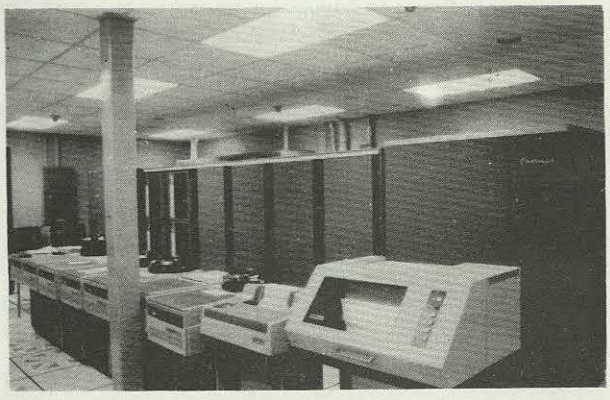
Since I fully intend to keep you here late tonight, you will not have an opportunity to call your office. You probably have a stack of messages sitting on your desk. I know I do, but I don't care. But that stack of messages is now inaccessible to you until such time as the young lady who will be at that desk tomorrow morning chooses to read them back to you — that is, if she is not in the middle of tea break. With a system like this, you have absolute access to those messages at any time of the day, 24 hours a day, seven days a week. The important thing though, gentlemen, is that the time that it takes to put a message into the voice bank is significantly less than the time that it takes to hand-write it, with all the rest of the advantages that we are talking about.

That is what the old, conventional answering service looked like — and that is a good one.



That is what our operation in San Francisco looks like. There are some 30 terminals like that, operating in soundproof compartments, so that the operators are dealing in a very quiet calm instead of the boiler factory that is happening in that other operation.

The information that I said would be on the screen. I am able to do private addressing of messages for a department. Each individual in that department can have private mail boxes, shared mail boxes, or any combination of the above. We can talk about the mail box concept another time. I want to type in a message. This is the message information check list. She simply selects from the list on a number pad on the right, determining what the segment is and the piece of information that is in that segment corresponding to that list. If she wants to read something back, she gets temporary information about the person's whereabouts that will normally turn up in here. I can classify calls, and classify them by emergency routine and their disposition will automatically be taken into account, based upon how the operator classified that call. It may be an automatic call at three o'clock in the morning, I have got to get somebody at home. It may be a broadcast call to 14 different people because of the nature of the call.



Do you mind a little bit of commercial? These four units in the middle comprise the system built by Delphi. Every circuit board and every chip in there was put in with loving care. These are air conditioners and tape drives, and the rest of it is almost irrelevant.

Because of the shortness of time, first, since his critique on the human engineering of the ADAM system was so devastating, I would like to ask Mr. Fox to come over and do the human engineering for us for the operator interface. We think that it works reasonably well. She cannot make up her own nouns or verbs, I'll tell you that. In fact I should like to invite all of you to come to San Francisco. It is a lovely place, I can attest to that. I should like to extend an invitation for you to come and see it in action, taste it and see what it is really all about. It is real.

DELTA BENEFITS

- ANSWER ON SPECIFIED RING
- MESSAGE INTEGRITY
- CONVENIENT ACCESS
- REDUCED LABOUR COSTS
- TAS/AM
- DICTATION
- VOICEGRAM

As a matter of fact, Pacific Telephone Corporation's own headquarters are now having their phones answered by that system whose picture I just put up on the board, because they have come to the conclusion that they do not know how to answer the phone. I kid you not! These are some of the details of it. There are a couple of buzz words up there — TAS and TAM. TAS is with an operator, TAM is without an operator. Dictation — all I have time to say is that it is absolutely superb; it is all you have ever wanted on dictation. Your operator can control the replay of that dictation using voice commands, no pedals, no hands, keeping her hands on the typing line. It is what dictation should be. Voicegrams — suppose I have a telephone call that I want to place to Los Angeles, say at 12 noon today when we took a break, telling them when I am coming home. Anybody that I know in Los Angeles who would have taken a call from me at that hour in the morning probably would have ripped my head off. What I could have done was to place that call, determine what time I wanted it placed, dictate the message and have it delivered automatically at a specified time, saying, "I will be home on such and such a flight. Please be good enough to pick me up."

SUMMARY

CHANGE/GRACEFUL EVOLUTION

COST EFFECTIVE

ACCEPTANCE/USER BENEFIT

APPLICATION EXTENSIONS

- DICTATION
- TEXT EDITING
- ELECTRONIC MAIL
- FILE SYSTEM
- FACSIMILE
- MESSAGE SWITCH

In summary, in terms of office automation which is one of the things that we have been talking about today, it is change. It is rapid change, but it is a graceful evolution. You are not forcing people to change significantly the work environment or how they do things. It is cost effective, although I cannot go into the details in the time left. Most importantly, there is acceptance because the user gets his user benefit on a moment to moment basis. He gets the gratification from it, because it does something for him personally. Learning how to type may or may not do that. Taking the word processing pool and removing it from him may not do that. This gives him day to day satisfaction. Then there are the application extensions. I wish that we had time to get into some more of them, but I am afraid that I must stop at this point. Thank you very much, gentlemen.

COX: We have time for one or two quick questions from the floor.

QUESTION: How big is the system?

STOFFER: The system at the moment has the capacity for operating 32 independent processors, each operating at 7½ million instructions per second, for an aggregate of approximately 250 million instructions per second. The software, the operating system that goes with that will enable us, when we can handle the speed of light problems that exist, to go up to about 128 independent processors of that or greater speed. It could handle 20 pairs of 300 megabyte drives. It can skinny down to an eight or ten processor system, with a couple of disc drives on it. So when I say that it is expandable it covers a fairly broad range.

QUESTION: I meant how many instruments, telephone connections will it handle?

STOFFER: That is simply a function of how many of those concentrators we hook up to it. I can put 25 physical concentrators of 640 lines each on the system. That is its maximum capacity at the moment, but it is a fictitious capacity. It is possible to have 1500 simplex voice contacts at one time within the context of the system in a maximum configuration. I have not found a particular need for that yet.

We are not building a PBX, I want to make that abundantly clear. It has all the functions of a PBX, but that is not its main purpose. It is going in many other directions.

COX: At that point I am afraid that we must close the session and, if you have further questions, leave you to discuss them tonight over dinner with Jay. I might say that our own research team in the States were very enthusiastic about what they saw. It is real. It has many of the advantages claimed for it. I think that many of the implications are very important to the way that we regard this whole question of telephone communications. Jay, very many thanks for coming across and giving us that most exciting look at your system.

MAINFRAME PROCESSORS – NEW OPTIONS FOR THE USER

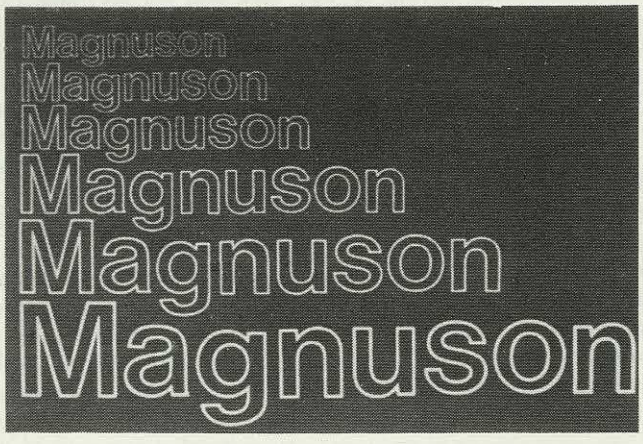
C. G. Amdahl
Magnuson Systems Corporation

Carl Amdahl is Executive Vice President of Magnuson Systems Corporation. He previously worked for Advanced Memory Systems (now Intersil), E M & M, Fujitsu Limited and several other companies. At W M Brobeck & Associates he was responsible for the final development of a point of sale system, subsequently produced by another company, for McDonald's restaurant chain.

Mr. Amdahl graduated from the University of California at Berkeley with a BS in Computer Science and has completed UC's course requirements for a PhD.

COX: In a field controlled, moved and driven by such forces as IBM, AT&T and Exxon, it is very reassuring that we still get our equivalents of the Freddie Lakers and we can still get individuals making a big impact. No name brings this home more in the computer business than that of Amdahl, with Gene Amdahl offering new machines which compete with the largest computer companies, at the high end of their range; and at the opposite end of the market, Carl Amdahl's company, Magnuson.

We are very pleased and privileged that Carl Amdahl has come across to talk to us today on what his products are and what his company is offering. I might say that this is the first time that he has been induced to come to Europe, to describe his plans and products. It gives me great pleasure to welcome Carl Amdahl.



AMDAHL: Good afternoon, ladies and gentlemen. My name is Carl Amdahl. I am the Executive Vice President of Magnuson Systems Corporation, which is based in Santa Clara, California. This afternoon I should like to talk about the plug compatible manufacturing business, specifically that of replacing the IBM compatible machines; about my company, Magnuson Systems, in particular; and end with a short conclusion talking about some of the impact that we expect to have on IBM and the impact that we expect them to have on us.

First, for those of you who are not familiar with the plug compatible business, I should like to talk briefly about the market place and about the current environment in which we operate. Plug compatible manufacturers loosely shortened to PCMs, generally market against new IBM machines, primarily the 370 and 30XX series machines, the used 370s and the used 360s. As such, it is a rather volatile market, going up and down as new products are introduced and new developments occur.

The market place for 360s and 370s is a vast one. In fact their performance ranges that we typically have to deal with are on the order of 50 times from the smallest machine to the largest machines currently offered. As a result, there is a great demand for products of varying natures, capacities, performance and so on. The pricing of these products follows roughly the performance which they offer.

The installed base of these 360 and 370 machines, if one includes both software and hardware, is an indeterminate sum, but obviously in a range of many billions of dollars. No one can really put a precise figure on it. I have heard numbers like $200 billion, I am not sure whether that is correct, but it is certainly a larger amount than I would ever like to shell out of my own pocket.

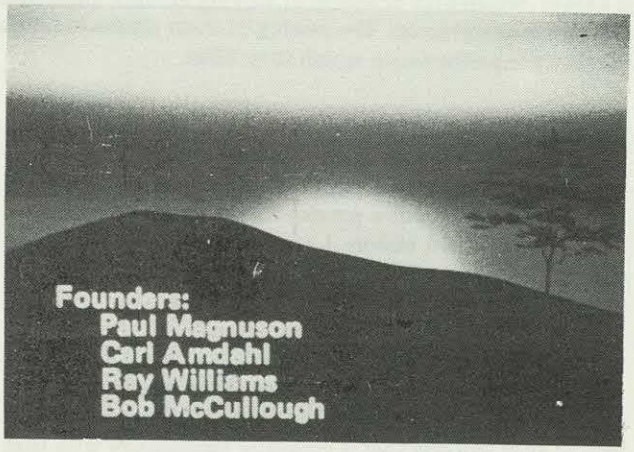
One of the main features that we offer on our plug compatible machine is a better price/performance ratio than that of IBM and one that is generally competitive with that of the machines available on the used machine market. This is the primary selling point of any of the plug compatible manufacturers. Other features include added performance, added function, remote diagnostics and things like this – features that are nice things that the customer would like to see.

Briefly, there are a number of choices available in today's market place that one might consider as an alternative to an IBM processor if one does not wish to leave the IBM fold of software products. These companies include IBM itself, that is always around. Itel is marketing what it calls its Advanced Series, which ranges from approximately that of 1.5 times the 370/138 performance up to their AS/6 line which is somewhat more powerful than a 168 or a 3032

machine. There is National Semiconductor which is currently not offering products of its own on a retail basis. They generally market to Itel Corporation. They produce the AS/4, the AS/3 and the AS/5 machines that Itel, in turn, markets.

Control Data Corporation has its system. There is Amdahl, my dad's company, which is primarily going after the high end of the 370 market, offering a V5, 6, 7, and now the newly introduced V8 models. There is Two Pi, a relative newcomer in the industry, which is primarily going after the low end of the machines, generally the 138 class and below. Finally, there is Magnuson Systems, which I represent. We are currently marketing 138 and 148 class machines.

This is a view of Magnuson Systems just to show you that we really do exist. We really do have a building in Santa Clara.



We were founded in January 1977, so we are a relatively young company. The four major founders were Paul Magnuson, the president; myself; Ray Williams; and Bob McCullough.

We were financed through a combination of the original founders, then joined in by some venture capitalists and, finally and most recently, through Thurtell Camera and Instrument, which currently owns approximately one-third of our company.

Work began on a prototype system in January 1977. This was an engineering prototype. We built this to prove to investors that in fact we could build a machine that would be 360/370 compatible and would gain us some measure of viability as a producer of central processors. We had to do this because the costs of actually building a prototype model that we could produce effectively and sell were well beyond what we were able initially to get together.

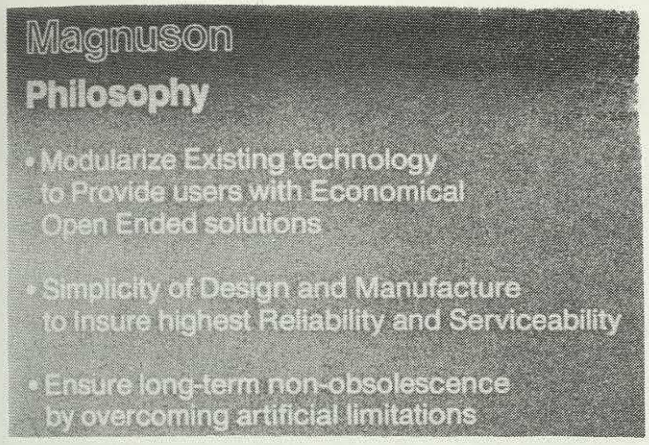
We started in January on this prototype and we completed it in October of that same year. In fact what we had built was a 360 compatible machine which was fully operational at the end of the nine or ten month period. It is being utilised today, running approximately 15 3270 CRT terminals under the IBM OS/TSO operating system. We have used it ever since we got it running as an in-house data processing system and, until recently, it has supported all of the internal DP activities.

We are currently delivering two 370 compatible machines — the M80 Model 3 and the M80 Model 4, each of which offers approximately 1.2 to 2 times the performance of the competing IBM models, the 138 and 148.

Our objective at Magnuson is to become a major supplier of computer systems. We are not interested in becoming an OEM manufacturer. The purpose of our company was really beyond that of just making money. We wanted to prove that someone could do an IBM compatible machine in a very different way from that which IBM has used. We saw that there were a number of very large gaps in the market place. For example, the industry has got to a point where, when you need to expand your system, you generally replace the machine that you have in-house. The whole offering of computers goes along these lines, that leasing companies can provide you short-term alternatives to buying a new machine — all of the problems associated with having to buy and sell, replace, and temporarily lease machines, in order to trap the growth or demands that you place on your computer system. It is a very difficult problem.

We started out with what I would call rather modest objectives from a technical standpoint, trying to build a 125 to 135 class machine. This machine should be upgradeable somewhat, maybe to a factor of 2; so that we could first build a small machine and then, as our customers grew up, we would offer them an enhancement. But they would never have to replace the machine that they had originally purchased. It would become an investment that they could keep and add on to as time went on.

Well, as we got into it, as all engineers know, your dreams get a little larger. As you get a little more money you get some new engineers who all have their own good ideas. What we eventually ended up with was a 148 class machine that we had to tune down and market as a 138 in one alternative, and market it straight across as a 148 on the other hand. At any event, our objective was to become a major supplier of machines and to become independent in our own right in the United States, marketing and servicing the machines that we produced.



Our philosophy here is to modularise the existing technology and to provide users with economical, open-ended solutions. By this, we mean that we are not going to put a lot of constraints on you. If you buy the machine it comes with the amount of memory that you tell us that you want; we do not say, "You can only have 2 megabytes of main store with this machine." We have resources in this machine to provide you with as much memory as a 370 can support, and that is 16 megabytes. The same thing with channels; we can supply you with from one to 16 channels in an IBM compatible mode.

Simplicity of design and manufacture was required to ensure the highest reliability and serviceability. Basically, what we are saying is that anyone can make a machine complex, over-engineered and clumsy. That was not what we wanted to have in our product, we had seen that enough in the market place. We wanted to come up with a simple solution. A lot of people talk about simple solutions; they seem to be more difficult to come up with than complex ones. I don't know why that should be so, but it seems to be some kind of natural law. Finally, we wanted to ensure the long-term non-obsolescence by overcoming such artificial limitations.

By this, we are saying that we do not know what will come in the future. We really do not have a good idea of what will be required two years, five years, let alone ten years from now; so what we want to provide is a machine that is engineered to adapt to new solutions as they come along, new technologies, new ways of doing things. We want to provide a machine which in a sense, like a chameleon, can change its colour. A number of people have attempted to do this. I am sure that many of them will survive and many will not.

What we developed to provide these features was what we called strategic architecture. It is an interesting term. I am not sure exactly what it means! It was developed by our marketing group. It allows the open-ended development of processor products. I think that what they are trying to get across here is that we have something that is a little bit larger than a box. It is an architecture. It is a way of putting things together. An architecture really defines the way that pieces fit together rather than what the pieces are themselves. I think that has been the primary goal in the development of this machine — to really work out how the portions of a machine should fit together and provide a computing resource. What do those interfaces look like? How should they be done so as to provide an upgradeable machine with the least inconvenience or expense to the customer, and to ourselves?

The solution that we came up with was the machine that we called the M80, which was 100% hardware and software compatible with the System 360, 370 and 30XX series machines. The machine is right there with the guys operating it. It looks like a console but that is in fact the entire machine. That is a 148 class processor; that was our engineering prototype. That is the background and a view of the data centre at Santa Clara.

One of the objectives also in this business is to provide a family of machines, not just one. I can outline the reason for doing this. It is because customers, no matter who they are, generally change their needs and requirements as time goes on. Nothing stays static long enough for a customer to ever be 100% satisfied with what he owns. So our approach has been to provide more than just a product — a family of products; much like the Series 360 and 370 were a family of machines. I believe that that approach of saying that one provides a spectrum of machines, with varying features and capabilities, has a lot to do with the success of that product line. I think that any plug compatible manufacturer attempting to compete in this field has to be aware that what he is providing is not a box, it is a solution to the computing problem; which means that it has to be growable; it has to be flexible; it has to tune itself to the users' needs. That is what we are attempting to do.

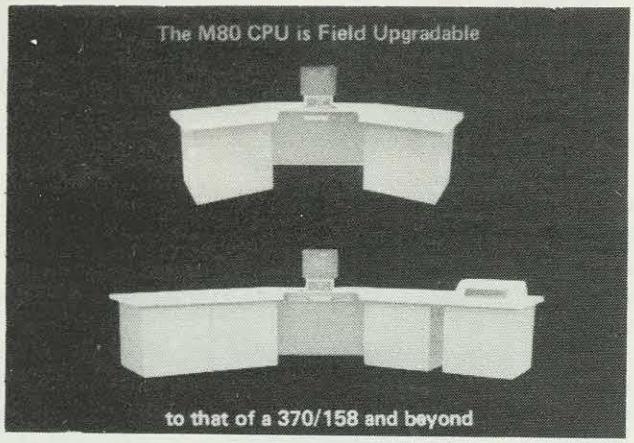
This is what we call the shopping list. It tells all the standard features that we offer, which IBM offers as well.

Magnuson M80

Standard Features

* 512K or 1 Megabyte of Main Storage
* Advanced Control Program Support
* Byte-oriented Operand
* 3 or 5 Channels Microcode Configurable
* 256 Unshared UCWs per Channel
* Channel Command Retry
* Channel Indirect Addressing
* Clock Comparator and CPU Timer
* Console File
* Control Registers
* Dynamic Address Translation
* Error Checking and Correction (Main Storage)
* Extended Control Mode
* Extended Precision Floating Point
* Interval Timer
* Machine Check Handler
* Program Even Recording
* Storage Protection (Store and Fetch)
* System/370 Universal Instruction Set
* Time of Day Clock
* Doubleword Buffer
* 16K (Bytes) Control Storage

The M80 offers what we would call unprecedented performance. There are machines that go faster, but I think that for this category of machine it does out-perform a 148. The execution time is from 20% to 100% faster than the comparable 370. Let me qualify this statement by saying that any performance measure is based on programs that are being executed, and generally speaking we do best on COBOL computational or I/O bound instructions.

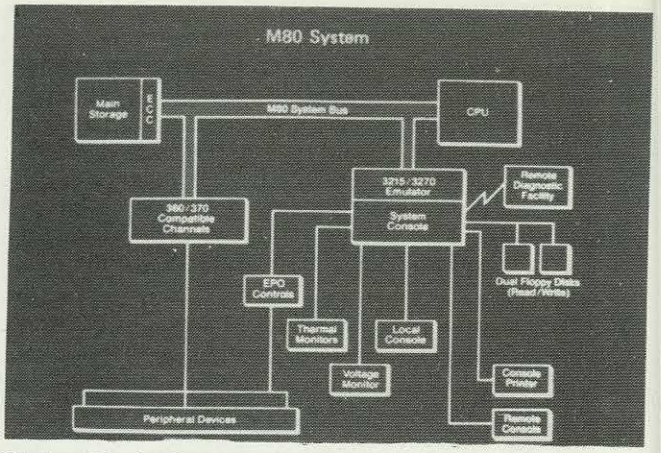


The M80 is field upgradeable. This is an important feature because it means that, as a customer of Magnuson, you do not have to be in the business of re-marketing your machine. Once you put it in place it stays there. On top is shown the smallest machine. I cannot tell whether that is a Model 3 or Model 4. Let us say that it is a Model 3, 138 class processor, to a 158 and beyond. We are currently delivering 138s and 148 class machines. The 158 is still an unannounced product, but will be announced shortly.

One of the unique aspects of the M80 is structural modularity. It means that all the functions of the system are really categorised into sub-systems. We have taken the time to separate out the central processor from the I/O sub-system, from the main store system, from the console function. We try to divide these up into a logical set of functions so that we can then define a general interface to connect them all together to provide a total machine.

It makes it easy to add new modules or replace old modules to take advantage of technological advances. This is generally a fall out from this bus structured concept in that each of the cards are sub-systems in the machine, since it conforms to an interface that is predefined, and can be implemented at any point in time with a new or different technology as long as one adheres to that interface, as long as one generally specifies the way in which that sub-system should communicate or converse with the rest of the system.

Finally, we overcome the artificial limitations and permit an open-end expandability. By adding new features as time goes on — features which we identify as being key or important to the customer base — we can keep his machine going. We can keep it viable. We can add new features as time goes on. These can be in the form of hardware, firmware or software.

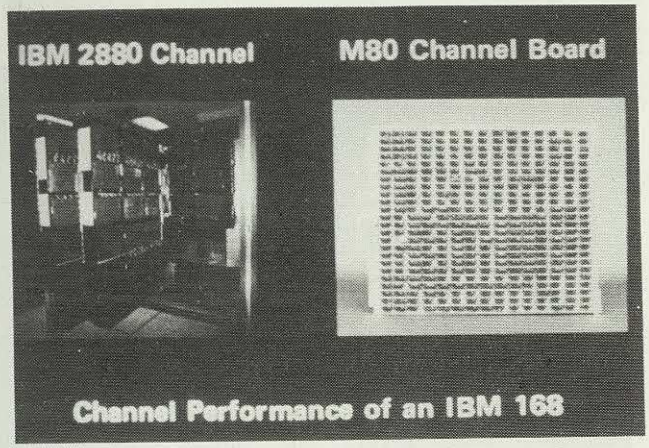


This is a block diagram of the M80 system, showing the major sub-systems involved in our processor. On the left top you see the main storage sub-system with error check and correction. Below that you see the 360/370 compatible channels connected to peripheral devices. In the right lower corner you have the console sub-system with the 3250 and 3270 emulator, which is really a very intelligent sub-system; it is one of the most powerful consoles available on a 370 compatible machine today, having smart emergency power off controls for the peripheral devices, thermal monitors throughout the system to check for overheating conditions, voltage monitors to make sure that all the voltages in the system are in correct tolerance, a local and remote console and console printers. We also have a remote diagnostic facility in which mode we can transfer over phone lines all of the normal functions of the operator's console. So we can, from Sunnyvale (the Magnuson headquarters), operate the machine and do things such as measure temperatures, measure power; we can power down the peripherals from Sunnyvale on any remote site, as long as the customer lets us by dialling up the Sunnyvale office. Finally, in the upper right corner is the central processor.

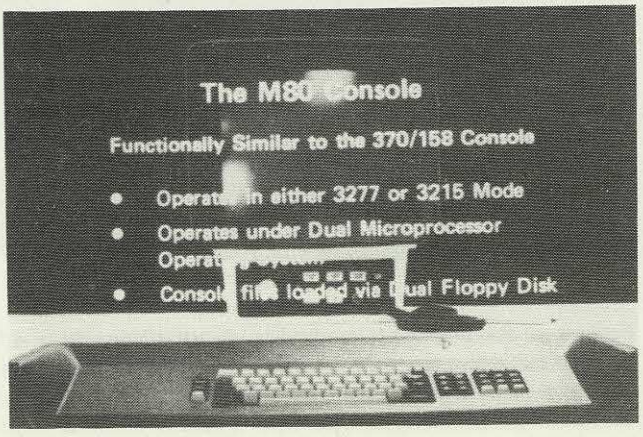
Each of these pieces is tied together with what we call the M80 system bus. It is a universal exchange for information between these major sub-systems. There is no discretionary wiring or extra cables between any of these pieces. What we really have is a single, integrated back panel and all of the cards fit on this back panel and are tied together via this system bus. So if one wanted to replace the central processor, one would merely unplug the cards and plug them back in. One can add to the central processor by merely adding in more cards, since there is no specialised wiring tying them all together.

This is a view of one of the M80 memory boards which utilises the standard 16K technology available quite readily today. That single printed circuit card holds ½ megabyte of main store with error correct. So we can build a full-blown 148 class system with four storage cards, having a full 2 megabytes of main store.

Again it is expansible. On the right-hand centre section there are some thumbwheel switches which allow us to relocate that card in terms of memory space that it requires. If a memory component fails, this allows us to dial that section off; which is very important to the customers because memory failures are one of the more common things that we see in the field and it can bring an entire system down. You do not want to have to power down your system just because a single chip has gone out in your memory sub-system. So this allows us to reorganise main store without causing an outage.

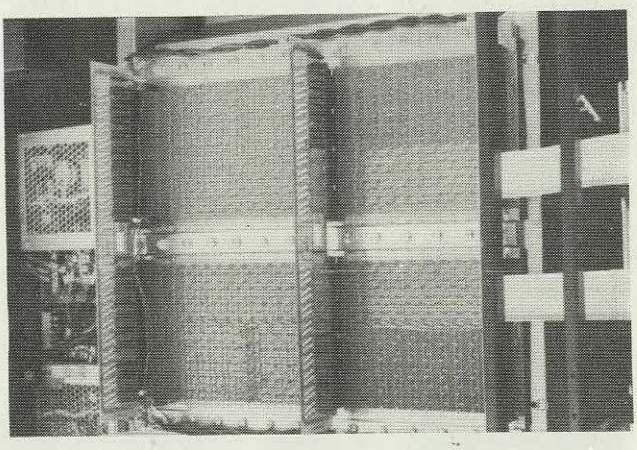


Our channel is 370 compatible. For those of you who are familiar with the 370, there are three modes of operation of a channel which connects the central processor to the peripheral. The first is the block mode. Then there is a selector mode; and finally, the byte multiplexor mode. IBM market a 2880 channel which is a self-contained, stand-alone processor which emulates a 370 channel. As it is shown on the left, each of those bays is 5 to 6 feet tall. There are several swing out bays for one 2880 channel. That is our channel on the right, implemented on a single processor card in standard TTL technology. It does all of the functional things that a 2880 channel would, at approximately the same speed.



The console that I talked about earlier is similar to a 158 console in terms of the functions that are performed. This is particularly important to the user, because re-training one's DP people is a rather expensive chore. Even in the 370 field there are a number of differences in the way that the machine is presented to the operator: switches are in different locations and they have different meanings. So we chose to standardise somewhat around an available 370 machine, roughly in our performance category which we chose to be a 158. It operates under our own dual micro-processor operating system. The console is implemented with a pair of Motorola microprocessors so that if one should go out the other can take over, and in normal mode of operation when they are both functional they share the processing load of the console.

The console itself downloads the machine in terms of its microcode from floppy discs, so that one can exchange microcode sets for emulating different instruction sets or adding features, merely by changing that floppy disc from the console.



This is a view of the back panel of our machine. This back panel is where all of the processor exists. The processor, the channels and main store, and an interface for the console, though not the console processor itself, are all resident in this chassis. It is rather small. In fact that one box will hold 4 megabytes of main store, eight channels and a 158 class central processor.

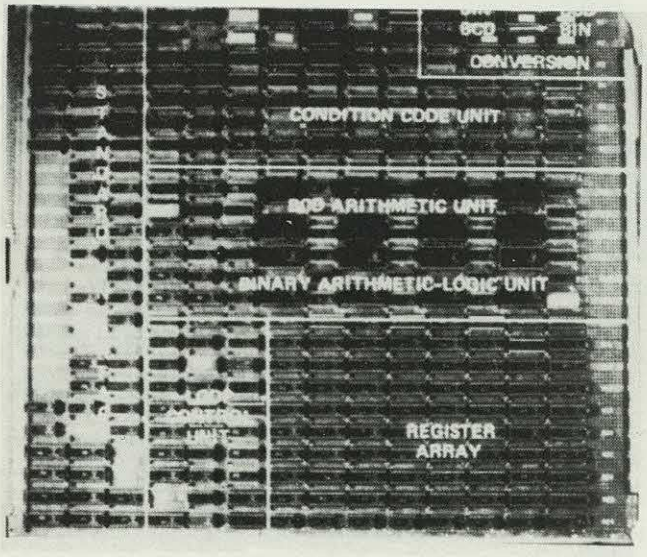
The organisation of the machine roughly follows the structure of the box itself. On the lefthand side we have the section for I/O channel. In the centre we have a section for main store, and on the right hand we have a section for the central processor. You can see each of these sections is delineated somewhat by differences in the interconnections between the various sections, though you will notice also that down the centre we have one single bus which winds between the various pins on the back panel.

This is the physical system bus which ties each of the major sections together and all data and control is passed across this central bus. In each of the three major sections one can physically remove the cards, shuffle them and put them back in without affecting the performance of the machine. It keeps running. The cards do not care which slot they are in, as long as they are in the proper section. One of the reasons that we are able to do that is because all the wires on the back panel are straight. Pin 13 of this card is connected to pin 13 of that card: 13 to 13 to 13 to 13. There is no cross wiring on the back panel whatsoever.

This is one of the key features of our machine because, as long as one has a back panel that defines what cards should be in it, and you have set a constraint on what that machine can be. You have predefined what those wirings have to be. So our machine is probably the truest of the bus structured machines available today. If the central processor itself is implemented in the same fashion, each of the PC cards that make up the central processor is tied together with a pair of buses, internal to the central processor. All of the cards in the central processor have this interface that ties them together and they are all identical in that interface. So the central processor as well as the major sections in the machine adheres to this bus structure concept. This is one of the things that allows us to upgrade the machine over time, as new things become available.

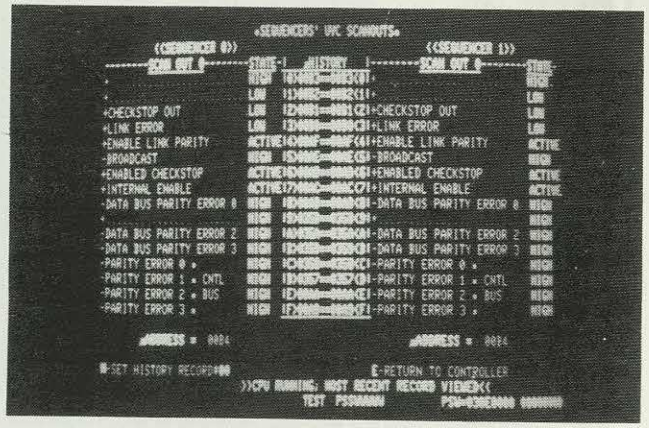
From this picture you can see every major cable in the system. This ties to an auxiliary chassis which we are currently using in this particular box. There is one cable at the top which takes you over to the other side of the console and thus gets you to the microprocessors that run the CRT. Then we have power supplies here; there are two power supplies in the system and some fans up at the top. All of the connections for I/O, which are not shown here, are merely little cables that plug on to these pins, each one of these slots representing a single IBM channel.

On the other side of the chassis, if we were to open it up, you would find that there are no cables on the other sides of the printed circuit cards, so one can exchange a card merely by opening the back door, pulling a card out, putting it back in. It takes about 15 seconds.

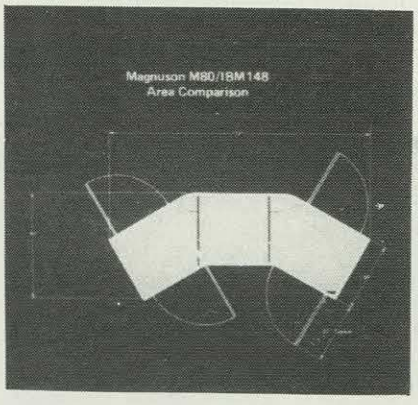


This is a picture of one of the cards in the central processor. This is the arithmetic logic unit which we took out. We have the edge connectors with the pins that I showed on the previous slide which makes all the interconnections between the central processor cards. All these pins make all external connections. We have what we call the standard interface, which is a set of chips on each card, identically replicated from card to card internal to the central processor. This set of logic in fact determines the architecture of the central processor because it defines certain bit fields and the control words that are assumed to be present on each card in the system. It then provides the timing and control interface to the rest of the cards which the engineer is allowed to define in order to produce a machine of some particular type — in our case a 370/148. So this being the arithmetic card in the system we have a register array for holding some temporary data within the machine. We have some loop control units for doing DO loops and an interactive structure; BCD and binary arithmetic logic sections; condition code unit for generating 370 condition code; then some conversion look up tables for converting various formats of data.

As I said, our console is extremely powerful in what it can do. It is not tied to the system via a set of hard wires or cables, it merely plugs into the system bus and communicates to the central processor in a relatively soft fashion. Because of this approach we are able to diagnose problems at the individual card level. We can run routines in the console processor that will communicate with the rest of the system and indicate to us if errors occur and hopefully isolate them to the failing sub-system. For main store we do fault diagnosis to the chip level.



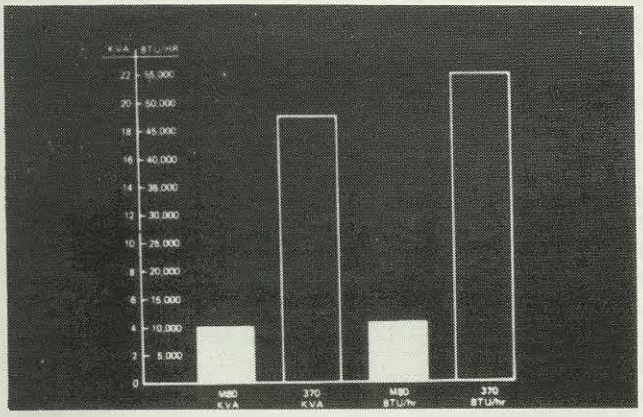
Since we communicate with the central processor in a fairly soft fashion, we also have the ability to get information in and out of that central processor for diagnostic checks. This is another one of the pictures of an actual display on a machine. This one is checking the processor itself and shows some of the status in the machine. If there is a parity error it shows the last micro-instruction that you executed before you stopped and, if you had failed at some point, it provides you with some indication of what went wrong.



Several of the goals that we had in doing this machine were to provide a machine which had minimum constraints on power, cooling and space, because these seem to be things that come in short supply and many times are reasons why

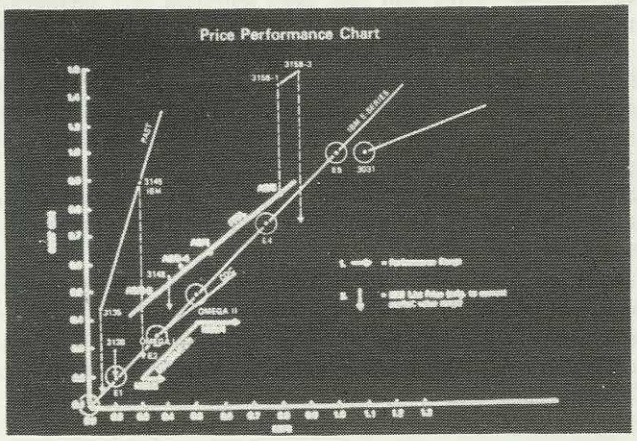
a customer is forced to exchange machines. They are just taking up too much space for the processing power that they provide.

We used T^2 technology rather than ECL, which is the choice of most other machines generally because it is fast and you want a little more flexibility in the way you do things to achieve a particular performance level. But because of the technology that we chose we were able to implement a machine that had a far better power in terms of thermal dissipation to performance ratio. I believe that they are comparing a 148 versus the M80. I guess this is a 138 and that is a 148.

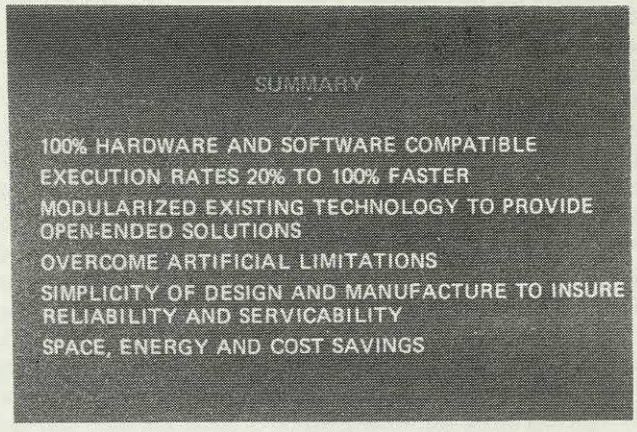


Again, because we try to be efficient we can justify to the customer that he will save money. It is not some pie in the sky thing. These calculations may not be relevant in England; in the United States they are pretty close. In general, for the 148 the average customer can expect about $6,000 to $7,000 savings per year just in energy bills because it uses so much less power.

Finally, performance, something in which everybody is interested. It is difficult to market a machine which does not compete with IBM. Generally, you want to go faster or at least as good. So we provide a machine which basically will marginally to greatly outperform the IBM counterpart. That is what we have in the Model 3 to Model 4.



This curve primarily shows the relationship in terms of current selling prices, which are always in flux, of how our system fits in with some of the other plug compatible vendors available today. We have the new IBM pricing line which we expect to see with their newest announcements; the Itel series; the CDC Omega series; and our machines down here. Obviously this is showing that you should buy from us.



Finally, our machine is compatible with the 370. We have proved this. We have a machine installed which has performed well. We have run virtually every operating system that IBM has out, connected to virtually every peripheral that IBM has out. We have had a few problems which we have corrected, and right now we are going great guns. Our execution times are better than IBM's for the competitive machine. We can modularise, that is we can upgrade a 138 to a 148. We can downgrade as well. We have overcome the artificial limitations that IBM has given its customers. You can only have 2 megabytes on a 148, no more. On our Model 4 you can have 16.

We have tried to simplify the entire concept of what a machine is. We have tried to do away with these twisted pairs and cables running everywhere. Those are sources of problems. Who needs problems? We have tried to reduce the physical constraints on a machine — the energy, the cooling and all that. That can all be simplified.

Down the road we have a few other things up our sleeves, which I will tell you about now. One of the things is that replicating processors for error checking is an important feature which is, as of today, only being initially explored. We have tandem computers with their multiple non-stop processors. All that stuff is really nice, and I am sure there are a lot of markets for it. But one has to realise that the 370 software, the impact of it, there is just so much software that you cannot ignore that when you are making decisions about machines. Customers who already have 370s in place are not likely to want to change. So what can we do for them in terms of redundancy? What can we do for them in terms of non-stop computing?

Our solution follows the line of the bus structured concept, which says that if all the signals that tie the machine together are available on one back panel, it is a simple matter to replicate cards that are identical and have one in a 'dummy' mode comparing all of his generated results against his active counterpart, actually voting every minor step of the machine. Did that other card that is the same as me get the same result as I did? If not, stop the machine and we'll go into recovery mode.

The M80 architecture supports up to four copies of each central processor card, so one can truly have four copies of each card co-resident in the system, dynamically voting

their results. If there is a miscompare generated, the console can dynamically effect reconfiguration of the machine to swap out the failing card.

Another thing that our machine has is the capability of adding hardware and leaving it in the box so that it is not currently active. Picture if one were running a shop with a Univac machine, and they wanted to migrate to the IBM class machine. But they did not want to do it, bang, today; they wanted to convert, phase in new programs, slowly, and not make a lot of havoc in a DP shop. We can offer a solution to that as soon as we come up with our other emulators which we are currently working on in the development phase, so we are not committed to any particular one. We provide hardware for emulating the other machines, as opposed to the classical solution which is, "Well, we'll just give you new microcode. We'll send our programmers away for a month and they'll come back with a Univac emulator." It does not really work that way.

If one looks at the way one builds emulators, there always will be a hardware/firmware trade off in any machine design, because there are some things that are done that are done better in hardware and some things that are done better in firmware, and also there are some things that are done better in software. What our machine really allows is to make that trade off constantly, constantly to be able to announce new hardware that can integrate with your existing system, that allows you to move that line. So if I wanted a Univac I do not have to go out and do it all in microcode, I can say, "You've got to buy these five cards that will plug into the existing system and use new microcode. But that machine will be as efficient at doing its job as the Univac machine you used to have. You do not suffer in performance." That is our philosophy on emulating other machines, and I believe that it will be a very viable one. I think that it will be a lot more viable in the market place than straight microcode emulators.

Finally, microcode itself, which is something that all of us are hearing about, listening to the new IBM announcements. What will we do about microcode? The structure that we have adopted in our machine is very simple. We have tried to make it as understandable, as close to a mini in terms of programming at the micro level as possible, so that in response to IBM's announcements we can quickly come up with our solution. We believe that we have the most easily microprogrammable machine around. We have brought programmers on board, had them studying for about a month, and then actually writing instructions in microcode for the emulation of IBM instructions. They have been very useful.

Now I should like to talk about IBM as a competitor in the market place. IBM is a very good competitor and very adept. They have set up a market place where they really do dictate the terms of competition. They have set up their own standards and every competitor is virtually forced to compete in the same way as they do. One has to have a service organisation which basically looks like IBM service. One has to market the way that IBM markets. The machines have to be compatible.

The question that is most often asked of me, and I am sure of most of the other people in the PCM business, is, "What are you going to do if . . . ?" There are always a lot of things. "What are you going to do if IBM lowers prices?" We will go through a few scenarios now before I close.

Lowering prices. Yes, IBM can really lower prices. They have very good ratios of manufacturing cost to selling price. They make money, there is no doubt about it. They are also very conscious of the bottom line. IBM is a company run primarily by financial types and I imagine that they are not going to worry a whole lot about saving face if they are making their return on their dollar. But again they may want to compete. So what will they do? We guess that IBM will probably do some rebundling of their profit centres. Hardware prices will drop; software prices will go up. So IBM can play the 'shell' game; they take the profit. The profit is always the same, it is just who is paying for what.

That is great for IBM. We can compete in that arena as well. Our machine costs so little to produce; I'll be frank with you: it doesn't cost as much as we sell it for! We are going to stay in business. If you look at the things that IBM can do with pricing, it is rather like you push down here and something else pops up. IBM will push down hardware; the software prices will go up; so we will see some more software firms sprouting out that offer some more software products to what IBM has available. If they lower the prices enough and they push down their leasing dates, they are going to mess things up. They will keep things roughly the same, that's my guess.

I think the incremental change is the name of the game for IBM in the next few years. Prices will erode but they will not plummet. Especially when one looks at the prices that the user is paying for his computer power, if one includes the hardware and the software, that price will be eroding but not dramatically. A factor of two is not unreasonable. I would not call that dramatic.

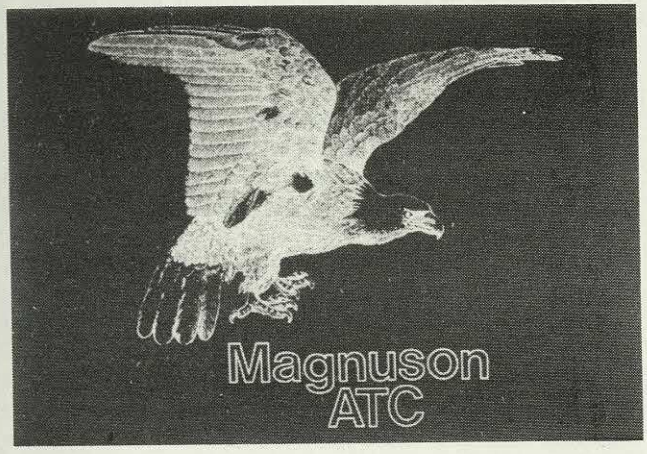
One of the things that we can expect to see from IBM is incremental additions to their firmware instruction set. Really what they are saying is, "You guys have got a 370. I've got this great new feature which you can plug into your machine and make it the newest, best. No one else can compete with this because they don't have it themselves." They will just keep peddling new features, and they will make them essentially free.

I suspect that what they will try to do is to provide the plug compatible manufacturers with a moving target. They do not give you enough time to look at the specs to come up with your own thing before they hit you with a new announcement. That is a very viable way of competing; it always keeps the competition off their feet.

There is no good answer to that. If IBM is dictating the compatibility level, they have the reins. It is foolish for any plug compatible manufacturer to say, "Hey, you guys, no problem: we've got the latest and the greatest too," because they will always be behind. How far behind is an important question. How long will it take each company to react to the new announcements? How critical is it for the customer to have the latest and greatest? Can he afford to last a year without this newest feature? I believe that many can. I believe that it is primarily a marketing ploy of IBM to tell the customer, "You cannot survive without this part. Just wait till next year. You'd better have it or else

you can't take advantage of our latest machine." It is a viable approach.

Magnuson's answer — and I think it is the answer that some other manufacturers will eventually come up with — is to provide a machine which is so simple to program at the micro level and so easy to add hardware to that you can attempt to track the moving target. You will always be behind, but you can keep up to a point where you are viable, where you can sell your machines in that market place that IBM defines.



I should like to introduce Magnuson's entry into Europe which is Magnuson ATC (Air Transport Computer). We have chosen to limit the scope of our marketing in Europe. We are a young company. We are not over-anxious at this point to take the big jump and to sell to everyone. We think that would be a little too much, too soon. So if any of you are interested in getting a Magnuson machine and you do not fly airplanes, I guess you will just have to wait a little while.

Are there any questions?

COX: Perhaps I might ask a question which is on the lips of a lot of people here: can you give us some idea of your market impact to date, what the growth of your installation base has been and how much of a dent you have made in the US scene?

AMDAHL: We have not made any dent at all, except for two machines. You cannot put that in percentages, it is too small; which is one of the reasons that we are in business, because we can market a hundred machines and not make a big dent, which is nice. We are relatively new, although we have delivered and customers have paid us for our machines, which is a nice position to be in. We are young, we make no bones about it. But we think we can do a better job.

STOFFER: What is the dimension of the processor card? How many layers are in it?

AMDAHL: I believe that the processor card — don't quote me too strongly on this — is 14 x 16 inches. It is implemented in 6-layer PC cards, of which two are power and ground. We do all of our printed circuit card layout with an internally designed automated PC layout system which we have developed for ourselves.

QUESTION: How is it that just fifteen of you are capable of building a machine in nine months which is comparable with the products of the giant — IBM? Something radical must have changed in the technology to make this possible.

AMDAHL: Yes. Things have changed, there is no doubt. I think that in any process of design and development, even though technology itself changes, new things become more feasible and easier to do, and so there are more paths to explore. There are more ways that one can go in implementing any particular machine. I think that one of the great things that I have found in working with the group of people that I do is that if one can throw away one's preconceived notions about what a machine should be, one can explore paths which make things simpler. If one says that one does not want to go the traditional route and do the machine in a traditional fashion but that one is willing to explore new ways in which it can be done. If one chooses to do things in a routine fashion, to look at what IBM has done and do them incrementally better, that is certainly an engineering task although it is not the task of an architect. I think that is what we have got together to do at Magnuson, to provide a new architecture. The time that we spent up front was a very creative period. It is not clear to me that every company where they could do a 370 compatible machine would want to invest in a fair amount of non-productive time up front, or take the risks that we took in our approach to building a 370. It seems to me that in many respects the pay off can equal what you put into it. It is not clear to me that everyone will make the same decisions that we made. I think that is one of the reasons why we were able to do it so fast, because of the talented people we had on board.

QUESTION: I have one question and a presumption. You talked about multiple copies of the same board, but you did not talk about multiple processors working concurrently. I assume that you could do that .

Secondly, what happens when IBM brings out radically changed equipment, for example, a new hierarchical storage sub-system which you have to attach? Can you attach that sort of thing to your machine?

AMDAHL: In answer to the first question, yes, we can have multiple processors. One of the problems in using a multiple processor voting scheme is that the interface is extremely complex, when one is doing it at processor level in terms of I/O activity and main store activity. We were not looking at this machine as being primarily three independent processors each doing separate, useful work and at some point checkpointing, we were actually looking at the complete, step by step redundancy approach. I believe that there is a place for both in various applications.

Software for a multiple processor system where they each perform useful work is a very complex business, and it is not clear that the things that IBM has out now to support that kind of environment work very well. So we chose the approach that would minimise the impact of the customer on software, which is at some level internal to the machine and not at the processor or 370 level. That interface is just

too difficult to maintain. That is why we took the approach that we did, so in fact our bus is able to support up to eight central processors and a console can talk to up to eight central processors independently.

In answer to the second question, what will we do if IBM announces a new storage sub-system, I do not know. It will probably depend on what the storage sub-system looks like. We have talks going on currently with a number of companies in the storage business — tape, disc, whatever — that are looking into that area, because that is primarily their bread and butter. I presume that what we would come up with would look something like what they would have. I am not sure if at this point we are willing to make an investment of that magnitude to develop such a product.

I have a feeling that we have a few years to market the product that we currently have, to build up enough cash reserve and cash flow to support whatever developments we will then need. One of the reasons for taking that approach is that one of the major areas in which we are marketing is the used 370 area. That will remain a fairly stable market through new IBM announcements. The profit margins may go up, depending upon what IBM announces and how radically it departs from the traditional 370 compatibility.

COX: On that note I am afraid we must draw the day to a close. I should like to thank Carl for a very stimulating presentation. It has been an interesting day and he has ended on a very high note. I should like to thank him on behalf of all of us and to wish his venture every success.

ELECTRONIC FUNDS TRANSFER IN PERSPECTIVE

R. T. Clark
Inter-Bank Research Organisation

Ron Clark is a Senior Consultant with the Inter-Bank Research Organisation — the policy research unit of the UK Clearing Banks. He has responsibility for identifying and assessing the banking opportunities and problems created by developments in automation, telecommunications and technology. His previous experience was in computer systems development and electronics.

BREWER: Let me welcome you to the second day of the Butler Cox Foundation Conference. My name is Tony Brewer. I normally work on the consulting side of Butler Cox, but I have been invited to chair this session.

Like the poor, the banks are always with us. After yesterday's sessions I was wondering whether the machines that we were told about will take us over altogether and, instead of having the cashless society that we have all heard about, maybe we will move into the moneyless society where the communicating word processors will keep a tally of our efforts and automatically credit our bank accounts so that when we buy our bread and butter they can be automatically debited. I hope not.

Here to put our minds at rest is Ron Clark.

CLARK: Good morning. I have come to speak to you about electronic funds transfer. It seems to be a very fashionable subject in that, whenever anything to do with technology or telecommunications development is mentioned, electronic funds transfer seems to creep in somehow. I continually read forecasts that in a few years cash will have disappeared and the sorts of scenarios that were painted a minute ago will have happened. I want to show you the reasons why that will not be so.

Most of the forecasts are essentially technology driven. They seem to be based on the argument that if these things are technically possible that is the beginning and end of it, and that these things will therefore happen. I do not think this is the case, and I want to try to show you why.

ELECTRONIC FUNDS TRANSFER

is the storage, processing, transportation and transmission of financial information in electronic form

The first thing is to start off with some sort of definition. There is no real definition of electronic funds transfer so I have made one up. This is chosen so that it is sufficiently broad. Electronic funds transfer is the storage, processing, transportation and transmission of financial information in electronic form. That covers just about everything I can think of. I do not want to end up in some sort of quibble about the definition. I think some banking purists, for instance, would claim that the SWIFT system is not electronic funds transfer because it does not transfer funds, it purely sends instructions asking other people to transfer funds. But that debate is sterile. I think this definition covers everything I want to talk about today.

It is not really a subject in its own right. It is a question of techniques relating to automation in banking, and what we should really be talking about is developments in payment systems because that is what the development really is. Automation comes under a number of hats and in a number of different places, and there is not one cohesive subject that you could call electronic funds transfer.

From a customer point of view what electronic funds transfer will do is to provide a diversity of service and a flexibility of service which is not currently available. The other thing about EFT is that the comments I make are mainly specific to the UK, but I think you can extrapolate them to any developed country. There are national differences, but with respect to the sorts of things I want to talk about here they are not very significant. We have potentially some sort of mid-Atlantic culture now in terms of payment requirements — certainly in terms of cooperative payment requirements where the logical developments in one country will tend to be very similar to the logical developments in other countries. I want to use examples mainly from the UK, but I do not think there is any problem about saying that they do extrapolate to other countries.

MONEY TRANSMISSION and BUSINESSES

cash flow, costs, charges

new business opportunities

new markets for suppliers

What I think I need to do is to ask: why is it of any relevance to business at all? Historically, methods of making and collecting payments have been rather like the drains — something that you must have, something that you must deal with. It costs you money but you do not look too closely at it. Historically, I think that is a reasonable posture because there was not a great deal of choice. You tended to have cheques, particular methods of making payments and collecting payments that customers accepted, and there was no great benefit in worrying about it; there were other major business problems to worry about. What EFT does is to provide a much wider range of options. Businesses will have to start to think about how they make payments and, more specifically, management services and DP people in companies will have to start to think about payments, because 'electronic funds transfer' means just that. If it is electronic it will tend to involve computing, it will tend to involve conversion to electronic media, transmission between systems and developments of that sort.

If we look at the first line, traditonally it has always been charges that companies have tended to worry about first. Negotiate a good rate with your bank. Try to get the bank charges down as far as possible. These sorts of things do not tend to involve DP people too much. It tends to be the treasurer's department, the financial director or somebody of that sort who deals with charges. EFT means that charges are less significant. Hopefully, it means more effective money transmission and more effective payment systems. Where the money can now be saved is on these two other items: processing costs, particularly exception processing which seems to be where most of the money goes. If you could have a payment system where, when you are getting in money you get it on the due date, you get enough reference information to know exactly who it is from and why he has paid it, and you know that you do not need elaborate procedures for chasing up money, that minimises the processing costs. Usually they are hidden. In my experience, in most companies those costs are not explicit, but they are significant and they are there. Cash flow as well. Payments do make a difference. If you have a choice you can make significant differences to cash flow. A lot of work often goes in chasing up creditors, looking at credit extended to creditors, looking at how we can leave our payments longer to debtors; but the float inherent in payment systems is often ignored. Again, EFT will give you more choice and therefore I think you should look at that sort of angle as well.

The other two I will touch on very quickly. There are business opportunities, and companies are finding new business opportunities in new methods of payment or payment related activities. If you are a business which is dealing with the public, you want your customers to be able to pay in as many different ways as possible. You do not want them to be reliant on the fact that when they come in and, say, want to buy a hi-fi, they have enough cash in their pocket. If they bring in £100 and they suddenly decide that they want to spend £150, you do not want them to have to go away and come back on Monday, you want them to be able to buy then. This is one of the reasons that I feel credit cards have been so successful, because they are really the only acceptable way of making payments over the current cheque guarantee card limit, where the funds are guaranteed to the retailer and it is very easy for the customer to make the payment.

A number of organisations are looking at payment as a means not so much of helping the customer to pay, but of actually getting them into your premises. You may have heard that Tesco is looking at issuing its own card. Marks and Spencer have an arrangement with Citibank. Citibank provides a special cheque book which has 'Marks and Spencer' stamped on every line where the payee's name has to be and which gives you some sort of credit facilities as well. This involves those organisations in considerable extra cost which is only justified because it gets people into their store. As you get more flexibility you get opportunities to increase business just by payment development.

The last one is that EFT involves a great deal of capital investment, a great deal of equipment and a great deal of telecommunications. I think anybody who is in the business of supplying that sort of equipment needs to be aware of developments and to be participating in them at a very early stage. Payment systems developments have a certain commonality across countries, so we are talking about a world market as well. We are not talking about something where you need a separate development programme for the UK and a separate one for the US. It will be a very large market. The figures are difficult to quote because you can choose any forecast from 50,000 terminals up to as big a figure as you are happy with. But there will be very large capital investment involved, and therefore fairly large new opportunities for suppliers.

I think that the case for businesses being interested in money transmission takes longer to make than that, but I think there is a strong case.

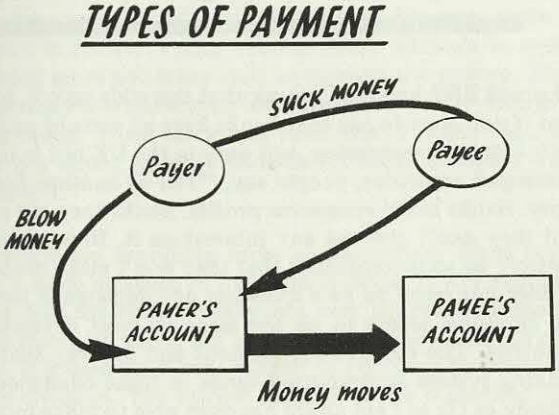
FLOWS OF PAYMENTS IN UK

To / From	Individuals	Businesses and Public Utilities	Central and local Government	TOTAL
Individuals	1%	41%	5%	47%
Business & Public Utilities	16%	23%	3%	42%
Central and Local Government	9%	2%	–	11%
TOTAL	27%	65%	8%	100%

I want to move on to the other side of the coin. The significance of this is that businesses are the key to EFT developments as well. This is from businesses to all other parties. If we exclude payments between businesses and individuals we end up with a figure which shows that 84% of payments are either to businesses or from businesses. These are non-cash payments. To some extent, that is not an unexpected result. There are not too many payments between individuals. You will notice that the figures for central and local government are fairly low. That is because there are still an enormous number of order books, pension books, and other means by which principally government makes payment to people.

But businesses are the key. Because they are involved in the vast majority of payment, if businesses do not accept new payment systems development then customers cannot use them. The cheque book or cheque guarantee card is useless to you unless you know that you can go into a shop, virtually any shop, and it will be acceptable. It is the same with credit cards. Any sort of payment development tends to be of this sort. Any sort of system which enables businesses to make payments better, or in a more convenient form, again has to be acceptable to business. Individual customers create the demand, but businesses have this almost passive growth. They have got to be prepared to accept it. They must see the benefits, otherwise you can do absolutely nothing at all.

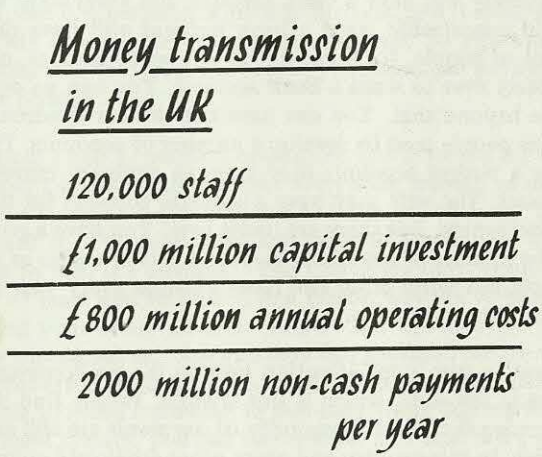
Banks cannot propose payment systems developments. I am sure that, as in all organisations, there are people who feel they can and would like to. "It's for their own good, we'll make it happen". But that is completely wrong. The first key to any development is business acceptance.



The point that I want to make is this: there are only two ways that you can make payments. Whatever sort of frills you put on there are only two ways: all payments start with the person who is making the payment. The key to any payment is that the payer has to authorise money to come out of his account, one way or the other. He has only the two variations: he can tell the person who holds the payer's account directly, "Pay money to somebody else." That is a credit transfer. I call it 'blowing' money out of the account. You push it out to somebody. Or you can do it the cheque way. You write down some sort of authorisation and you give it to the person to whom you owe the money, and he uses it to pull the money out of your account — to 'suck' the money out of your account. There really are only two ways, because in the end you want money to move from one account to another.

One of the most common frills is to say, "It's ridiculous my having to send an authorisation every month when the payment is the same." So the two basic forms are that you can give your bank a multiple authorisation, which is a standing order; or you can give the payee a multiple authorisation, which is the direct debit system. Again, there are only two possibilities. So EFT comes up in a variety of places. You get all sorts of terminals, but they tend all to resolve to this sort of simple division. Most EFT is treated the credit transfer way. The customer authorises the person who holds his account to push the money to somebody else, because technically that is much easier. You have all sorts of problems if you must have some sort of electronic authorisation that goes to the payee, who then has to use it to collect money. It is much easier if I communicate with my bank and tell them to pay money to somebody else. So virtually all EFT developments are of the credit transfer sort.

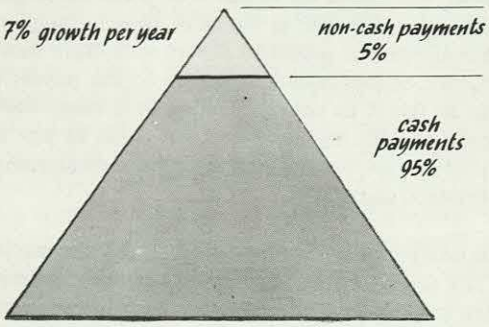
There is one problem. I tell my bank, "Pay the money to him." The money goes to him, but how does he know about it? There has to be a link. There has to be some mechanism to let the payee know. The money is no use to him until he knows that he has it. So you have an information requirement in that link. It must be good information; not only that you have £10 or £1 million, but who it is from, why he sent it and any sort of reference number. So that is often a major problem in any EFT development.



Let me move on and look at the situation from the banks' point of view; a few basic facts and figures about money transmission in the UK. It is a fairly large business because about 60% of the staff of the UK clearing banks — and the UK clearing banks are by far the predominant providers of payment services in the UK — are involved in money transmission, not in the banks' other activities. You have a fairly large capital investment, fairly large annual operating costs and a very large number of payments. We are talking in the UK in terms of six, seven, eight million cheques every day; and that does not include credit transfers, standing orders and all the other types of payments. There are millions of payments every day and the organisational problems become very large. These operating costs are principally staff costs.

It is a fairly significant, and to some extent parasitical business. There is no product. It is providing the oil to allow businesses to operate, and without a payments system very little can operate. Cash has such severe limitations, certainly for businesses, that without an efficient payments system you really are finished.

Demand for MONEY TRANSMISSION



If you look at non-cash payments on the figure, there is 7% compound growth a year. It is very steady. It seems to depend on virtually nothing; it just goes on and on and on. Part of it is new accounts but there are limits there. You are reading a situation in most developed countries where you can see saturation coming. That does not mean that everybody will have a bank account, but everybody who could conceivably want a bank account will have one. A lot of people, for a variety of very good reasons, are unlikely ever to want a bank account. You can go on a little beyond that. You can have the two-car syndrome where people tend to develop a number of accounts. They have a budget account; they have an ordinary current account. The wife may have a separate account for the housekeeping. But there are limits here. You have a growth in the number of payments that each person makes as well. People just write more and more cheques every year as it becomes acceptable.

I want to turn your attention now to the predominant thing in the slide, which is this triangle. People find it surprising that the vast majority of payments are still made in cash, in this country and every other developed country, even in the States. The figures in the States are slightly less, but they are still well over 80%. In these figures I have deliberately excluded all payments under 50p, to get rid of the trivia — the newspaper purchases and things like that; and you still have these sorts of figures. Non-cash payments are just the tip of the pyramid, the tip of the iceberg. This 7% growth tends to be as much because, as non-cash payments become acceptable, this line moves down very gently. The key here is that it shows how very far away we are from any sort of picture of the cashless society. In any developed country it will be a very long time before cash disappears. It is still overwhelmingly the predominant influence.

If we look at these figures, they are for the 5%. If you had 100% and you made the assumption, which is perhaps a dubious assumption, that there was no increase in productivity in banks, then the calculations show that you need about 2 million extra staff, about £19 billion in extra investment, and running annual operating costs of about £16 billion. The assumption is a little dubious because you would get increases in productivity, but not sufficient to make those figures any less frightening. Banks, like most companies, have capital liquidity problems; they do not have unlimited amounts of capital. Those sorts of developments would obviously take a great deal of time.

So we are stuck with this sort of situation for a long time. Scenarios which say that cash will disappear, we will all have plastic cards and there will be instant debiting and crediting for everything, do not make economic sense and are a very long way from the current position.

The Problems of MONEY TRANSMISSIONS

- charges don't cover costs
- payments don't create deposits
- current systems have limits
- customers are more sophisticated

Why will EFT happen? I think that this slide says it. I find that if you start to say that banks have all sorts of problems with money transmission, not only in the UK but in most developed countries, people say, "Tell us another funny story. Banks make enormous profits. Banks keep my money and they don't give me any interest on it. How can they possibly be so incompetent that they don't make money?" It does not seem to be a question of competence because the situation seems to be the same in most developed countries. The competitive element and the way that the banking system is structured varies in those countries, but nobody as far as I am aware has been able to make money transmission, providing payment services, particularly to the individual in the street, a profitable business. It is becoming less profitable and if we quickly look at this slide you can see why.

Charges do not cover costs. The facts and figures that I have given illustrate that very well: 2000 million payments a year, £800 million a year operating costs. The current charge for a cheque is something like 10p. So in revenue, in bank charges, even if you are paying bank charges — and a lot of people are not — then you cannot recover more than £200 million of that £800 million, so you have a big deficit there. What about all this free money? It used to be so, that little old ladies with large sums in their current accounts funded the average customer. Some people kept very large sums in their current account. Some companies did. That does not apply any more. People are tending to leave in their current account only just enough money to offset payments, there is no real surplus at all. That sum is fairly small. We do not really have enough money to make enormous profits by putting the money on the money market. So you still have the problem that you have covered some of your £600 million deficit but not necessarily all that much.

You also need EFT because current systems have limits. That is not to say that the current payment mechanisms are creaking at the seams and that they are just about to

collapse, but you have got to the situation where you have diseconomies of scale. There is a common misconception that banks have large branch networks, and people feel that in some way these networks are primarily associated with processing cheques or something similar. There is a large payment function in there. But what happens if there are two people in a small town, and one pays the other with a cheque? Say they have their accounts at different banks. That cheque will go to the bank of the person who has received the cheque; it will be processed there; it will be transported all the way to London; it will go through that bank's cheque clearing centre; it will come out as part of a very large batch of cheques which moves to the other bank's clearing centre in London; and it will be shipped all the way back again. The two people may live next door and the banks may be across the road from each other, but the technology and the logistics require this paper-paper movement. So we have the situation that every night the motorways are filled with Securicor vans, to get all those cheques to London. That is also one of the reasons why it takes three days to clear a cheque, because of the physical transportation problems. Those sort of systems have limits and when we are talking about millions of cheques a day, those limits are visible. It is not that the systems will collapse but you no longer have economies of scale, you have diseconomies of scale. Problems become more difficult to resolve; errors become more difficult to avoid; you need more and more staff to support the system. There is definitely a tendency to look for some better means of doing things. There are major problems in doing that, but there is a strong pressure to look for some different way of doing it.

Customers are becoming more sophisticated. What they want is more diversity in payment systems. It was explained to me that the cheque really is a very simple instrument. It has grown up and it has been the same for hundreds of years. It is used for a wide variety of purposes by companies and individuals. The nearest analogy is the statement by Henry Ford that customers can have any colour of car as long as it is black. Cheques are a little bit like that. They are made to do a lot of different functions and it is necessary to develop payment systems which cater more specifically for individual customer requirements.

So there are problems in money transmission and there is a need to change. I think that need is to make the business viable. The development in all developed countries tends to go along similar lines. The key has to be automation and technology.

TECHNOLOGY and MONEY TRANSMISSION

The technology already exists
to increase productivity
to improve current services
to create new services

The point is, however — and this is where the technology forecasts fall down — we already have the technology to do just about any development that you can think of. In EFT you do not have an infinite number of developments that you can think of. People make payments not because banks provide payment services, but because they want to buy things in particular places at a particular time. You do not have a great deal of control over that. The payment systems available to people may change them a little. But essentially if you want to buy a car you want to be able to go along to the showroom, or send a cheque in the post; if you want to buy a newspaper, your payment behaviour is nothing to do with banks, it is the structure of your life, the way you behave and the things that you want to buy. Most of the technology already exists, there is not a major problem there. Things like public data networks and cheaper electronics will have an impact; they increase the pressure. But I do not think that banks have to wait for those developments to make EFT happen.

When I say that technology is the only answer, again we are not talking about complete replacement of what exists now. You just cannot do that. What we are talking about is an increase in productivity of existing staff. Money transmission may not be a particularly good business to be in, but it is certainly a growth business; and it looks as if it will continue to be a growth business. So you want to make sure that your unit costs, your costs per payment come down.

Suppose I had a complete brainstorm and invented the ideal payment system, the one that everybody wanted to use. I rushed along to a group of senior bankers and said, "I've cracked it. This is exactly the thing that everyone will want to use. It's obvious." The first thing they would say is, "At least you've proved one reason why we've been paying your salary all these years." But the question that they should ask is, "Are you sure this payment service will be cost-effective in its own right?" because if you did get people to move from cash to non-cash, using this marvellous payment system, you had better make sure that it is a good economic proposition because you have an enormous reservoir and unless a particular payment system is cost-effective, unless it is something that the bank really wants to provide, then you are in dead trouble. Even the smallest loss multiplied by the enormous hidden reservoir is a major problem. So we have a situation where payment developments — and this is a personal opinion — have to be looked at as cost-effective in their own right; and that limits what you can do.

SPEED OF EFT DEVELOPMENT

customer inertia
need for cooperation
scale of development
marginal attractiveness
investment in existing systems

I keep saying that EFT development will be slow and will not happen just because the technology is there. I want to try to explain why. One of the major reasons is customer inertia. Payments are not a major problem for most people. They grumble about them, they mumble about them, but they would not be prepared to pay a lot of money to change. They would not be prepared to put a lot of effort into change. That is true of individuals and companies. There is not a lot of interest or a strong motivation to change. I think the motivation comes from banks, from the financial institutions, which need the change.

The need for co-operation is often overlooked. It comes back to businesses again in which 84% are involved. A payment system is absolutely no use to a business if you can only get money from customers who have an account with a particular bank, particularly in the UK where there are a small number of large banks. A payment system which works for only 25% of your market probably is not worth the candle. You need something which collects money from any customer who wants to pay you money, regardless of who he banks with. Similarly, when you are paying money the same logic applies. It is absolutely no use having something where I can pay all my employees as long as they bank with Lloyds, or Midland, or any other bank you happen to choose. The trade unions and the employees will say, "No. I've got a bank account but I don't like that particular bank." You have got to be able to pay money out to people, regardless of where they bank. So if you want to provide payment services you must co-operate. There is no way round that. To make the services acceptable there has to be co-operation.

There is a great deal of talk of cartels between banks. Obviously there is a lot of co-operation for a variety of reasons, but one reason which is very valid is that cheques would be of very little value unless banks co-operated. Any new EFT development, any new payment system development will need this co-operation as well.

As an aside here, I think that EFT will happen a lot faster in Europe for this very reason. In the States you have a very highly competitive, very fragmented banking market where co-operation is almost impossible to achieve. There is no history of co-operation; there is no mechanism for it; there is no willingness for it. In the UK there is some sort of mechanism for co-operation, as in a lot of European countries. The pressures are the same on the US banks, but I think that the developments are liable to happen first in Europe.

I think the application of technology is a rather unusual case. The experimentation may happen in the States, but large-scale, meaningful developments — and this is a personal opinion — will happen first in Europe.

I have mentioned before the scale of development. If you are going to install a payment system it must cover the country. It is no use if it applies only to some small region. People move about a lot. If you had a cheque book that you could use only in some restricted geographical area, it would be of very little value to you. So we are talking about national developments.

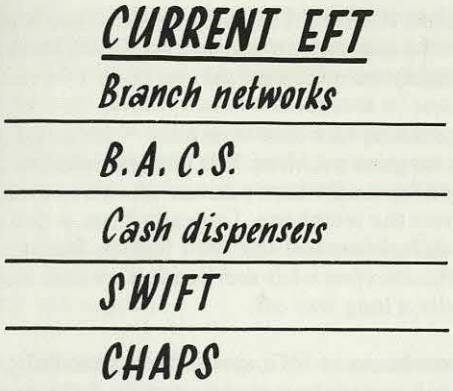
Let me take a specific example. Suppose we consider putting some sort of financial terminals in shops, where you can make payments. You have to talk about national coverage and, depending on how far down the market you go, whether you can include small corner shops, etc, you come up with a figure in tens of thousands of terminals. A figure from the air is about 50,000, which would probably be a reasonable figure; and that is a major development, particularly when you think that the banks' branch networks are considered fairly large and they in total have only 12,000 to 14,000 terminals. That is one particular type of EFT. It is a large development that takes a great deal of time. Unless you have a very large number of people involved, it will take 10 to 15 years to get those terminals in. It is not something that can happen in two or three years, it is something which will happen in a gradual way and over a fairly long period of time.

People are not prepared to spend a lot of money specifically to make payments. You see the phenomenon in bank charges. Whatever bank charges are, people do not like them. I do not like them. It is a natural reaction. Companies do not like bank charges. If you went along to a company and said, "Why don't you buy this computer so that you can have this super new payment system?" you would get a raspberry, quite rightly. You need to have a marginal argument. Electronic payment systems involving companies have got to use existing equipment. In my view, the key here is the development of public data networks, because EFT will involve a lot of communications. Virtually all the developments that are talked about are on-line authorisation of some sort, a link through to the customer's bank to get some sort of authorisation saying, "Yes, the funds are good. We can guarantee the funds." So there are a lot of communications involved. I cannot see how that communication will be built up except in a number of fairly specific cases, unless you already have public data networks and you have companies using them. Then it becomes a marginal cost to have some sort of call through to the bank's computer centre, go through an identification procedure, and make payments or receive payments. Until that happens I can see no cost justification. I cannot see any way in which it can be justified.

My view is that, certainly in the UK, a viable public data network system is still a number of years away. So a lot of potentially attractive EFT developments just will not happen until this infrastructure is there.

The last point is the usual argument. The investment in existing systems is massive. You cannot throw it away overnight. You certainly cannot justify a whole new wave of investment overnight. So another drag, another inertia. All these put together mean that EFT developments will take quite a long time. They will be very noticeable, even on a fairly small scale, people notice terminals in shops; but before there is a massive impact and it changes the way that people behave and make payments, I think we have to be talking in 10, 15, 20 years' time, not in the almost instantaneous terms that any technology driven forecast would tend to suggest.

Let us look at specific EFT. People talk of EFT as something that will happen, something that is about to happen, but there is already a lot of it about. In the UK, there are the banks' branch networks. They are fairly extensive, fairly stable now, and fairly well developed. We have BACS Bankers Automated Clearing Services). It is a common



service provided by the banks to enable businesses to make payments. They provide one magnetic tape, send it to BACS, which sorts out which payments go to which bank, reconciles the whole thing and makes sure that it all matches up. The establishment of something like BACS is an acceptance of this co-operative philosophy. Companies will not provide four or five different tapes, different formats for different banks. They need one point, post it in and the financial system sorts it all out.

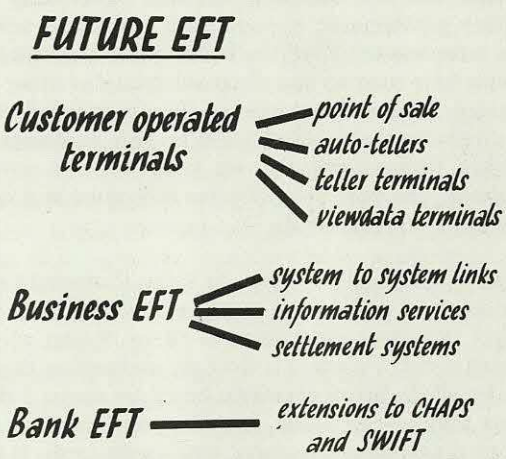
Most of you will be familiar with cash dispensers. They are still being installed at a fairly fast rate in the UK. All the banks are involved. It looks as though there will continue to be the development of cash dispensers in the UK. Interestingly, there was a fear when they were first installed that people do not like machines, particularly banking customers. They like personal service and they would not be very happy with these sorts of machines. The experience has been completely different in that people prefer machines. I do not know quite what conclusions you can draw from that, but you can get the situation where in a branch you have a teller position and a cash dispenser, and you can get a queue at the cash dispenser and nobody at the teller position. The teller may be an attractive young woman, it does not seem to make a great deal of difference, people still prefer the machine. In banking that has been a very surprising conclusion.

Some of the latest cash dispensers enable you to ask for your balance. There again, people would much prefer to be told that they are overdrawn by a cash dispenser than by somebody in the bank. They feel that if the cash dispenser tells them it is a secret, and the bank won't find out. It is that sort of logic. I can assure them that it is not true, but if that is what makes them happy . . .

The SWIFT system now connects banks in a number of different countries — about 500 banks — and enables payment instructions to pass between banks. That system is now operational and the volumes are building up fairly rapidly. There is excellent evidence that banks are developing good confidence in the system and they are using it for meaningful payment. They are quite happy to put in a payment for £10 million to some bank in another country, and not worry too much about it. That is confidence because it really matters if that sort of payment goes wrong.

There was a suggestion — I am sure it was slanderous — that in the initial stages banks put through only small payments from customers they did not like very much because they did not care whether they got lost. But that certainly is not the case now. Lastly, we have the CHAPS system (Clearing House Automated Payments Systems). That is the domestic equivalent of SWIFT. It connects banks in the UK and enables them to make payments between each other on an instantaneous funds basis. You enter the payment; you get it authorised at one bank; press the button; and the other bank receives instant notification. It replaces an existing system of messengers or bankers' payments which are essentially bankers' cheques, and a very manual-intensive, fairly clumsy system. That system is under development and will be in operation within the next year or 18 months, probably a couple of years.

So we have already quite a lot of EFT. What I want to look at briefly is: where next?



I have said before that there are not too many different flavours that you can have. They come in these three main categories: customer EFT, business EFT and bank EFT. Customer EFT means plastic cards, bits of plastic with a magnetic stripe on the back, identification number, and the customer being able to make payments, initiate financial activity of all sorts in a variety of different places. The ultimate is that you have terminals everywhere through which people may make payments — the point of transaction principle. People make payments in shops, garages, hotels; they still make some in bank branches; they make them at home. The instances that I have listed here cover those situations.

There are already point of sale financial terminals in shops. There was a recent press announcement that the UK clearing banks, which include the TSB, the Co-op Bank and the Scottish banks, have a full-time project team which is looking at the feasibility of point of sale development. There is a considerable amount of interest. It is a development which I personally think will happen. It is a development which I would suggest — and this is very much a personal forecast — we will see some evidence of in the early '80s, but it will probably be the late '80s before there is any sort of major development, again because of the size of the operation, the time that it takes, the problems of customer acceptance, and the problems of retailer acceptance.

Auto-tellers are just a logical extension of cash dispensers. Once you have a machine that provides one banking service, you extend it. These already exist. You can ask for your balance. You can order a cheque book. You can order a statement. In some you can make deposits.

There is no systems reason why those sort of functions could not be extended as far as you can think of. If you can find an extension that is cost-effective then it can be done.

The rationale behind teller terminals on the branch counter is that the human teller is often unable to provide instantaneously the service that you want. If you want to know whether a particular payment has been made or whether a standing order has been changed, she cannot do that. She has to trot round to the back of the office. She will be away for five minutes and there is a big queue behind you. Teller terminals are a means of providing her with the information she needs. But again card based, because the first difficulty she has, particularly with privacy problems, is: who are you? Should she tell you this information? Everybody can quote examples where people have rung up and obtained details of other people's account. It should not happen. In a system which is so diverse as the clearing banks' system it always will happen. Teller terminals help you with that sort of problem. The card identifies the individual and enables you to provide terminals.

I had to mention viewdata. As Brian Cartwright said yesterday, if you do not mention viewdata everybody thinks that there must be some funny reason why you missed it out. Viewdata is the only mechanism that I can see by which home payments could be made. I do not think they will be made, except in one specific case, which is payments associated with credit cards. It is for the co-operation reason that I mentioned before. If you make a payment and use a credit card, the credit card company has both ends of the transaction. It has a relationship with the retailer and a relationship with you. It is a private operation of the credit card company and it is something with which they can deal. They can decide what risks to take in authorisation and what sort or service they are going to provide.

If you talk about payments from one account to another, then you have all the problems of co-operation. To make the service viable, all possible participating financial institutions have to come to some agreement about security, about procedure, about how they are going to transfer money, when they are going to pay over the money. That is a major undertaking and, given the current status of the viewdata project — and again this is a personal opinion — it is one that banks would be very silly to undertake. If we had a situation where viewdata terminals were widely installed and used, it might become viable. But we have a chicken and egg situation because if you, as a mail order company, want to display your wares to people with viewdata terminals, as soon as they see something they like you want them to be able to pay for it. So I think there will be a pressure for payment systems, but it is a major undertaking, and it is purely this co-operation point of view that makes it a major undertaking.

I think all these things will happen. I have given rough dates for point of sale. I think the UK and Europe will lead the US in this sort of thing because of the need for co-operation. I was predicting that we will see something like point of sale in the 1980s. We already have auto-tellers. I think we will definitely see teller terminals in the early 1980s. The logic suggests that they will start to appear. The widespread deployment of them will probably take the best part of 10 or 15 years.

Credit cards on viewdata terminals — whenever you like. There is no great problem. It is conceptually the same as the current system where you can give your credit card details over the telephone. Logically there is not a great deal of difference, and that will happen fairly quickly. More extensive payment services in viewdata I see as being quite a long way off.

So we have business EFT, system to system links, which means bank system to customer system. I think we have to develop confidence both in the banks and in the commercial companies that this sort of connection will work. It does not have major security problems. I think these sort of links will come because companies need faster and more effective payment systems. You do need some sort of direct link if you are going to pass a lot of control information, if you want money to be transferred that day, when the current system tends to be very clumsy. You may have to go to your local bank branch, which telephones a branch in the City, which arranges for the transfer. Once you have started the process you have very little idea of whether or not it is happening. In my experience this is a major problem of customers who want money transferred. Once a bank starts the process and another bank is involved, it is very difficult for them to find out how far they have got down the pipe, where it is, and when exactly the money will get there. You need some sort of system link to enable that to happen, but I think the development will be slow, partly because it is not in the main cost saving stream for financial institutions and I do not think there are many businesses which would be prepared to stand the costs of such a system to system link. So I would see that as a development to be seen some time probably in the 1980s, but fairly late.

There are two sorts of information services. One is letting companies know the status of their account better. This is something that has already arrived in the US, of the terminal in the treasurer's office in a company. It comes back to my initial diagram about the two types of payment systems, where there is a need to tell people when money arrives in their account. The more EFT you get the bigger the problem. You may have the money in your account, but until you know about it you cannot do anything with it. So pressure develops for better information services to companies about what is happening in their account, particularly as treasurers' departments in companies become more sophisticated. They want to know if the money is there. They want to get it out. They want to get it placed somewhere overnight. As customers get more sophisticated and as EFT develops, those sort of things will happen. That is one side of corporate information services.

The other is that a payment by itself is of very little value. You need an invoice, reference information, details about the customer. If banks are providing EFT services then you can develop a concept which is very much like the value added concept in telecommunications. You can have value added payment services where the bank will take over some of the information flows which are not strictly payments,

but which are certainly associated with particular payments. The development of these services is more advanced in the US, possibly because of a slightly more aggressive commercial attitude and because these sort of services quite often do not require a great deal of co-operation between banks. The basic payment mechanism you must have; the value added ones you do not necessarily need to have.

I think they will come. I think commercial pressure will make them happen in the UK, but I would not like to predict when they will happen.

Settlement systems. If there are a lot of payments between a certain number of commercial organisations in a short period, it is mad to make individual payments. A lot of people still do. I think that you will get netting off between companies. If companies have to stand the real cost of money transmission services, I think they will look for other ways of reducing those costs. That has already happened with the Stock Exchange, which is probably the prime example, where you settle off between the commercial participants in some particular grouping and then the only bank payments are the net result. The concept is already enshrined in that statements are effectively that sort of mechanism — statements as opposed to invoices for particular payments. But you can carry that logic a great deal further. I have no idea when this will happen, because I do not know to what extent payment costs will become a significant thing to companies.

The final point is bank EFT, the CHAPS domestic service. There is a similar one called CHIPS, in New York. CHIPS came first and there had to be a name for the UK equivalent of CHIPS. It struck me that 'CHAPS' was a very English title to be the UK equivalent of CHIPS. You already have these inter-bank domestic systems. You have SWIFT providing the international links. I think we will see the development and merging of those. Again, the main constraint may be one of security, because it frightens the traditional banker silly — quite rightly. If you consider a situation where a bank branch network is connected directly to a computer centre, that computer centre has a direct link into CHAPS and there are also links to SWIFT.

The nightmare is that some little clerk in a branch cracks the system, starts transferring large sums of money through his terminal connection, out through CHAPS and SWIFT, and ends up with several million pounds in the Bahamas or the Cayman Islands. He is off to Heathrow and away. He has laundered that money; he has got it out and moved it about a bit more; and he has made the chain sufficiently complicated that you will never catch up with him. He has spent it, moved it on, or lost it long before you can ever catch up with him. So there is that sort of security nightmare. I do not think it is a real problem, it is one that is manageable and can be dealt with. But there is a confidence barrier there before you get emerging a great elaboration of these sort of systems. These things will happen gradually, there is no time scale for them. I think they will happen in the '80s. Confidence is developing. If you use a thing every day and it does not go wrong, you stop remembering about the security risk. I think that tends to be human nature.

I think those are the sort of developments that we will see in EFT. We will see a start of a lot of them in the 1980s, but we will not see the completion or the widespread acceptance of them until the 1990s, right up to the end of the century.

EFT ISSUES

privacy
security
competition and choice
discrimination
national policy

One or two final comments on the sorts of issues that are usually discussed when EFT comes up. Privacy. Yesterday we heard from Patricia Hewitt, who is very much concerned with privacy questions. I think the party line, which I tend to support, is that EFT will not greatly change the privacy problems that currently exist in banks. Banks have a reasonably good reputation for being worried about privacy matters. I think the concern is there and will continue to be there. I think the real risk with privacy and the one that is often quoted, is the privacy in a cashless society problem. It is a frightening thought that if all payments were electronic and there was information about them recorded centrally, if I knew all the payments that any one of you made I could tell just about everything that I wanted to know about you. I could tell where you had been; I could have a very good idea of why you had been there; I could find out all sorts of things about your private life that you certainly would not want me to know. I could make lots of commercial judgments about you. We live in a money society. If I know how much money you have and how you use it exactly, I think I would know, by inference at least, just about everything I wanted to know.

Coming back to the point. It is a real concern and one that will progressively be tackled, but we are a very long way from that, because cash is anonymous. As an aside, banks issue cash and you would expect most of that cash to come back into the banking system. People use it for making payments, the business aggregates it and brings it back to the branch. It does not happen. The banks issue cash and a lot of it never comes back. It is the back pocket to back pocket syndrome. This is because cash is anonymous. I think there has been a publicly quoted figure of something like £150 to £200 for every family in the UK, of cash which is out there circulating in a purely private economy. The only reason that it is circulating that way is because of moonlighting, because of tax avoidance, and a lot of other reasons which are perhaps more reputable. But as long as cash exists the privacy danger will only occur when it gets to the situation where cash is disreputable; where you only have a residue of cash so that if you use cash, people say, "Ooh, why does he use cash? What's he got to hide?" We are a long way from that. But it is a real problem and one which has to be tackled.

I have mentioned the security already. EFT provides a whole mine of new fraud opportunities, which have to be dealt with. Bankers are conservative. They have got to be

happy that they understand what the risks are and they have some sort of reasonable protection before they will have these EFT developments. Again, a lot of the work has been done. It is clear that the problems are soluble, but they will take time.

In the US perhaps more than in the UK we have the next two items: competition and choice, and discrimination. If we have this co-operation we have one terminal in shops which is owned jointly by all the banks, where is the competition? We end up with one payment system. It becomes more and more integrated. I think the essential thing is the idea of value added services where the basic infrastructure may be common, but the payment services that you offer the customers will vary. There is a great deal of room for competition in terms of packaging of services. "We will give you a job lot, all your financial services at a reduced price. We will give you cheap payment services because you have some other business that we want." There may be quite a lot of difference in views on what sort of tariffs should be charged for services. There is a big difference between shared costs and tariffs charged to customers. So I think there will be competition, but the co-operation is inevitable. The argument that says that banks should not be allowed to co-operate because they are all just a big cartel does not hold water. You just cannot have that argument and have good payment systems as well.

Discrimination is the 'cash is dirty' argument which says that you have EFT to an extent where cash becomes something that people do not want to use, because it has connotations of evasion or illegality of some sort. I tend to dismiss that. It is a long way away. I do not think it will happen in my lifetime, but current trends lead towards that sort of thing. I have no answer in the longer term, other than that we have quite a long time to think about it.

The final point is national policy. First, you must have good payment systems. You cannot operate a modern economy without them. The needs in different countries are similar. This means that the first country to develop an effective payment system will tend to set *de facto* standards. This has large implications for suppliers in that country. The suppliers in that country will tend to have been involved in those system developments more than suppliers overseas. They will have first hand experience. They will already have some production capability of equipment which is saleable in other countries. So there is a national policy aspect which says that EFT developments in any particular country should be developed. It may help public data networks; it may help suppliers. This is something completely outside banking. It is a national policy issue, but there does seem to be a reasonable argument which says that suppliers in those countries which are first with EFT development will have an advantage in a very large market.

I think I have covered just about everything that I wanted to. I hope I have made some sort of case to show that the things steering EFT, that are deciding when it will happen and where it will happen, do not have a great deal to do with technology. We are not waiting for the microprocessor revolution. There are reasons why it will be fairly slow. I think there are good reasons why it will happen in Europe first, and I think there are very good reasons why all those concerned in business should take a more active interest in payment systems than they have done in the past.

BREWER: We are running a little over time but I am sure that you would not want me to let Mr. Clark go without giving you the opportunity to ask one or two quick questions.

QUESTION: You did not really give a picture of how much the lower part of the triangle (Slide: Demand for Money Transmission) corresponds to cash distribution costs. In order to make a case for going to EFT you must have a view of what it costs.

CLARK: Yes, what we are talking about is the triangle showing the demand for money transmission. You cannot really relate cash distribution costs to payment costs because the banks issue the cash and it moves about in a variety of cycles after that. Cash distribution costs are a major cost to banks. It is very difficult to see any commercial benefit from it. To some extent it is a public service. In a lot of countries cash distribution is part of the central bank's function, it is not done by commercial banks at all. Historically it has been done by commercial banks in the UK and I can see no reason or any way that the UK banks could stop that.

I think they see it as a major problem. I always put the cautionary note about the 95% figure. There are an awful lot of payments caused by the act of distributing cash, and to try to encourage EFT as a means of reducing your cash distribution costs might be a very dangerous game indeed, because you would end up possibly with non-cash payments which, if they were not totally cost-effective, would cost you a great deal more than the cash distribution costs. So it is something that does cost a lot of money. I cannot give you any figures, but it is something that I see as a public role that the clearing banks have taken upon themselves and which they will have to continue to provide.

It is a fairly woolly answer and I apologise for that. I cannot really make it any more explicit.

QUESTION: How will businesses be persuaded to use EFT? EFT tends to mean faster payments and therefore businesses lose float.

CLARK: I think it depends what sort of business you are. If you are a business where most of your customers are the general public, EFT must help you because the float will tend to operate in your direction. You will get faster payments and guaranteed funds. You will get cheaper payments as well.

I think the other situation where companies are paying out sums of money, the sums tend to be very much larger and the float is something which you can certainly set off against the processing costs of the payment. So there is a trade-off there. If the sums are large and the number of payments small, the float question occurs. But EFT does not necessarily mean that companies lose float. I think that is a matter for negotiation between the financial institutions which will provide this service and the companies. And unless the companies accept the service you just cannot start. So it may be a necessary part of any payment system, that you build in the sort of float that companies are prepared to accept, which may be the sort of float that the company gets.

BREWER: We have heard a most interesting and down to earth talk this morning. I am sure that on your behalf you would like me to thank Mr. Clark very much indeed.

THE FUTURE OF IMAGE PROCESSING

D. Butler
Rank Xerox (UK) Limited

David Butler is currently the Manager of the Special Businesses Division of Rank Xerox (UK) Limited. After qualifying as a chartered accountant he undertook a number of management consultancy projects before joining Rank Xerox. He has held management posts in finance, administration, marketing and was also the National Sales Manager for communication products before creating and developing his new division.

RAY: Yesterday we had one view of future office systems and office communication systems from Brian Cartwright, which was essentially a technical view of what is going to happen. This morning we have a second view from a major equipment supplier in the field, Rank Xerox, which will focus on the lessons which they have learnt in this country, both from using the equipment within their own organisation and as suppliers to people like yourselves.

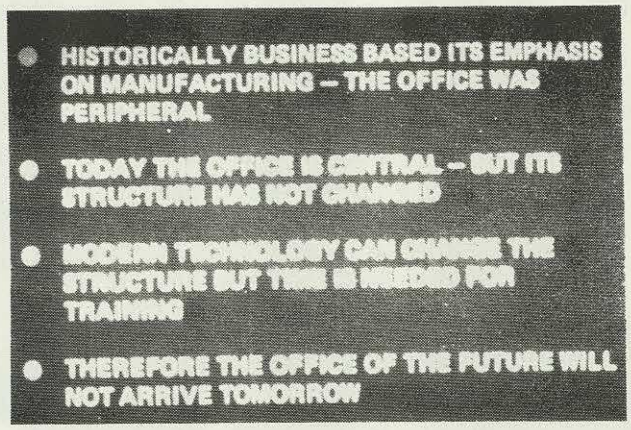
We have the Manager of the Special Businesses Division of Rank Xerox, David Butler — David Butler the younger, as someone said at coffee break!

BUTLER: Good morning. I have been asked to illustrate one major supplier's strategy to advance into what is often termed 'the office of the future'.

Before I go into that I should like to explore briefly the history of the office, where we are coming from; to probe the reasons for the current growth in emphasis on office automation; to identify some shortfalls that we have currently in the office; to look at media trends; and then to lay out our particular direction to take us into the electronic office era.

The strategy that I am putting forward has been one that has changed over the last four to five years, to my own knowledge, based on a number of probes that we have done in the United States, and also some of our own experience in Europe and in the UK.

Throughout the presentation I think that one theme will become noticeable, and that is the emphasis that we put on the human needs and the attitudes to change in a hitherto conservative environment upon which we are now encroaching. In order to implement the electronic office with successful results and also to maintain good personnel relations with your staff and your managers, you must have an absolute understanding of the human needs and fears in that environment. I believe that this must be a priority of managers accountable for implementing such changes in the 1980s. I believe that the lack of such understanding will lead to organised resistance against some of the radical changes or advances that we are projecting at this conference. Those resistances are already manifesting themselves in our industry right now, particularly in the government area.

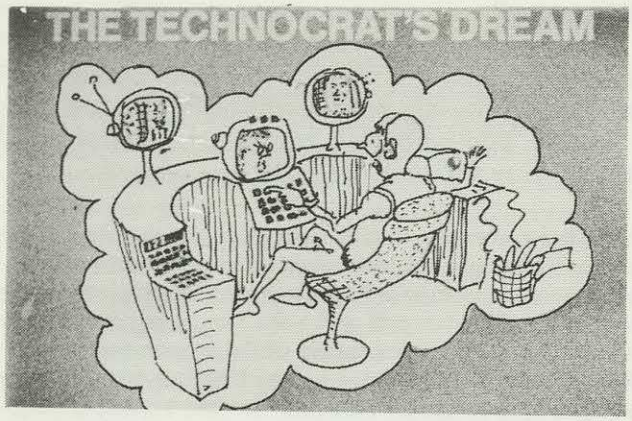


Let us look historically at where we are coming from. In the UK, the office in less complex times, 50 or 60 years ago, was a small part of the business and the major effort was in the manufacturing area. The efforts to automate manufacturing and reduce its costs occupied the majority of the creative business thinking. The office really has not changed in structure over the last 50 or 60 years, but it is now central and not supplementary to the main purpose of the business.

We feel that office automation can only take place very slowly. We have a large number of people to train and educate, not least the managers as well as the operators of the future equipment. The unchanged environment that is the office, say for the last 50 or 60 years, if applied to manufacturing would almost certainly be a recipe for bankruptcy in the majority of businesses. If you look into an office all we have achieved is electric typewriters, very

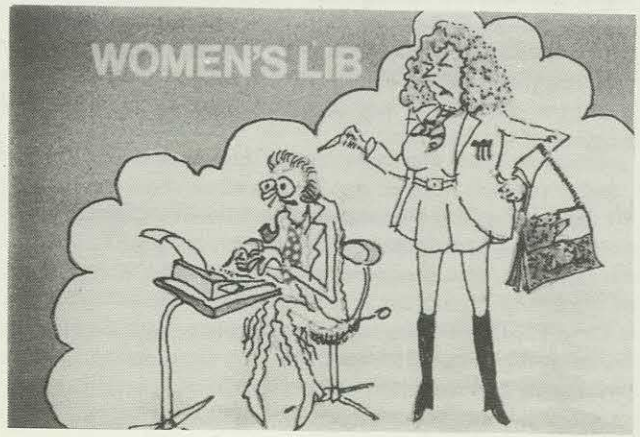
few word processors, copiers and perhaps some dictation equipment. Very little change has occurred. You are going into an area where change will be resisted.

People who work in those offices tend to look a long way into the future, in the planning departments and the research departments; but when they do, it depends on what sort of people they are as to what they see as a development into the electronic office.

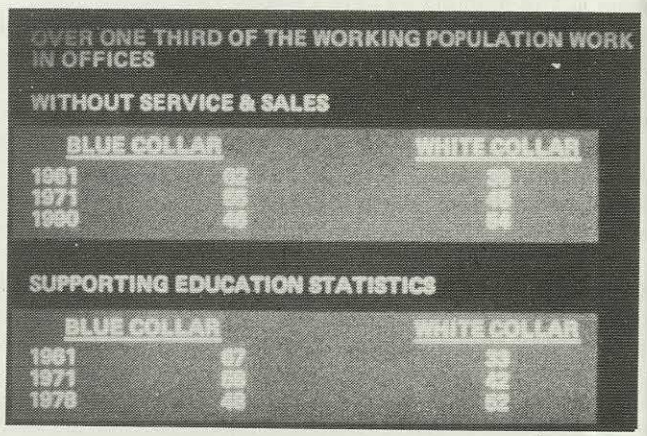


The technocrat would see this sort of screen, console, dials. I had a tender in very recently which I am sure derived from this slide. The only thing that it omitted was the man specification to run it!

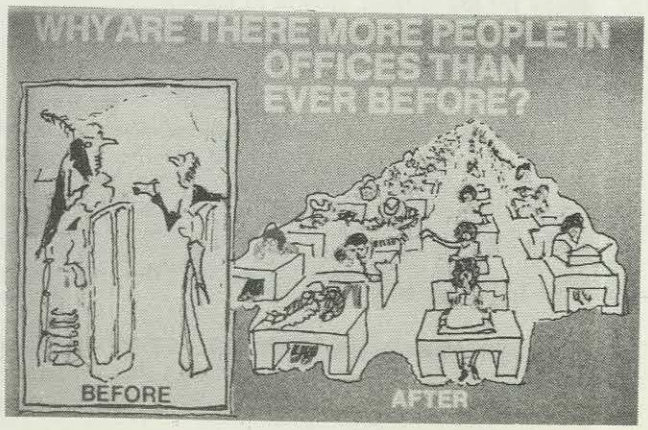
That is my idea of an office.



Behind the humour of this slide, I do believe that when we look back, in ten years' time, to this period in business involvement, we will see the changing status of women in business as being very important in the structure of business itself. The attitude of young women now to careers in industry is changing. No longer do you have the young girl out of school, rushing to a secretarial college, because the pinnacle of her career is to be a secretary. It isn't any longer. If you look in your own companies over the last ten years, how many women managers did you have on your staff ten years ago, or even supervisors? Now you look and they are up around the board room level and throughout the business. They have new opportunities, different opportunities; and the office fodder coming from the secretarial colleges is no longer fuelling the office needs. That lack of supply will tend to push costs of good secretarial and professional staff support up higher and will lead to looking for alternative methods. I believe that the costs and the lack of good support people are pushing the emphasis on to office automation.



If we look at a slide of how the office population is split currently, throughout Europe one-third of the working population work in offices. If you look at education trends, they are showing a substantial swing towards the academic rather than the manual courses. Statistically, therefore, we see a declining production element and an increasing administration and management element. Whether this is healthy I leave to your own conjecture.



Why will there be such a growth, and a continued growth, in the office? Again if we look historically to the position where you had a principal or a family running a business, their main preoccupation was manufacturing. They did not need marketing staff, legal staff, or taxation staff. They could run — pull the strings of — the whole business. Now we do need the legal experts, the taxation staff, the market research people, the planning for the next ten years. We need those sort of people, professional people. Those professional people need support.

WHY WILL THERE BE SUCH GROWTH IN THE OFFICE?

* MORE BUSINESSES
* LARGER BUSINESSES – MORE COMPLEX
* GREATER RESPONSIBILITY
  FOR STAFF
  TO CUSTOMER
  TO GOVERNMENT
  FOR ENVIRONMENT
* MORE COMPLEX EDUCATION, TECHNOLOGY SPECIALISATION

THESE TRENDS WILL INCREASE IN THE FUTURE

THESE TRENDS WILL INCREASE IN THE FUTURE

Let us define what we mean by the office itself. Let us look at the growth of the office. Why is it growing? Statistically, of course, there are more businesses, if you take all the subsidiaries of the larger companies as separate entities. The growth of the these multinational companies is yet another phenomenon.

There is also the need for companies to take on more responsibility or, more likely, to have the cloak of responsibility placed upon them by government. They have a greater responsibility for the staff, through legislation; to their customers, through the Office of Fair Trading Acts. There is a whole host of legislation that can encumber businesses. People now need to understand, interpret and implement that legislation within businesses.

The whole of business is becoming more complex, and we believe that the trends will increase in the future, regardless of the colour of the government in power.

WHAT IS THE OFFICE?

* THE OFFICE IS THE POLICY, CONTROL & CENTRE OF ANY BUSINESS, WHETHER IT BE –

  COMMERCIAL
  LOCAL GOVERNMENT
  GOVERNMENT DEPT.

* IT IS ABOVE ALL A COMMUNICATIONS CENTRE LINKING –
  * CUSTOMERS NEEDS TO SERVICES & GOODS
  * POLICY & DECISIONS TO ACTION
  * IDEAS AND FEEDBACK TO DECISIONS
* AN INTERACTIVE CENTRE WHICH BECOMES MORE COMPLEX AS THE BUSINESS GROWS

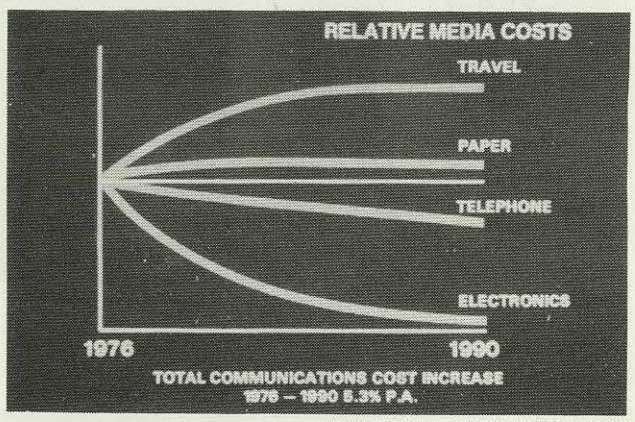
If we define what the office is, it is a policy-making, control and administrative centre. It does not matter what sort of business you are in, the office is a communications centre. You communicate with your customers on the goods and deliveries. It is a place also where ideas are communicated to other people and you receive the feedback. It is an interactive centre between all parts of the business, from the customers to the staff to the directors.

VALUE OF BUSINESS COMMUNICATIONS

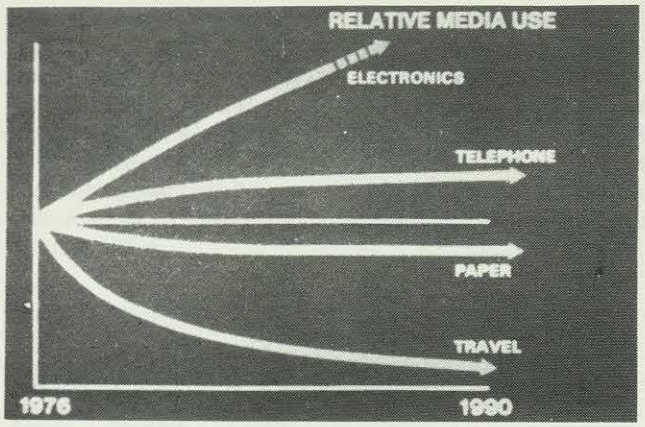
EXPENDITURE

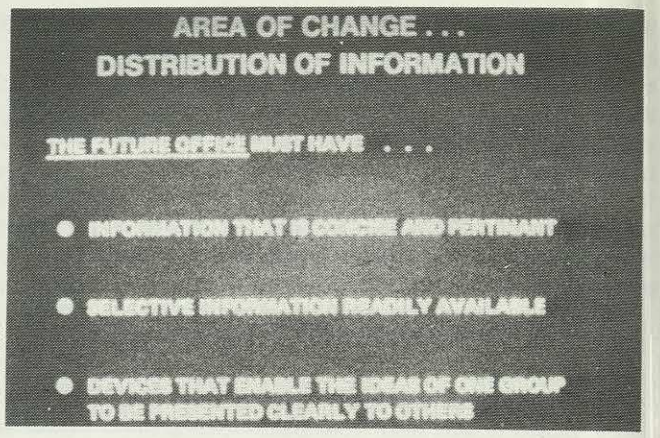
1976	MEDIA	1990
$200 BILLION		$690 BILLION
60%	PAPER	48%
12%	ELECTRONICS	24%
18%	TELEPHONE	12%
10%	FACE TO FACE	16%

I now move to the expenditure on the business communication media. Incidentally, the majority of the statistics that I am showing here came from a combination of information from the Henley Forecasting Centre where we sponsored a study into the year 2002, and also from our own extensive research both in America and in Europe and the UK. Currently, we are spending in Europe about $200 billion on the communications media. One of the points that I need to emphasise here is that we feel that paper will still be predominant, even in 1990, on the basis that it is economic; it is good quality; it is legible. Hard copy is always the best evidence. It is still the best display screen that we have invented.



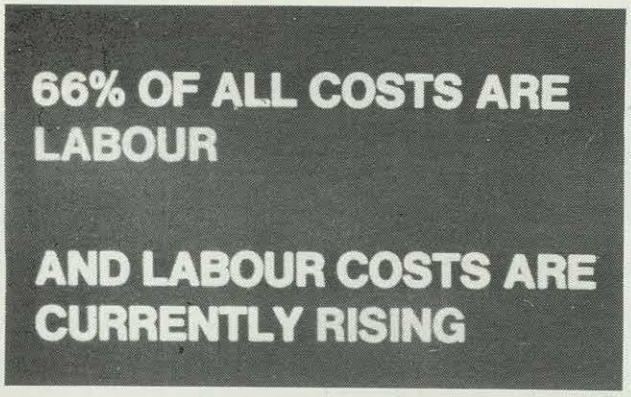
In order to explain the previous chart a little more clearly we need to look at the costs and the underlying assumptions for those costs between now and 1990. The cost of electronics will certainly decline spectacularly between now and 1990, but travel costs — and this is projected on the basis of massive increases in fuel costs — will rise dramatically. We are projecting here that it will be probably three or four times greater by 1990 than it is today.





If we look at the use, you saw electronics doubling in expenditure, but because of the drop in the cost of electronics the actual growth of usage will be stupendous. Again, the use of travel dropping quite dramatically purely because of the cost of travel. This has great implications within the office for such technologies as Confravision, which I will mention later.

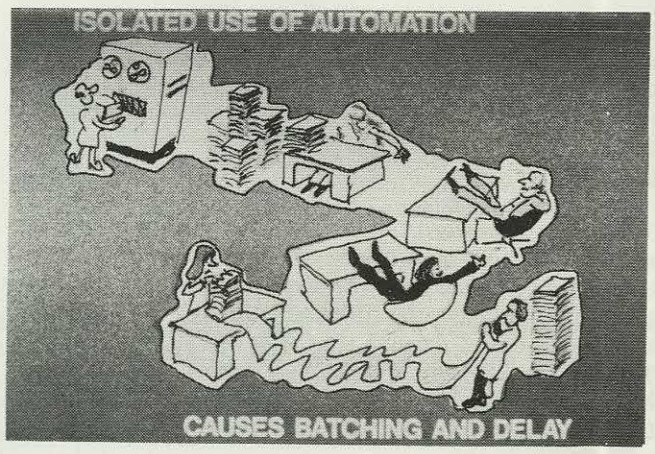
This is a generalised study of the total business communication functions, including computers. In order to identify the areas of prime need which the office of the future will have to attack to be acceptable to business, you break down the seven basic functions of the business communication. If you look at creation, storage and retrieval, and updating, it represents two-thirds of the total cost. It is not difficult, therefore, to identify where the electronic office really has to make its mark.



Of those costs, two-thirds are labour. Again, it is not surprising that labour is a predominant cost throughout when you look again at how we have developed the office over the last 40 or 50 years. Very, very little has gone into that area to make it more effective.

We can also see from this slide that in countries where the labour rates are very high, the concept of the electronic office is much more acceptable because it can be based on a very viable financial standpoint. That is particularly relevant in the United States and Germany.

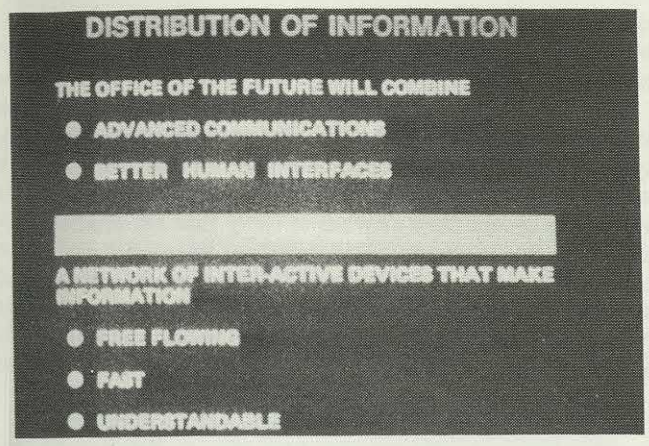
If we look at the current office and the problems that are presented to us, usually the information being sent to all of us — look through your mail when you get back to the office, there will probably be quite a pile waiting for you — is very much too general. It is possibly obscure and a lot of it is late coming to you. It is general because you do not have the ability to access just what you require, therefore people put out a distribution list for people who just might need that information.



The isolated use of automation in the majority of businesses has resulted in an uneven work flow, where you have batching bottlenecks created not by the computer itself — because that can produce endless amounts of information — but by the front end systems to get into the computer. This has led in many cases to a lack of credibility in electronics in the office.

In the heyday of the '60s, computers promised all. I think that everybody will agree that they gave rather less than that. Also they left a legacy of inflexibility with the major systems, the large computers, that were put in at that time. The burden of that inflexibility has often fallen upon the managers and the office support staff to whom we are now trying to introduce a new era of electronics.

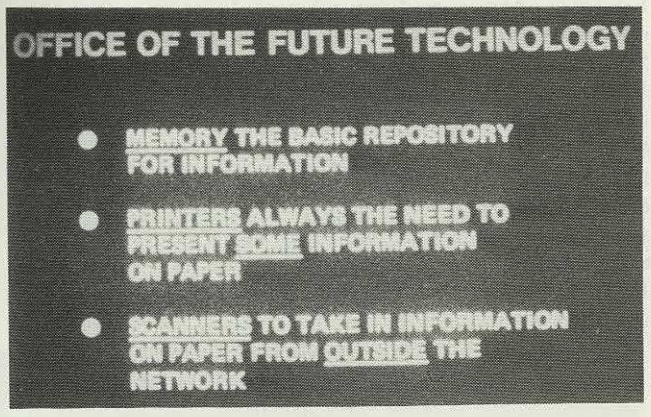
So what do we want from that future office? We are looking for information that is concise, pertinent, but also available in a way that is urgent, selective, and at hand only when you actually need it.



In order to provide these advanced features the office of the future must offer technology that gives more advanced communications plus much better human interfaces.

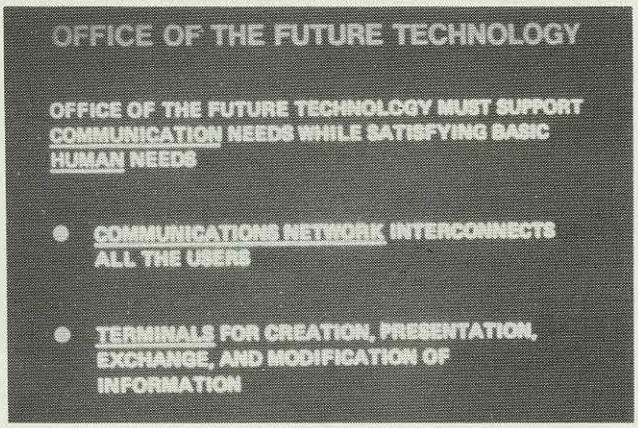
What do I mean by human interfaces? What I am talking about here really is friendly equipment. You do not want the piece of equipment to frighten people because it looks like the control board of the Star Trek ship. You also want the functions that this equipment is undertaking to be familiar to the people using it. If it is familiar it is much more acceptable.

This implies a network of interactive devices which is designed to make information more quickly available, more rapidly transmittable and, above all, it has to be understandable — understandable in terms of the information being presented and understandable in the way in which the equipment has to be used.



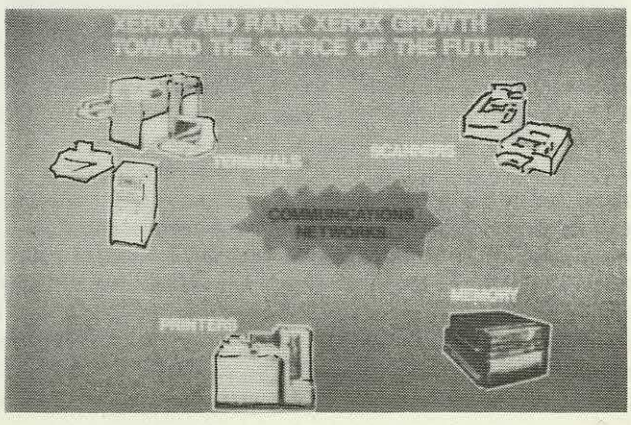
What does it mean in terms of technology? Any potential for office automation must eventually be referred back to the capabilities of human beings, because they are the ultimate users of that information which is being communicated to them. Thus it is useless to design even cost-effective devices which are difficult for human beings to use and understand. They are only a small set of functions that a human being requires and which must form the basis of any integrated office system, communications being one of the most important here.

Communication paths are really at the heart of the office of the future since without them, no matter how powerful the individual devices are, the office will revert to isolated pockets of automation with terminals — and I will change the terminology here to one that you have already heard today, which is multi-functional work stations. Mr. Cartwright mentioned that yesterday. We need a device for creating and presenting information, exchanging it with others, and also obtaining feedback from those people.

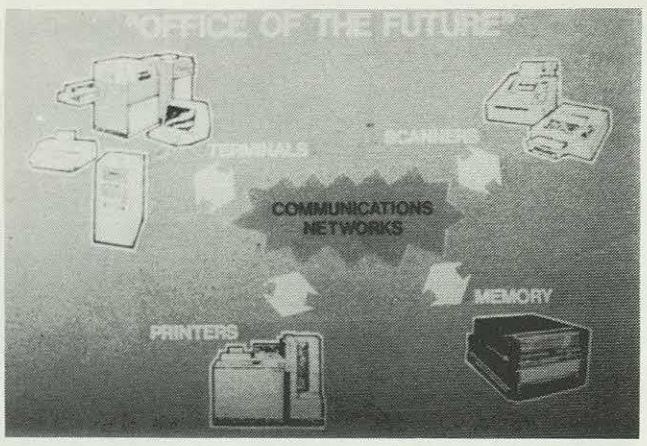


We also require a memory, but a memory which is under the control of the individual managers. We have heard a lot about security and privacy of information. The privacy of information applies to managers in offices as well as to individuals in their homes. You require some privacy. You need the privacy of your information on your staff, their appraisals, their salary reviews, your own budgets of your departments. Here we are projecting that the technology will enable vast memory banks to be available at the point of need; therefore you are not looking to massive databanks and the problems that occur with those databanks in terms of control and security. I believe that there is a need to satisfy here in terms of being in control of your own information.

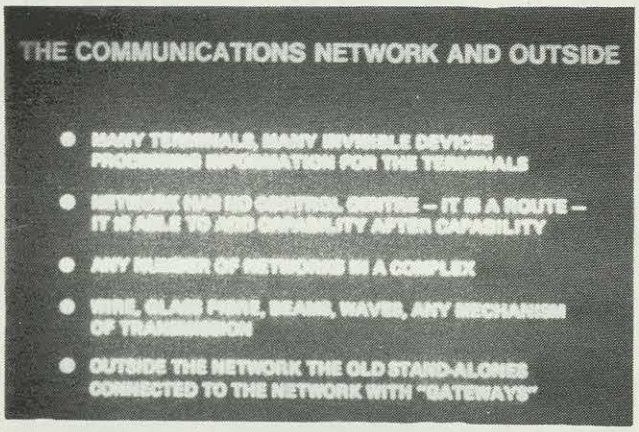
I mentioned paper earlier. Certainly there will be a requirement for printers, because not everyone will be on a totally electronic system. Here I am talking up until 1990. There will still be a vast amount of information that will need to go to small suppliers, small customers who are not advanced in these systems. I certainly hope that there will be printers around in 1990. Also, on the last slide there were scanners. Those scanners can be seen to be digital facsimile equipment which could carry out that function of taking information from outside of an electronic network and putting it into a form that could be used within the electronic office.



How do we intend to grow towards the office of the future? Our direction is that at present we are in the scanning business with facsimile equipment, in the memory business with the Diablo electronic memory systems, obviously we are in the copier and duplicator area, and in word processing in shared logic and with our 800 and 850 systems.



What we are looking for here is to combine and electronically link those familiar functions within your office. It is a very simple strategy of merely linking what is familiar in the office; and this method of electronically linking the machines that are used currently in an office, we feel is an acceptable and simple approach to the integrated electronic office.



We see many terminals, again multi-functional work stations, here, and other 'invisible' devices because operators need not know that they are there. For instance, a communicating copier. She does not have to know that it is there, all she needs to know, all the manager needs to know, is the consequences of actions to bring that copier or a facsimile piece of equipment into action.

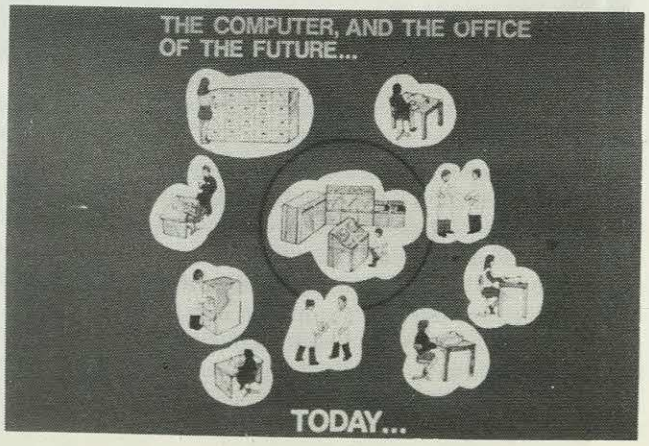
A network. Here we are at considerable divergence with our major competitors. Here we are talking of a network — think of it in the simplest of terms as being a coaxial cable connecting every office that you have in a particular building. That network does not have a control centre. It is not a computerised system. It is not controlled by a computer. It is a communication route into which you can add additional capability, additional work stations, additional copiers, and additional facsimile equipment, plug minicomputers and connect into your normal computer systems. But it is a communication route rather than a computer controlled office system. Again, we see any number of these particular loops in a complex. I mentioned coaxial cable, but there are other developments in terms of glass fibre, beams and waves. We will be developing these before we actually see the products coming into the market place.

We do not feel, even with advances in telecommunications systems, that the ordinary public switched network system will be capable of carrying sufficient amounts of information and at the speeds that we want to carry that information via the ordinary telephone lines, therefore we are putting a network in. But to connect to the network we are talking here of going through a gateway which will be currently the PABXs and the PEBXs, the electronic branch exchanges of the future.

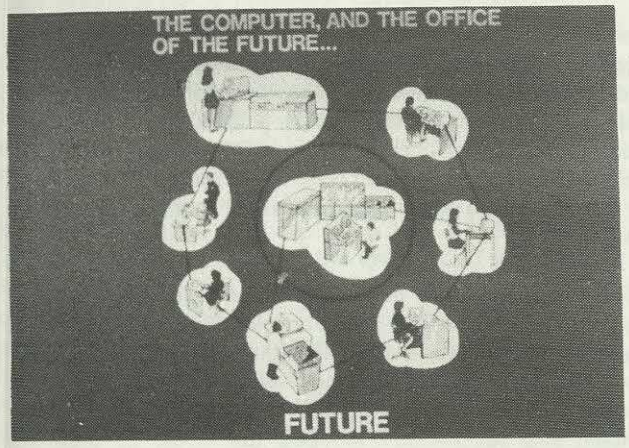
I am not talking theory here. I have personally used these systems. For any of you who will be travelling on the Butler Cox American trip, I have no doubt that you will see one of our systems which is already in the White House. We signed all sorts of confidential agreements with the White House, knowing that we would get quite a lot of publicity from it — knowing their security systems! They actually broke our security system there by a very shapely blonde, who seemed to override all the confidential agreements that we signed up there.

If I can elaborate further on the practicality of using this system, I sat at a secretarial station, with a keyboard and a screen; tapped in the manager's electronic post code — this was in El Segundo — and through the public switched network went to the PABX in Palo Alto, 500 miles away, accessed the communications computer which is connected to the system, and read the guy's mail. When I wanted parts of that mail, I scanned some of it, and parts I did not want we merely destroyed. Other parts that needed reading or updating I put on to his private electronic file which was on his desk. Then to ensure that I used the whole system I dialled a copier in El Segundo and got copies of the information.

I did not know — and did not need to know — that the computer was 500 miles away, or that the copier was three floors below me. I did not have to know that, I just had to understand the consequences of the actions that I was taking on a screen in front of me. That screen was used equally by the secretary and the manager. Incidentally, that is a different environment because it was a research environment and people were encouraged to use the equipment and understand the changes that were necessary, asking managers to sit in front of a screen or use a terminal. In the UK I think that we might find just a little more difficulty.

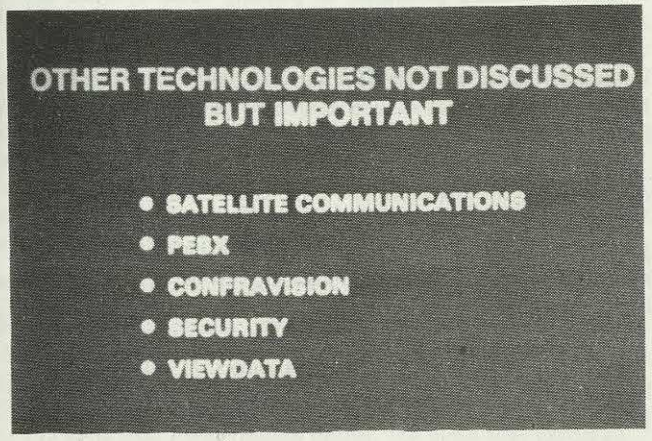


Centralised computing has been in existence for almost 20 years and during that time the growth in the industry has been immense, but the explosive growth, certainly in major installations, has now more or less ceased; but there is much of the office that still is not affected at all by the computer. When you do need to interface with the computer you often need skilled people to do so. The revolution in micro-electronics means that now vastly more powerful equipment can be brought to the individual user. We are suggesting here that those small microelectronic processors and computers can be connected directly into the network, and every one of the stations has the power of however powerful the computer is that is connected to the network.



As we progress towards the electronic office we see all the isolated offices that are currently not connected being gradually connected into a major system. The transfer of the information over the network from one multi-functional work station to another really means that you have a full electronic internal mail system. You also have the ability, through the PABXs, to have an external mail system, and a very effective one.

What we are creating is a decentralised office system and a communications route connecting all of the staff and all of the functions together.



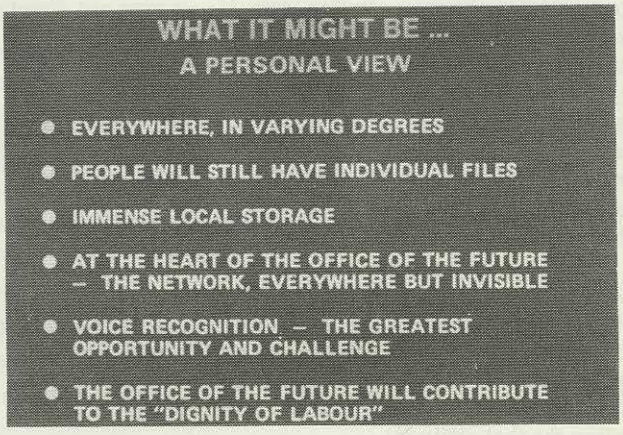
If we look at a number of other technologies — and I have not gone into them in any detail here — the availability of good satellite communications we believe will have a significant effect on organisation of business. High speed communications could be carried out easily between any two establishments, regardless of where they are.

The PEBXs, which I mentioned in the early part of the presentation, will also make a considerable difference to organisations and their ability to reorganise the business environment. We also see the PEBXs as giving the capability for the electronic mail that Mr. Cartwright talked about yesterday.

Confravision. At the moment only a number of experiments are occurring with Confravision, but with the projected cost of travel we believe that Confravision will be in all major companies within the next five to ten years, depending upon the experiments that the Post Office and also the Government are carrying out. If you combine the Confravision studios with the ability of high speed facsimile equipment so that you can have a conference here and a conference in Germany, and have hard data going backwards and forwards, literally in seconds, it really does obviate the need and the cost of travelling to negotiate in other countries.

You have heard a great deal about security and I will mention it briefly here. It is a fear of management that they will lose control of the information that they have and they will lose the privacy of their sensitive business information. This is something that, when we are looking at major systems, almost invariably comes from the managers who are concerned and not from the designers of the systems. It is a fear that they have, and I believe that we should be aware that managers do wish to have control over their own data.

It seems to be mandatory to have viewdata on a slide. I think that is because the capability being made available through viewdata, at a relatively low cost and even right in our homes as a business tool, could create the ultimate in decentralisation of offices. About the acceptability of carrying out your business functions within your home — well, I leave that to you and your wife.



If I may conclude on a personal view of where the electronic office will be and how we will get there, I think that everywhere we will have some form of this electronic office. It may not be the full, integrated system, but you will have parts of it in the organisation. Again, I think that the area to beware of is the isolated electronic pockets of information, not connected together.

Again, emphasising the need for individual files and the control of those files, the technology will push you toward having your own control of your data, because of the immense local storage that will be available. If you look at just the last two years in word processing, where you have changed from cards to tapes and now gone on to discs, that increases twentyfold the storage that is available instantly.

At the heart of the office is the network; a communications route, everywhere, but invisible. Voice recognition, on which we are doing a great deal of work, we see as the greatest opportunity, but also a considerable technological challenge. I have left it out until 1990, because I really do not see developments at sufficiently low cost to enable such devices to be put on to the market place. I am also sceptical as to whether managers will use such equipment; in other words, they would have a microphone into which they would dictate and it would come up on a screen in front of them. This is what is projected. You also have a keyboard for any particular parts of vocabulary that are not recognised by the machine. I have not put that in until 1990. I really do not think that it is a viable proposition before that period in time.

Of great importance with any of these systems is that we must not promote the use of human beings as robots in this electronic era. I really do feel that the electronics in an office should take away the mundane tasks and release human beings to do what they are good at: to think; to identify problems; implement solutions. In that way we feel that labour will have some dignity in an office and not be degraded by the mundane functions that occur currently.

Let me end on the same note on which I began: human attitudes to change, particularly in implementing the first stages of this revolution, which is usually word processing. When you propose such changes you need to understand that you are embroiled immediately in status issues of managers — and secretaries. Secretaries have a pecking order within your organisation, even if you may not directly recognise it by grades. There is scepticism of the projected benefits of electronics in the office, particularly with managers who are long in the tooth and can remember the promises of computers. There is a fear of productivity and effective use of the machines in offices creating more and more unemployment. There is a great deal being written currently in union circles concerning this effect on the office.

There is a resistance to change — and it is not just a resistance at the operator level; it is a resistance right to the top of the company. It is fine for a director to say, "Yes, I'd like to go ahead with the electronic office provided that another director does that in his division, not in mine." You very often get that attitude.

In the UK there is a different attitude from that which exists in the United States or Germany. In the US they decide to have a try at new technology; and the UK , we decide to have a committee to think about it. That epitomises the difference.

From experience, may I be bold enough to advise on proceeding slowly with these changes — but do proceed, because there is a need to get into a considerable learning curve of the effects of these changes, and also to begin an educational process in every part of your company.

I would also suggest that you look at identifying particular problem areas in the office: high overtime; absence levels; unsupported middle management; and pick on applications within those particular departments that will show, in a fairly short period of time, some obvious benefits, because from there you gain credibility and acceptance of these systems. From that point, I would then suggest that you begin to develop a strategy within your organisation to eventually aim for the goal of the integrated office in whatever format you are projecting it.

I would also suggest at the outset not to change your organisation immediately, because one department having had that change, you will come across resistance everywhere else you try to put in the system. I say that from some quite bitter experience, with our own organisation incidentally, where we do try to take our own medicine by using our own systems and installing them in the fullest possible way.

There is also the very delicate issue of head count in the majority of companies. One particular local council put together a proposition for what they termed their own electronic office, and the prime justification was a reduction in secretaries — 23 to be precise. Immediately the unions resisted and successfully stopped the whole of that installation from going on. You need at the outset to look at and understand that productivity with these systems takes time and that the work flows must develop around the systems to make them operate in the most effective way.

I would also say do not be too ambitious or too sophisticated in an area that has not seen change for such a long period of time. Do not make a vast technological jump in one go. Keep it as simple and as straightforward as possible in the early stages. If you can, pick a department which will encourage trend setting, may build an image for you, and also, because they are encouraging you, accept some of the inherent teething problems in putting these systems in. Again I have had some unpleasant experience because a department has been picked by a director for the implementation of systems when the departmental managers have not been involved, and therefore have not co-operated in making the system work.

Also involve the operators in the choice of the equipment. You would not like somebody in your company to choose your car for you. Then why would you wish to choose a machine you would not be operating either? Give them some involvement and some choice.

Yesterday, Mr. Cartwright emphasised that our objective is productivity of the professional staff and the management. I totally agree with him. But if the people operating and using the systems, managers as well as staff, are not committed and not sold on the need to change, any systems man will tell you that it is much easier to block and destroy a system than it is to put the effort in to make it work.

I believe that we have an opportunity to improve the effectiveness of our managers and the working environment of our offices, but we must be cognisant of the sensitivity of the issues when attempting to grasp these opportunities.

RAY: Gentlemen, do you have any questions?

QUESTION: Yesterday, somebody mentioned a £1000 communicating word processor. It would help business greatly if we could achieve that sort of price level for some of the equipment that is being suggested and would certainly save us the awkward problems of having to seek quite clear staff savings to justify this equipment. Could you give us some indication of how you think prices are likely to come down in the next four or five years?

BUTLER: I have suggested that you should not at the outset look for head count reductions as a major objective. If the system is put in correctly, you will in fact achieve those through natural attrition. This is what we have found in a number of systems. This is more acceptable than at the outset saying that you are going to make 23 people redundant. It is the way in which you implement and the way in which you approach it. I believe that the end result will be the reduction of people.

You were looking at the price levels and a £1000 word processing communicator. At the moment, if you look at the market place — and I believe that it is a matter of supply and demand here — in the UK there are only about 12,000 word processing units. In America there is nearly one-third of a million. So there is not a vast market that we are currently dealing in. Also, although you are looking at the hardware costs of electronics reducing, the major cost in the profit and loss account of a word processing company is in the support necessary in terms of training schools, follow up support and the application and development within the customer's premises. So it is not just hardware. But I do see the reduction in hardware costs perhaps dropping 30% to 40% over the next five years. That is the sort of figure that we are projecting. But within that hardware cost you still have a very high degree of customer support, particularly when you move away from the fixed function systems into soft load systems, where you are virtually developing an individual machine for an individual customer. There you are getting into software support. It is not necessarily the hardware that in fact is the majority of the cost, it is the support levels.

QUESTION: You have drawn attention to the possibilities for a combined piece of equipment for facsimile transmission and also photocopying, perhaps also with document capture capabilities whereby original documents are read and digitised. Can you say a little more about when these designs will be available in the UK and how much they will cost?

BUTLER: How much I am afraid I couldn't answer. Not that I don't want to, but I don't have that information. The first communicating copiers in the UK will be launched by my own division as a probe, early next year. Full systems of the type that I was talking about, the type that are in El Segundo and Palo Alto and the White House, will in fact be in Europe in the same time scale, again as probes; because I do believe that we need to do considerable work on probes in major companies before we understand how to implement. Again, it is not the technology. You can go down Silicon Valley and buy all this technology, it is not difficult, and solder it all together. The difficulty is in understanding the skills needed to implement the systems and to market the systems. In terms of price, if I may I'll duck that one.

QUESTION: I find it rather difficult to reconcile your concept of the invisible network with no central control. Surely although the control may not be visibly central, as you begin to connect many work stations together, there will be many control functions that will have to be brought in.

BUTLER: Yes, there will be. Somewhere in the network you have to feed in the reference numbers of the work stations, the changes necessary. But that does not mean to say that the individual work station should not update, say, their own directory on an accessible file. You do not need a central control for that; nor do you for accounting. If you wish, you can break these networks down so that you know what traffic you have on a particularly small network, or a large network. A network can be a department; it can be part of a department; it can be a division. We have not found it necessary to build in those sort of controls. In fact we try to avoid them if we can because it adds considerable complication and sophistication to the equipment, which is not what we are trying to do.

QUESTION: In the scenario that you painted, you made no mention of microfilm or microfiche techniques. Is that because you see them as irrelevant, or they've died a death, or what?

BUTLER: We have not considered microfilm or microfiche in any of our projections, we are looking straight at electronics rather than that side. We really feel that is an outdated technology now. Do you disagree with that?

QUESTION: I am not convinced that it is outdated. There are certainly some archival systems for storing and retrieving information, where microfiche seems to be not a bad way of doing this. I do not see how we bridge that gap of getting into those sort of archives and feeding it into the sort of system that you have been describing.

BUTLER: I can see the need in a number of industries like engineering, where a great number of plans and drawings simply could not be fed into this system, although we have a graphics capability. I can see the need for microfilm or microfiche in that area. But it has not been felt necessary within the office environment to feed that information into the system. I see no way in which it could be done currently — other than bringing it back to hard copy and scanning it into the system.

QUESTION: Every time one hears a presentation on the office of the future one is told that there will be some savings. I am somewhat sceptical about this. I will give you a case in point.

There is a large organisation in the United States that I have been tracking for some years. They said, "Forget the office of the future, we'll go for telephone conference hook-ups. This will cut down the transport bill." It has not. All that happens is that they spend an awful lot of time talking to people on the phone in Cleveland, Ohio, but they still spend just as much time travelling to San Francisco.

BUTLER: I sympathise with their view. We have not done any studies on the saving in transport. When you are looking

at what I projected, which was an internal mail system, the only transport that you are saving there is literally someone walking round the building. We have not really gone into the transport saving. I would not consider that you would save that amount on transport. Again, you are back to human needs. People like to travel. They like to go and meet people face to face, not talk to them over a telephone.

QUESTION: This is not a question but a comment. I do not believe the statement on Confravision, for the same reasons. I have been involved on about four different occasions on projects which show quite good cash savings on a Confravision system, but people will not use it. There are a variety of reasons. One of them is that it is a business image. There is no image factor in sitting in a television studio, whereas there is quite an interesting image in getting on a jet plane and going somewhere.

There is the 'out of the office for a while' feeling, which I think that most people need. I mean that quite seriously, to get away from it, to get time to think and do things like this.

The costs are marginal and there are quite difficult limitations on working a Confravision system practically.

The other aspect is the social aspect of television in those sort of circumstances anyway. Professor Cherry, Imperial College, whose work is in the communications area, believes that it is socially unacceptable and that things like television increase people's use of libraries and record libraries, when the idea that you would be able to see all this on television would stop that sort of thing.

BUTLER: I do not think that would necessarily happen, John, if the cost of travel, as was projected by the Henley people, quadrupled. You may well still travel, but maybe not with the same frequency. You may still want to get out of the office — I would agree with that. But if you are bringing down the cost of Confravision and also adding to the capability with very high speed facsimile devices, it would be more practical then to use Confravision. In spite of the cost of travel and the time element involved — time being a considerable cost when you are talking about expensive executives — I think there will still be a human need to travel about and get out of the office, but I really think that Confravision will begin to be a more useful business tool than it is currently.

QUESTION: When you think about the petrol costs in the last three years, it has not made the slightest difference to the Confravision market; yet it has definitely quadrupled the mileage allowance that you pay to your executive.

BUTLER: I think that one of the problems is that it does not have an image. It needs to be marketed as an up market facility that all major companies should have, the way that computers were marketed in the early '60s. Everyone ought to have one. That was the proviso to the way in which it was projected.

QUESTION: You described your network system as consisting of a coaxial cable. Does this impose a finite limit on the capacity of the network?

BUTLER: Yes, there is a constraint in terms of the amount of equipment and the amount of traffic that can be taken on a coaxial cable. One way of obviating that restriction is simply to cut downthe size of the networks.

QUESTION: You put an emphasis on selling the system in to avoid labour reaction. Do you not think that increasingly you will get the same reaction to job destruction, without necessarily personal redundancy, that you have had in the past to individual redundancy?

BUTLER: I am not sure that I understand your question.

QUESTION: The union concern which in the past has centred on no redundancies — and we have evidence of this ourselves in areas of high unemployment on Merseyside — says that natural wastage is now no longer acceptable, that you are reducing employment possibilities in society.

BUTLER: Yes. The answer that I gave on the local council would then not be acceptable. They would be asked to recruit back up to a particular level. I have come across that twice. It does normally happen outside of very strict union environments that you do have a considerable attrition after you have put in a system, which then enables you to gain the productivity benefits through fewer people, with machinery. But particularly in government at the present time, those sort of negotiations are, as you have pointed out, fairly unacceptable. In both cases they were government installations, local government and central, where we hit the problem.

RAY: Thank you very much, David, for a very interesting presentation.

THE ON-LINE DATABASE INDUSTRY: OPORTUNITIES AND OUTLOOK FOR USERS AND SUPPLIERS

H. B. Gaffner
LINK

Haines Gaffner has sixteen years experience in the development and marketing of information products and services. He helped found FIND/SVP, the pioneer firm in information-on-demand, serving as President for five years, and now on its Board. Previously he served as Vice President of Business International and Quantum Science Corporation. Mr. Gaffner is on the Executive Council and Board of Directors of the Information Industry Association. For six years he was based in various foreign countries as an international marketing manager.

RAY: Gentlemen, we now have the first of two sessions, this one and the one immediately after lunch, which are concerned with two different aspects of publicly available information. This first session looks at the opportunities and the outlook for both users and suppliers in the database industry.

In the United States today, commercial databases are quite big business and I believe that there are over 300 publicly available information services. The market in Europe is now beginning to emerge with the development of EURONET and also viewdata. Indeed, as you are probably all aware, on-line information retrieval services are the subject of our next Foundation report.

We have with us this morning Haines Gaffner, who is the President of LINK, an organisation based in New York which has just completed a major study of this market. I think that Haines is particularly well placed to tell us how the market can be expected to grow over the next few years.

GAFFNER: Good morning. As I have listened to a number of the sessions over the last day and a half, I have noticed particularly the numerous American examples, such as "America — this advanced case example", and "America has 89,000 of this whereas there are only 22,000 here", etc. When we look at the on-line database industry, I think we have something good to report in the UK. I think that Britain over the next five years has the opportunity, if gentlemen like yourselves seize it, to become the world leaders in this rapidly-growing industry. I know, of course, that you are behind the US today. But no matter how sceptical you may be about the pace at which viewdata will grow, viewdata systems around the world will catch on rapidly over the next five years. A viewdata system is merely a dissemination channel for on-line databases. You have to re-format them and they are somewhat more simple, but viewdata has considerable potential.

In the US, database searching mechanisms are rather complex and as a result there is a lead group of people who are using these databases. But Britain is going to lead the world as far as the mass market is concerned. I think that that is a major advantage.

In Britain you have another major advantage and that is the English language itself. In the airline industry, as you know, all pilots, no matter where they are flying, speak English. It is the worldwide language of airline pilots. English is also the language of the database industry. The worldwide language, more and more, is English. Over 75% of existing databases today are in the English language, and that percentage is growing. That is why the Germans and the Spanish — and I have just been down in Spain looking at their industry — are way behind, and they do not yet know how to catch up. The use of the English language gives you a great advantage, and I hope that you take the opportunity to seize hold of this industry.

LINK has completed the study Martin mentioned. We have about 40 American clients and 10 British and European ones who have helped to finance the study, and most of the comments that I will be making today are based on this major multi-client study, the results of which are being released this month. However, I am very proud to have participated in a second study with Butler Cox which has given LINK and our staff a close involvement with and an understanding of viewdata. In this study we have done a six-month analysis of the potential impact in the US of viewdata and the opportunities in the infant viewdata industry in the US. In the US viewdata hardly exists at all, and you are four or five years ahead of the US.

This study has enabled us to gain some real insights into how viewdata interacts with the on-line database industry.

We have heard a lot over the last day and a half about the new technologies. It is hard to decide which technology to follow, and very difficult to make decisions on what to buy and install, and which device to have and which system to build. But I am sure that all of us here would agree that the technologies when they are properly applied, can bring fantastic, cost-effective results.

Historical fact bears this out. In the days of Martin Luther there were very many reformers in what is now Europe. But most of them are now forgotten, except for Martin Luther. Living in Luther's home town at the same time was a man named Johann Gutenberg who invented movable printing types. Luther was fortunate. He learned of this invention and he used Gutenberg's technology to spread his opinions and doctrines far and wide.

Today, still, many people think of Gutenberg when they think of printing, and today many people think of the on-line database industry as the new alternative in electronic publishing, the new medium in print. I do not think that the on-line database will replace print, but it will certainly become a new way of disseminating knowledge.

THE ONLINE DATABASE INDUSTRY

Opportunities and outlook for users and suppliers

The information industry, of which the on-line database industry is a major growth sector today, is important for several reasons that some of the other speakers have mentioned. There is the fast change, the technical advancement, the future shock. Strategic planning is becoming important in companies worldwide. Most companies are now thinking on an international scale. This requires fast decision making, and the ability to obtain the right information rapidly when it is needed. And that is just what the on-line database industry can produce for users.

Let me remind you that I am talking entirely about external information that you bring into your companies, not the internal information that you use in running your companies. I am talking about those collections of external information that many of your companies are now putting together, and which might provide your companies with an opportunity to enter the database industry. As executives in the management services function you are obviously interested in this industry, because you are going to be using it more and more as users. And, as users, you will have to devise and organise ways of providing a service to the various functions and executives throughout your whole company.

You will begin to see that there are ways that you can participate in, also enter, this industry as a new area for diversification. Some of you, I have learned since I have been here, are already doing this.

The database industry is a child of the three areas that Butler Cox monitors: computers, communications and, as George said yesterday, the growing area of office automation. We have heard a great deal about this and I think that what really excites people as they learn about it is the concept of the office of the future. Terminals are cropping up everywhere on the desks of secretaries and managers, but I have seen no mention in the charts that we have seen here that those same terminals — despite all the other applications that we hear about — will be able to be used to access these worldwide databases, wherever they are located, in dozens and dozens of subjects that I will talk about in a moment.

Database producers and online services play leading roles in online database industry

- 1. Industry consists of source and reference databases
- 2. Online services provide database distribution channels
- 3. Users are the primary focus for the industry
- 4. Planners must develop specific strategies for broadened database usage and precise entry and growth goals.

A database, as you know, is a collection of information that is put together in a structured form. When the database is put on-line, obviously it can then be used by a user, anywhere in the world, with any type of terminal. There are several hundred users here in the UK who are using US databases for several hours every day.

The major participants in the industry are the database producers. They are the ones who put together these databases. In the UK database producers break down into two major sectors: source databases and reference databases. The source databases include primarily numeric databases, which represent a rather overlooked area that is growing fast, and is making considerable amounts of money for the people who are mounting them. Even so, numeric databases are not being used nearly as much as they should be in most organisations both here and in the States. Another type of source database is a reference database which leads the user to some expert, or some technology, or some place where he can get the desired information. The user of a source database obtains the information which he can then immediately use for decision making. The companies in the States that are making the most money in the database business today are those who are in the numeric and the source database area, because their databases help users in organisations to make decisions more rapidly.

In the UK, Datastream is an example of a company that is growing rather nicely. I understand that BOC is a major investor in Datastream. They handle statistical information about companies, company financial information, and stock market activity. Another example is the Extel organisation with its EXSTAT database.

Extel have entered the US market over the past year. I think that the EXSTAT database is now available on three different timesharing companies in the USA.

Reference databases take information from all types of sources and provide the user with an abstract and the user then searches these databases. Reference databases are not manipulable like the numeric databases are. The user pulls information out from them very rapidly, and often obtains enough information on that abstract to tell him what he wants to know. It might have 89 abstracts on energy and Abu Dhabi, and these come out sorted in chronological order. The user can use these reference databases if he wishes to do so to ascertain where he can obtain the full documents.

Let me give you three examples of reference type databases that you now have in the UK. The Commonwealth Agriculture Bureau has two or three of the databases that are widely used both in the US and throughout the world. Also, the INSPEC database produced by the Institution of Electrical Engineers is one of the world's leading databases today. The Thomson Organisation have databases which they very wisely acquired a few years ago, the Derwent databases, which cover patents in all parts of the world. Derwent have virtually created a monopoly in this market. They started some 20 years ago abstracting and categorising all the chemical patents, and they then went into mechanical and electrical patents. Now, they have a family of about six databases that cover all the patent information in the world. These are bibliographic databases. They are widely used and are growing in popularity almost daily.

The chemical properties database is another type of source database, and this represents a small specialised sector. There are also full-text databases, which are mainly in the legal field, although Dow Jones who produce the Wall Street Journal now run the Dow Jones News Retrieval Service, which is one of the most rapidly growing full-text databases. With this database Dow Jones have their own specialised terminal, but users can use any type of terminal and pull out by industry, by company, articles that have appeared in the Wall Street Journal. Dow Jones first started by abstracting from the Journal, but they soon found that executives really wanted to get the information in full text. As a result, they decided to put the complete text whole article in the database, and now users can get instantaneous access to any full-text articles that have appeared in the Wall Street Journal during the previous three months.

Another major segment of the on-line database industry, and it is one in which some of your organisations could play a role, is the on-line service area. On-line services encompass a large number of different organisations covering on-line retrieval services, on-line vendors, timesharing companies, and many other organisations that are involved in the distribution of the databases.

In the UK, BLAISE is an example of an on-line service. They have several databases up, some of which are in the UK and some in the US. Info-Line, which is due to come into service soon, is another example in the UK. Derwent is part of Info-Line and INSPEC and a couple of Government agencies have invested to put together Info-Line. Timesharing companies such as IDC (Interactive Data Corporation), General Electric, Computer Science Corporation and ADP, are all on-line services. Only a small part of their total business comes from on-line databases, but generally about 2% to 5% of the timesharing companies' revenues come from on-line databases.

The Lockheed DIALOG Service, which is an on-line service which is widely used here and in Europe, has about 75 databases up on it. SDC's ORBIT has about 50 databases.

The users, of course, are the primary focus for the industry. These users are primarily executives in your companies and in companies like yours. They are also in universities and government offices. Users can be categorised into two major sectors. First, there are the libraries and information centres, where people spend their whole lives searching databases and searching for information. But second, there is the exciting new area represented by what are called the end users. These are the people in your planning departments, your market research departments, your research and development departments, etc.

The emphasis in the on-line database industry is now shifting to the end users. The industry is trying to build more and more access, and is looking at the office of the future. In other words, the industry is putting considerable effort into developing this market. There is, of course, much to be done in teaching the end users about databases and in training them how to use them. But this is inevitable with any new development of this kind. So far as you people in management services here are concerned, you need to be planning for the advent of these users throughout your companies, because in due time they will be demanding more and more access to databases.

For instance, in the US there is now an association which has about 300 members. Some of these come from the library world but some of them come from the management service function in organisations. The association is conducting a programme for these members and its objective is to produce a cadre of people who will become managers of information in their organisations. This will represent a new career for these people and they will manage the external information resource for their organisations. This new development has largely been brought about because of the rapid growth of on-line databases and the unique problems that managing databases inside organisations will bring.

When users take on a database, they usually have to pay an annual fixed fee. Then the use of the database has to be promoted to the various departments and the potential users in the departments have to be made aware of the service and facilities they can obtain from the database.

The use of databases raises one large question that is the subject of much discussion in the US at the moment. It relates particularly to certain large organisations, such as Plessey and Shell in this country which some of you gentlemen represent. The question is whether the databases should be kept at a control place with questions being fed into them by lead searchers, or whether the databases should be distributed amongst the appropriate end user departments. Discussions on this question will probably range over the next five years, and so some of you here today will be involved in them.

As Martin mentioned, there are about 300 on-line databases publicly available in the US today, and these are produced by 172 different database producers. I should like to give you a little more information about the specifics of this industry, and particularly, about some of the databases so that you can get an idea of the subjects they cover. The 172 database producers are in five major category areas, and about 27% of them are producing scientific and technical databases. About 50% are producing business, economic and legal databases, about 13% are in the social sciences and humanities, and about 6% are multi-disciplinary.

Now a word or two about the database producers themselves. About 50% of the companies are commercial, entrepreneurial-type, privately owned organisations, both large and small, ranging from McGraw Hill down to $1 million companies.

Of the database producers, about 26% are non-profit organisations. I would say that the bulk of database production in the UK today is in non-profit organisations such as PERA, the Commonwealth Agriculture Bureau, INSPEC, and the IEE. I would expect, however, that fairly soon more and more commercial companies such as Derwent and Datastream will be entering this field of activity. In the US about 10% of the databases are Federal Government databases. About 14% of the databases available in the US are produced by international and multinational organisations. Those are the kind of organisations that are putting databases together.

I should like now to tell you about a few specific databases. EXGERPTA MEDICA is a famous one out of Amsterdam which covers the world's literature in medicine. It competes heavily with the one financed by the US National Library of Medicine called MEDLINE, which is one of the main ones that is up on the BLAISE network. MEDLINE is available to all users in the US at $15 a connect hour, the cost being subsidised by the US Government. By contrast, the average cost per connect hour for using reference type databases is between about $40 and $60. So MEDLINE is a giant database. It is distributed over several on-line services, and it also distributes itself.

CHEMICAL ABSTRACTS is another database that has been built in the States over the last 30 years, has been heavily financed by the Government, and is now run by a non-profit society. It is now available over many systems here in the UK.

A very interesting one that has been put together by Control Data is one of Bill Norris's pet projects inside the company. It is losing a lot of money at the moment, but Bill thinks that it is on the right track. It is called TECHNOTECH. TECHNOTECH is an attempt to link people who are interested in any given technology with people who happen to have that technology available for licensing. It is available over the CYBERNET network, and theoretically it is marketed by Control Data's sales people But frankly, they mispriced it and they did not have a good marketing plan or an adequate training programme for users. As a result, sales have fallen short of expectation and the operation is just ticking over. What they are really doing is cutting out the advertiser and creating a new commercial market. There is no reason that you could not do the same thing that they are doing with this database for used cars, for women's lingerie, or anything else. They are really creating a commercial market. We categorise all this as product information, and a lot more product information type of databases will be built.

In Florida, Dr. Davorkovitz has produced a similar database to TECHNOTECH. However, unlike Control Data, who charge an hourly rate for usage and a fee for putting the user's technology in (I believe they charge $100 a shot to put your technology in), Davorkovitz charges his users a finders' fee. His users pay to use his system and then, if they go ahead with a venture, they pay him. Both these databases are science and technology databases.

In the social science and humanities there are psychological abstracts which take the world of psychological information and make it available. There is a public affairs information service that services the people in the diplomatic corps and State department, who are the people who are interested in that area. Then there is the giant database which is funded by the US Government called ERIC, which is in the education field. There are a number of general business ones which abstract information of interest to people in management services, to people in public affairs, to people in market research. It is possible to dig that kind of information out from these databases.

In the economics field there are PREDICAST, VALUELINE and COMPUSTAT. COMPUSTAT is the McGraw Hill database which is comparable to the EXSTAT database of Extel. The economics field represents one of the most rapidly growing areas and Data Resources Inc. is the best known company in that field.

In the legal field, LEXIS is the largest database. Some of you will have heard of the New York Times information bank. It came out about eight years ago and has been something of a disaster. For a start the software system was wrong. Instead of trying to do any full-text manipulation of it, or to use computer photo composition typesetting to feed into the databases, they took everything and rewrote the abstract from scratch. So the cost of putting together the New York Times databank has been exceedingly high. They are continuing to market on a worldwide basis, and so far they have sunk about $12 million into it.

It is, of course, possible to profit from the mistakes that some of the pioneers have made. If you look back at some of the unsuccessful operations as, I imagine, some of you will do later, you can analyse the mistakes that were made and profit from them.

Another giant database that is quite well known in the US is the NTIS one of the Government. This takes all the documents of planning studies done in the US for the Government and in other parts of the world, and puts them in the form of abstracts. This database is one of the most used databases here and around the world.

Many database producers will take a more aggressive posture as the industry gains momentum

1. *Non-exclusive arrangements and more participation in usage revenues will be in vogue.*
2. *Marketing, training and customer service will be improved*
3. *Online databases generate more revenues for integrated and source producers than for reference producers*
4. *'Migration' by users from print to online is not yet a stampede*
5. *Spinoff of in-house databases will grow.*

So let us look at the database producers, now that I have given you an idea of the variety of databases that now exist. The industry really got going when more and more publishers

of directories, texts, reference services and information services of all types started storing their information in computer form to publish their print volumes. It was just an incremental step for them to be able to create from that an on-line database. At about the same time, SDC, Lockheed, and some of the timesharing companies started to go into the business of putting their database up. Out of this a new industry was started as a spin off from printing. Most of the databases that I have mentioned are still making 60% to 80% of their revenues from the printing side of their business. Many of them are in the experimental stages of having their databases put up and they are trying to learn as much as they can about what is a very complex industry. That is where I think viewdata is a very good opportunity for you in this country. It provides a base that people in this country can learn from.

There are 300 on-line databases, but there are also thousands of databases that are still in batch form, which are being used in various places in the Government and in companies. For example, Dun and Bradstreet have a $300 million database of credit files. They have computerised it, but they still refuse to put this database up on-line because they are afraid that it might have an adverse effect on the revenues of their print service. I am sure that their print service is in the form that most of you have it here. And so you will be able to appreciate from this example that the on-line database industry can be quite a difficult one to venture into.

Our study indicates that if somebody starts from scratch, the database production side has the advantage that information represents power. Those who control the database and the information (and this will apply even more as the industry becomes better known) are in a better position than the on-line service sector of the business. So the people who own the databases now will have greater influence in the future. In the past, the on-line services would be able to say, "Come in with us and go on an exclusive basis, and we'll promote for you". That was the situation when there were only about 20 databases on-line. But, now that Lockheed have about 76 databases they do not even know what is in most of them. So it has been proved now that the database producers get very little support from the on-line services, and they will have to take more of the marketing into their own hands. Consequently, they are now signing up on non-exclusive arrangements, and this is the definite trend in the industry.

Furthermore, the database producers are now demanding more participation in usage revenues. Instead of just selling the information by the hour, they want to participate in the computer resource units, and in the amount of money that is being spent. They realise now that they must adopt marketing and training programmes and work with companies like yours to help you in promoting your databases and to help you in making people in your company better aware of the value and advantages of your databases.

The integrated and the source producers are making more revenues and they represent the most worthwhile part of the industry to be in at the moment. Integrated organisations are ones like the New York Times, Data Resources Inc. — the ones that have created their database and have chosen to have their own on-line distribution of the database. Because they have more control over their operation, they are currently making more profits. The numeric types of databases are those which allow the user to manipulate the information. By users I mean people like those in your market research department, and your O.R. people etc. These are the people who can take the numeric databases, combine them with in-house data (some of which is often stored in the company's own computer), use an application package from a timesharing service, combine it with two or three other databases, and manipulate the resulting information into whole new types of reports, and services, and information for management that could not possibly have been produced two or three years ago. Because of this they are able to generate more revenue than the reference types of databases. They are more actionable.

The migration issue is one that does not concern you too much, but there is a lot of concern among publishers that if they put too much of their information up on-line, people will cancel their print subscriptions (irrespective of whether the printing be of numeric information or regular directories etc.) and use, instead, the on-line information. But our study shows that although this is a matter of concern, there is no stampede towards this new approach.

Talking to some of you yesterday evening I was delighted to learn that some companies represented in this room are more involved in this country than I realised a few months ago. ICI Plastics is now taking a database and offering it first of all in Britain, although it seems likely to me that they will very soon offer it also in the United States and worldwide. I am not quite sure of the dimensions of it because I learned about it only during the last month.

This database was one that they built in-house for use by their plastics engineers. They felt that they needed it over the years. There are also several similar examples in the States — for example, du Pont has spun out databases in the same way. In Frankfurt, Hoechst, the German chemical company, is taking one of its databases now, is spinning it out, and is making it available on-line.

In this country there is the interesting case example of RHM, who have spun out and now created an internal timesharing service, in the same way as, in the States, Boeing, Grumman and McDonnell Douglas created an internal timesharing service. Then RHM decided to offer their service to external customers in just the same way, as we heard yesterday, Unilever are doing with their management consulting service.

As it turned out, one of RHM's first outside customers was the BLAISE network. RHM now have some 300 users here and their move is a most interesting one. RHM will be very much a part of this industry as BLAISE continues to grow. If BLAISE should go on some federally-financed network, I am sure that RHM will find other ways to participate in the industry, because they have learned a great deal about it through the BLAISE experience and will obviously learn a lot more about it in the future. BOC is into the timesharing area and also in the database area through Datastream.

Although it is not as unique a move, Extel and the Financial Times joined together to form FINTEL, which is one of the major database producers for the new viewdata systems here. You will appreciate from all I have said that this is a growing area.

When we in LINK started our study a year ago we were not at all aware of how far the timesharing industry was involved

Timesharing firms are the dominant force among online service organizations

1. *Online database industry revenues approaching $200 million in USA.*
2. *End user departments will become the action area.*
3. *Online services will move toward more vertical and horizontal integration*

in the database industry. They do not promote it too much. They have mainly been involved in the sale of raw computer power. You people know all of the various reasons why the salesmen call on you, although I have heard that the timesharing industry is far more active in the States than here. Nevertheless, it is growing in Europe. But during the past six months we have found an intense interest among timesharing companies because of the threat posed to them by minicomputers, distributed processing, and various other developments. As a result, they now see on-line databases as one way of helping them to keep their existing customers and to obtain new customers. They are looking at the various text and numeric databases and trying to determine how they can get them on-line.

As so, the timesharing industry, even though it is not nearly as well known as Lockheed, BLAISE, SDC and some of the other major participants, still forms the biggest part of this $200 million industry as it stands today in the USA.

The on-line services are now focusing on end user departments and this will be an area of increasing activity. As I mentioned before, information is power. The on-line services have to try to get more control over their databases and this will mean that much more vertical and horizontal integration will take place. For instance, one of your small database producing organisations (Economic Models Ltd.) was taken over by Computer Science Corporation of the USA, a few months ago. Economic Models Ltd. has a DIADEM database which has been up on the G.E. network for some time, and I consider that this takeover was unfortunate. I hope that we shall see examples of British companies buying up American databases, because there are just not enough database companies around. This take-over of Economic Models is an example of Computer Science's huge, worldwide INFONET timesharing group making a move to give them more control. It is an example of vertical integration — a timesharing group taking over a database company.

Horizontal integration will take place where the timesharing companies (which so far have been almost entirely in numeric type databases and source databases) will begin to go into the text databases. They will form alliances (such as the joint venture with the New York Times and Dow Jones) and begin to put up text information. Even so, they are behind in the race, and they will stay behind. The leaders in the supply of text information will be those companies that are in viewdata. In this country there are already over 200 information providers experimenting in various ways to put text information up on viewdata. If you yourselves have an understanding of viewdata industry you will be able to make the right decisions in the future for your companies to participate in this broader, on-line database industry.

On-line services are also spin-offs. Lockheed had an internally-created system to feed the Lockheed Aircraft Company which was so effective that they decided eight or nine years ago to spin it out to form an on-line service. The same applies with SDC, which was part of System Development Corporation.

I should now like to give you some details and statistics which may be helpful to you if you are planning to go into this area. I will give you some details about how much it costs, and what type of arrangements are made, between the database producers and on-line service organisations.

One of the reasons that we started this study a year ago is that this whole area had been kept secret. Lockheed would not tell anybody what they charged and the timesharing companies kept it secret. Nobody knew what type of arrangements there were. Therefore, the people who owned the databases were entering into any type of agreement because they could not talk to anybody else. This then was one of the reasons why we set out to ascertain what was really happening in this emerging industry.

There are four major ways in which the person who owns a database puts it up on an on-line service, such as, for instance, the BLAISE service or the Lockheed service. The first is that the on-line service purchases the tapes. It purchases them for a year, it puts them into its computer, and then it makes them available. The tapes will sell for anything from about $1000 a year for the Department of Agriculture tapes up to about $50,000 a year for the MEDLINE tapes. But there is no usage participation, and the on-line service can charge whatever it likes for its service once it has paid the fee for the tapes.

The second way that the on-line service pays an up-front fee plus a royalty, for example, NTIS and engineering index of INSPEC sell for $5,000 a year plus $6 per connect hour. That is what the database producer takes as his royalty.

The third way is for the database producer to supply the tapes at no cost and to receive royalties. This is the way that is probably most commonly used in the States today and it is the way that most commercial companies work that are in the reference database sector. Then the database producer generally takes something like $30 per hour from the on-line service for every connect hour that users clock up by the month. Or alternatively the database producer takes, say, 50% of the connect time.

The fourth is a very interesting way and it is the way that RHM are doing it. This is the contractual way, where the on-line service signs a contract with the database producer to use the on-line service. The on-line service does the invoicing and the database producer provides the statistics of how much the usage is, but the on-line service handles everything with the end user. More and more database producers have learned now that the on-line service does

not give them any marketing support, so they go ahead and sign an agreement with the on-line service to pay all their costs plus a profit. The database producers then go out, do their own selling, and make the arrangements with the customers themselves. The numeric databases are rather different, largely because the database producers are dealing with the timesharing companies which work on the basis of a computer resource unit.

The way that this latter normally works is that the database producer (for example, COMPUSTAT, EXSTAT or Datastream) negotiate and sign agreements with the users for example COMPUSTAT charges $25,000 a year for a user to be "a member of the club". And so the user joins and gets a lot of usage. The timesharing companies then put the databases up on-line, and they collect all of the fees for the usage, while the database producer has collected the fixed fee. That is very common practice in the States at the moment.

Let me give you a few examples of the fees charged, because there are so many different structures. These examples will, I hope, be useful to you as a guide if you decide to go into this business yourself. One example is a $25,000 annual user fee plus no usage participation. Another example is a $500 annual user fee plus a royalty based on CRU premium charges. And the final example, a $6,000 annual subscription fee plus half of $56 per terminal connect hour and half of the 42% per CRU rate. Those are examples of the types of rates.

When EXSTAT went to the US, they offered it to the American businessman at different rates. They offered no minimum per item access charge, unlimited usage at $700 a month, or unlimited usage at $6,500 a year. Most people took it on the basis of no minimum charge and just paid an access charge whenever they used the service.

Specific case studies reveal diversity of approaches and attitudes to this growth industry

1. *Data Resources puts it all together to become the world's most successful online database company*
2. *OCLC achieves 75% annual growth rate to dominate online library services business*

You may be wondering whether there is money to be made in this industry. There are two organisations that I know are doing very well indeed. Data Resources Inc. is in the econometric database area. The company was founded ten years ago by Dr. Otto Eckstein who was a leading economist at Harvard. He teamed up with a Wall Street man who had a good idea. From 1969, when they started, their revenues have soared to $5 million in 1973, and to $35 million this year. Over the last two years their sales have been growing at the rate of 40% a year. But their really significant success lies in the fact that for the last two years their profits have been going up at the rate of 70% a year, and it looks as if this rate will be maintained this year. That is because these databases can be exploited with advantage. Once they have been built and the correct method of operation has been devised, it costs comparatively little to add on an extra user, and the really big returns can be achieved.

Data Resources have also succeeded partly because of the very interesting pricing schemes they have evolved. I realise, in making these comments, that in some cases your companies might be users of Data Resources. My comments on their operation may, therefore, be helpful to you in guiding your own buying decisions as you begin to deal with more and more database vendors. Data Resources have been able to build continuously, through excellent training programmes and good promotional tools, and good usage tools. As a result, the average revenue per customer has risen from $16,000 in 1971 (when they had 111 customers) to $50,000 per customer on average, in 1978, when they now have 550 customers. They have achieved their success by building more and more useful applications and by training the people on how to use those applications. When you think of your own costs of timesharing you will agree that $50,000 per year, per customer, amounts to a lot of revenue.

There is another company, OCLC, which is a non-profit organisation dedicated to the library field. They bought a beehive terminal, designed it to their own specification, and they have now installed it in 2,500 libraries around the US. They have grown in the last four years at the rate of 75% a year in growth, to $20 million in annual revenues, with $3 million profit. For a non-profit organisation, that is not at all bad, as I am sure you will agree. Now they are heavy users of our viewdata study, because they are now producing plans for using those same techniques to move viewdata-type information into the home. They provide a number of essential services to libraries, which saves the libraries a lot of cost because they do not have to provide these services for themselves.

Related services and products offer diversification opportunities for online database organizations, and exciting new information services for users

1. *Custom information services fill a void between users and online services*
2. *Stored reusable searches and packaged searches help users.*
3. *Users demand improvement in document-provision services*

There are also side areas in the on-line database industry. Maybe you do not want to become an on-line service or to become a database producer, but I am sure that you will

be a user. You already are, in one way or another. But there are lots of other aspects to this business. For instance, TELENET and TYMNET are the vendors who offer the packet-switching services to the industry. With these services, searches are stored and every month they can be run off in certain subject areas. There are package searches which outside organisations such as, say, the Times of London, or the Financial Times, will put together and publish. There are customer information services where the user does not do the searching himself but uses you people to phone into these services and they do the searching for him. For example, FIND/SVP in the United States has 100 different databases now, and since a lot of users are not yet trained to use these databases, they phone in and FIND/SVP does the searching for them.

Let me now mention another example. Proctor and Gamble could be like any of your companies. They have taken their in-house information centre (which has become very good at searching a lot of these databases) and they are now offering that service out around Cincinatti and around the country. So that becomes a spin-off area.

Intensive survey of users of online databases provide valuable feedback necessary for product improvements

1. *User expenditure on numeric databases dramatically outweighs textual database expenditures.*
2. *Users indicate that price increases of 15-30 percent would not affect usage much.*
3. *Broad system capabilities and getting there first are important.*
4. *Users report careful evaluation of print-versus-online issue, requiring database producers to creatively respond to changing usage patterns*

As part of our study we did an intensive survey of 4,000 current users of on-line databases, both in Europe and in the USA, with about 85% of the users being in the US. We found that those users are spending a lot more on numeric databases than on text databases. The average expenditure per month of those users on numeric databases is running at about $3,800, while on text databases it is running at about $800 per month.

So far as usage is concerned, we found that the text database users are using anywhere from one to ten different on-line services to which they have passwords, with an average of three; and every month they are searching at least seven different databases. With the numeric databases, users are using anywhere from one to eight on-line services, and the average user spends his time searching and manipulating three of those databases.

Our study also showed that dropping the price does not increase the usage very much. Raising the price, even from, say, 15% to 30% does not seem to reduce the usage. This confirms that the demand is there, but there is a need for increased training and increased awareness of what the various databases are. For instance, we found in our study that there is one called BLOODSTOCK where all of the various thoroughbreds are listed. Every time a new horse is born its details go into this on-line database, which is run out of Lexington, Kentucky. There, one of the things they do is to find out what name is available to fit this type of horse so that they do not have the same names.

There are definite advantages in getting the users as early as possible. Then, once a user starts searching a certain system with certain software and gets used to that — because there is very little standardisation in this industry as yet — that user will tend to continue to use that one service.

Let me tell you now what the users say they use the databases for. For you gentlemen with your responsibilities I think this might be of some interest. They rank seven areas where they are using databases in their companies.

- To provide general support to research and development.
- To help one or more individuals stay abreast of development in a particular area.
- To help an individual write a paper or give a speech.
- To help in decision making, that is to solve an immediate problem. (This area was ranked the highest.)
- To provide general support to planning and evaluation.
- To provide general support to operational activities.
- To provide general support to marketing.

Of not too much importance, because it is more of a US problem because the dominant part of the industry in the US is commercial, but they do worry about the Government coming in and running these various on-line services like MEDLINE.

When they had it up on the SDC system at $60 an hour and pulled it off, putting their own money behind it at $15 an hour for the good of the general public. This is in the health field so you cannot really argue with it, but it did hurt the on-line service.

Special issues and trends in the online database industry

1. *Government and private-sector relations*
2. *Examples of various government-based online database activities*
3. *Government as an operator of online database services*
4. *Government as a database producer*
5. *Other aspects of the future*
6. *Potential for integration and crossover among industry groups*
7. *Standardization within the online database industry*

There is a huge energy database subsidised by the US Government. As we learned yesterday, America keeps spending on energy and they also spend on creating large numbers of databases on energy. I do not know where it will end, but they will have all these thousands of databases on energy.

The big question is: will they make those databases available to the commercial services or will they key them to earn revenue for themselves? Or will they subsidise them?

We talked about the integration that is taking place. Standardisation is a big problem in the future, and it does not seem to be happening very fast.

Technology advancements affecting the industry

1. Current trends
2. 1200-Baud access
3. Microcomputers
4. Study views on technological advancements
5. Study views on intelligent terminals and small computers

In the technology areas we found five major technology areas that are of importance to this industry. The declining costs of the mainframes, storage and communications will obviously be of benefit to the industry. On-line database services will be cheaper; the connect hour prices will come down and the CRU prices will come down. The system architecture innovations will make it easier for people to put their databases up. Distributed processing and mini computers will make on-line database services more readily available to the end user departments. Two developments that cause some concern, depending on where you are in the industry, are the 1200-baud access which is growing rapidly in the US. When information can be pulled out much faster than at 300-baud, the user is not connected as long and therefore the rates will go down to the on-line services. So they are a little wary of the trend toward installing 1200-baud terminals.

Furthermore, they also worry about the piracy that can take place. After all, the database purchaser has created a database that is proprietary and he has invested a lot of money in it. He is naturally worried about the copyright aspects of the information on his database. If a user can pull it off at 1200-baud, store it on a minicomputer in-house and do all the manipulation there, he is taking money away from the on-line service that he formerly used to manipulate the information for him. I am afraid that I am giving you people some ideas, but this is the way that things are developing. If a user can pull information off and run it on a minicomputer, it means also that the database producer does not get the royalties. This is an example of a problem which exists because of the advancing technology in the industry.

Overview of the current European online scene

1. Alternatives for database producers in Europe
2. The European hosts and their databases
3. EURONET and the PTTs
4. The problem of transborder data flows
5. European users
6. 'Multilingualism'
7. National, multinational, and international scenes
8. Viewdata - the new online age?

I should like to end with a few comments on the European scene. We did not study Europe intensively, but we did a bit of research in Europe. Europe presents a very complex situation, mainly because there is a lot of nationalism. EURONET is unfolding, and each country wants to have its own "database industry". It is very difficult for a database producer to decide which networks or on-line services to go with. You have SCANNET, TRANSPAC and the PTT networks. You have the whole EURONET development, which some people still say does not have a chance of working, although others are fervent about how EURONET will pull it all together.

On the EURONET networks you have various European hosts who, country by country, are storing databases and making them available through EURONET. That is where BLAISE and INFOLINE are participating. There is Telesystems in France, and a very large one, DIMDI, in Germany. The leading one in Europe today is the one in Frascati, Italy, outside Rome, mounted by the European Space Agency, now called IRS (Information Retrieval Service). EURONET is going to try to pull all these together into one gigantic network. The problem is that there are competing PTTs in the different countries, and they all have different tariff rates that they want established, and so on.

The transborder data flow problem is there and will not go away easily. I am sure that you are all aware of the TYMNET situation versus the PTTs in Europe and how that situation has been resolved. But the nationalism that exists when trying to put tariffs on and when trying to get some control raises issues of privacy. All these aspects come together in this transborder data flow problem and they are causing considerable concern on the other side of the Atlantic.

The British and the Dutch are by far and away the biggest users of on-line databases today in Europe, followed by the French and the Scandinavian. The Germans are quite a way behind. I shall be in Germany next week, looking at their viewdata industry, to see exactly why they are so far behind. But I suspect that it is largely the problem of language plus

the fact that they did not get in there as early as the French. The language problem is very difficult but, as I told you earlier, because you have that English language you have an advantage over other people because that will be the ongoing language of the database world. You invented viewdata and it is growing here. It is supported by the BPO — and you have a real opportunity at least for a couple of years (as long as the BPO continues its financial support) to get involved in this industry at a very low cost.

No matter in what way you may choose to participate whether as a user, as a spin-off service, as a producer or as an on-line service, I think that it is important that you raise your level of consciousness on this on-line database industry, that you try to move forward quickly, and that you take full advantage of what Britain can do to be a world leader in this industry.

QUESTION: These databases are available via a variety of networks and using a whole range of terminal equipment. This would seem to raise all sorts of compatibility issues — how are these resolved?

GAFFNER: First let me deal with terminals. It was a concern two or three years ago. By now in the States — and I cannot comment on the UK — most of the databases and on-line services have established themselves so that they can be compatible with almost any terminal. TRW have a new credit database that they are avidly marketing. Their sales people carry along with them a directory that has 48 different types of terminals in it. Before a salesman goes to see the credit manager to make the sale, he finds a nearby terminal — because the main resistance from the credit manager has always been, "I don't have a terminal. I don't want to start running a terminal to use your service". So the salesman learns how to use this nearby terminal, goes in, takes the credit manager to the terminal, and kills that sales resistance. That really helps him to make a sale. By now, that problem has faded away in the States.

Protocols continue to be a problem. It is part of the standardisation issue that I mentioned. That is why the sooner that one gets in there and gets users signed on and accustomed to using their protocol and their system, the better. Because everybody is trying to move forward as fast as they can, there does not seem to be any willingness to try to bring about any compatibility in that direction.

RAY: Haines, may I ask a question? You mentioned that one can expect the suppliers to sell directly to end users rather than to management services people. You were saying that the action will be with end users. What steps should people in management services be taking to prepare the organisation for this, since clearly they have an important part to play in all the issues that are concerned in the area?

GAFFNER: In the States that has been more a concern of the libraries and information centres which are now using many of the databases. I see management services as having the opportunity to become very involved. Alternatively, if they neglect it, other parts of the company will step in and fill the void.

This is why this organisation that I mentioned, called Program for Information Managers, has emerged. If a management services executive in a department dwells only on the handling of internal information, zapping that around in a multinational corporation, and overlooks or neglects the external information that will be coming in, the chances are that management services will lose control of this area. However, if they set out now to understand at this early stage, they can capture it and make it an important part of the service that they give to the entire company. They can then help to control the expansion into the end user department areas in the same way in which they have controlled many aspects of the usage of the internal computer services by the end user departments. This would just be another area where management services could have control, with the market research, the corporate planning department, and so on. I am sure that most of you have programmes in your department for controlling the usage of timesharing. I can see a similar operational control emerging in your departments over on-line information.

BUTLER: (Butler Cox): Can you tell us how the issues relating to copyright and royalty fees are handled?

GAFFNER: It is being solved by entrepreneurial organisations, and by the US Government, setting up document provision programs. This has all happened in the last year. They have formed a copyright clearance centre to avoid this problem that if you do one-off copying it is OK for fulfilling, just as long as you are not doing mass copying, and it does not avoid copyright. Some of the on-line services now have electronic mail drops where you get a search out on your terminal that shows you 89 references. Then you pick, say, numbers 2, 12, 29 and 76, feed that information in, and it goes to the database producer. He keeps a store since he generally will have this full-text information on hand. It might be a magazine article or a journal article, or some type of study that was done in the past. The database producer will then make and send that out. It can be sent out by express service for delivery within 24 to 48 hours. But obviously there are fees involved, and the whole area of document provision will be a major problem.

Here it will be more so, because of all the different languages and all the translation problems when EURONET becomes operational. It will be an area of opportunity for various people to go into.

I would say that the problem has been minimised in the States because of the way in which users have responded. Most of the time the abstract is written so that it can handle, say, 85% of the retrieval use, especially where the searches are made by the businessman or the marketing man. The problem exists only when you get down to the scientist or, say, the people in R & D who are working on long-term projects. But we have found that the scientist is not the type of decision-maker who has to move that rapidly. In the past, he has had to wait a month for certain articles, and now he can get them in two weeks. So there tend to be more things like the Dow Jones News Retrieval Service that I described, to try to put enough into that abstract so that it solves 85% of the needs of the users.

TV-BASED SERVICES

R. Woolfe
Butler Cox & Partners Limited

Roger Woolfe is a partner in Butler Cox & Partners Limited, responsible for managing viewdata research activities. His background includes many years in the precision electro-mechanical engineering industry, with roles in computer systems development, internal consultancy and line management. He holds a BSc and a DIC from Imperial College and is a Member of the Institute of Production Engineers. Recently he has written reports on Display Word Processors and on viewdata itself. He was project director in charge of the Butler Cox study on viewdata in the USA.

BUTLER: For the past three years there has been a steady crescendo of interest in viewdata systems in Britain, which culminated last February in the announcement by the British Post Office of the launch of a national viewdata service, to begin next year. During that time a good deal has been written and spoken about viewdata. It was noticeable during the earlier stages of the Conference how almost every speaker felt it obligatory to include on one or other of his slides the word "viewdata", making as it were ritual obeisance towards Finsbury Circus.

However, viewdata and, in particular, the British Post Office implementation of viewdata which we shall have to learn to call by the unlovely name of "Prestel", is not the only instance of a TV-based system. It is the purpose of this next session to take a slightly wider look at such systems, what they offer and what the problems are.

WOOLFE: In recent months the prospects of an imminent revolution in home television have received a good deal of publicity, not only in the UK but in Europe, North America and Japan. For example, in Newsweek for July there is a long article on the television of tomorrow.

Lionel Van Deerlin, chairman of the US's house sub-committee on communications, predicts that the new video options

> "will transform not only the face of broadcasting but the lives of Americans as profoundly as the Industrial Revolution of the 19th century."

Alex Reid, Director of the UK's Post Office viewdata, says:

> "Our aim is to provide, in Prestel, a universal system of electronic publishing, that provides good value to user and information provider alike, that bolsters the open systems of communication on which a free society depends, and which benefits both the British communications industry and the UK economy as a whole."

Futurist Alvin Toffler says:

> "We're going to move from a few images distributed widely to many images distributed narrowly: it will be narrowcasting rather than broadcasting."

As evidence of the reality of the revolution in the UK, we now have entire periodicals devoted to the subject of 'using' rather than viewing television. Look at these, for example: 'Viewdata and TV user', which has just come out, issue No.1. 'Teletext and viewdata magazine', issue No. 1, October. Here are the first two issues of the Prestel Users Guide; the first one came out in July, and the second in October. And there will be others.

Well, despite the publicity and the predictions, there is of course little real evidence that the expected revolution will take off, and if it does, that it will be as significant as its protagonists proclaim. I say "of course" not in any critical sense: I mean that no true innovation really meets a market need, it creates one.

Now it is my intention to talk briefly about the nature of some new TV services which are being experimented with in several countries to provide an overview of what is going on, trying to look for any clues about what really might happen. My focus will be on home TV services. After a brief summary of TV enhancements which are aimed primarily at the entertainment market, I will go on to pay particular attention to information services.

New home TV-based services

cosmetics
games
VCRs
slides
home movies
big screens
videodiscs

A quick review now of what entertainment-oriented TV add ons are becoming available, as portrayed here. First, cosmetics. By this I mean 'goodies' like screen within a

screen to show two channels at once; pre-programmed channel selection; even audio channel identification. Games, which we all know about. Recently, programmable games have come on the market, such as the offering from Atari, the division of Warner. In the US, $185 will now buy you 1300 cassette tape games.

VCRs (Video Cassette Recorders); there are three prime contenders on the UK scene now creating a good deal of publicity: Philips, Sony with its Betamax, and JVC with its VHS system. They offer now typically two to three hours of colour video and sound on a cassette.

The purpose of these VCRs is twofold: first, to record off-air programmes, either on an alternative channel to the one that you are watching, or by preselecting up to several days ahead, a particular programme that you want to see. The second purpose is to show prerecorded tapes of popular programmes like M.A.S.H., though the choice at present is really rather restricted.

Sales have been frankly disappointing to the industry. For example, in the US about this time last year the predictions for 1978 were for a minimum of ¾ million devices to be sold and some predictions were well over one million; in my estimation the actual sales in the US will be unlikely to achieve 400,000 by the end of this year, and that allows for the Christmas rush. Europe and Japan have been similarly disappointing.

Could the reason for the low sales be that there simply is not really a great deal on TV which people want to record?

The consequence in the US has been fierce price cutting, down to about $700; compare that with £700 in the UK. The systems are incompatible and each manufacturer is anxious to establish his as a standard. If it turns out that the more important purpose of VCRs is for recording programmes, perhaps a standard is not that important.

Let us move on to slides. 35mm colour slides, of which there are billions in the world, can now be transferred on to video cassettes for showing on the TV screen via a VCR. A representative price for the US Fotomat process is $7 for 80 slides, each slide to dissolve on the screen after a ten second interval, though you can specify the interval yourself.

Home movies. These can be prepared in two ways: first, by converting your super 8 cinefilm to video cassette. Devices are available, for example, from Nordmende in Germany, and from Fotomat in the US, where a typical price is 60 minutes for $15. The rationale here is viewing convenience, and no need for a projector, screen and so forth.

The second way that home movies can be prepared is by making your own video films with a portable video camera, now available with sound and colour for around £1000, excluding editing devices, with tapes at around £5 an hour. In the US, where the price of the equipment is around $1200, some 50% of VCR owners are expected eventually to purchase a video camera.

Big screens. They are now firmly entrenched in the US market. There are several models; for example, the Advent 6 ft Videobeam screen which you can have for around $3000; General Electric's 4 ft Widescreen for about $2800. Sony is also about to enter the big screen market.

Finally, videodiscs. There have been annual promises of a launch of this kind of device on the domestic market, but one has yet to be announced. Videodiscs will look like regular LPs, except that they will include both video and audio, and be designed to show prerecorded material more cheaply than with video tape. The technological problems are considerable though.

Videodiscs must deliver a signal with over 200 times the bandwidth of hi-fi, for example, by spinning at 1800 rpm and modulating the grooves at four times the fineness of LPs.

Devices are under development by Philips/MCA, Magnavox, Warner, CBS, and JVC amongst others. The Philips device will have a platinum surface and a laser reader. Industry observers are predicting a price of around $500 for the player, and perhaps between $6 and $15 for a disc. RCA's device will supposedly be less expensive and will use a mechanical reader. They have certainly been able to demonstrate a videodisc system in the laboratory, but the problem persists of reproducing the laboratory devices as production items at a realistic price.

Videodiscs will be unable to record, so people already having VCRs may find discs unattractive. On the other hand, if they turn out to be significantly less expensive than cassette tape and the prerecorded material is good, they could be very successful.

Home TV-based information services

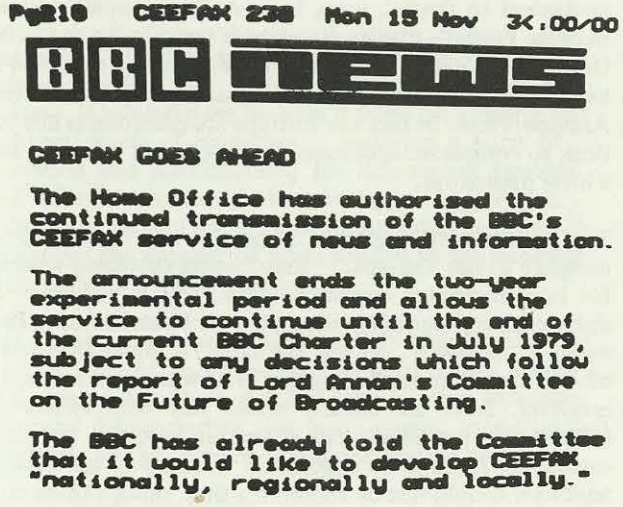
1-way teletext systems

Ceefax / Oracle
Antiope / DIDAN
Infotext
Teledata
Line 21

Let us now take a look at information services as opposed to entertainment services. This slide is about one-way teletext systems. Teletext is a one-way broadcast information service, allowing viewers with modified televisions to display selected 'pages' of information on their screens. The information is stored digitally on a computer file at the transmitter, and transmitted piggybacked on to the regular picture signal. In fact the data is encoded into one or more of the spare scan lines in what is called the Vertical Blanking Interval, which occurs as the picture generating beam returns from the bottom corner of the screen to the top.

The first system noted here is Ceefax/Oracle. In the UK a teletext standard was agreed in 1974. All three channels now have a service: Ceefax 1, Ceefax 2, and Oracle. A selection of roughly 100 information pages, each with text

and simple graphics in up to seven colours, is available on each channel. Viewers select a page of their choice using a keypad, and have to wait an average of around 12 seconds for the information to be broadcast, decoded in the set, stored (a page of information takes about a quarter of a second to be transmitted and built up in the 1000-character memory) and then displayed.



These photographs show examples of the Ceefax index page, and news page. At present the services themselves are free, but the set adaptors are expensive. New sets with teletext are up about 50% on the regular price. External plug-in adaptors which you can get for existing sets cost about £250. So although most of the 20 million sets in the UK already receive the teletext signals, only a few — around 10,000 — can decode them. But the potential for decoder price reduction with volume is high: just an extra 10% on the price of a regular set.

TV manufacturers in the UK have been disappointed with the market response to teletext so far, but recently there have been signs of faster growth. In fact it is becoming increasingly common to see teletext sets in TV retail shop windows and department stores.

Teletext in the UK is arguably the world's first up to the minute mass information service. Within a few years it could become the world's most widely read magazine, achieving a readership of ten million from around three million TVs — that is 15% of the total.

We have been talking about Ceefax/Oracle, but it is not the only teletext system. The next one that I have here is Antiope/Didon. Antiope is the French decoding and display system under development by the CCETT, the joint research centre run by the French PTT and the TDF Broadcasting Authority, at Rennes, in Brittany. It is similar to Ceefax/Oracle but gives rather greater flexibility at the expense of a more complex decoder and character generator, a larger memory, and a higher transmission load.

Didon is a broadcast packet system designed to transmit telex, fax, and teletext. It can be transmitted on any or all of the lines in the regular TV picture signal.

Since May 1977 the Paris Bourse (the Stock Exchange) has been using it to transmit stock prices to 250 sets in stockbrokers' offices in Paris and Lyons.

Next, Info-text. Micro TV of Philadelphia have been demonstrating their Info-text system this summer. It is designed for both broadcast and cable transmission. One customer is Canadian Cable which planned to install 25 terminals starting this autumn, and to show information including news, local news, sports results, consumer association reports, TV guide, air arrival and departure times, movie guide, lottery guide, shopping basket, weather, recipes and so on.

Teledata. This has been developed by KSL, part of Bonneville International Corporation, of Salt Lake City with assistance from the BBC. It is based on Ceefax. KSL has also been getting assistance from Texas Instruments, who have been supplying expertise and decoder components.

Line 21 is another American system. The Public Broadcasting Service of Washington has been developing its Line 21 system — so called because it uses the last scan line, No.21, in the Vertical Blanking Interval — to provide programme captions and additional information for the deaf. At present it is experimental to a handful of receivers, but a fuller service is expected to start towards the end of next year.

Besides these teletext systems there are others which are in various stages of development, in Germany, Sweden, Denmark, and Japan, just to name four other countries.

Home TV-based information services

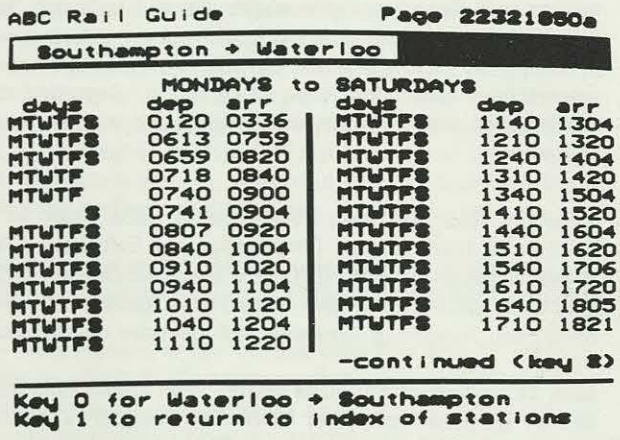
2-way viewdata systems

Prestel
Bildschirmtext
Antiope/TITAN
DOC Videotex
Captains
VRS
Green Thumb

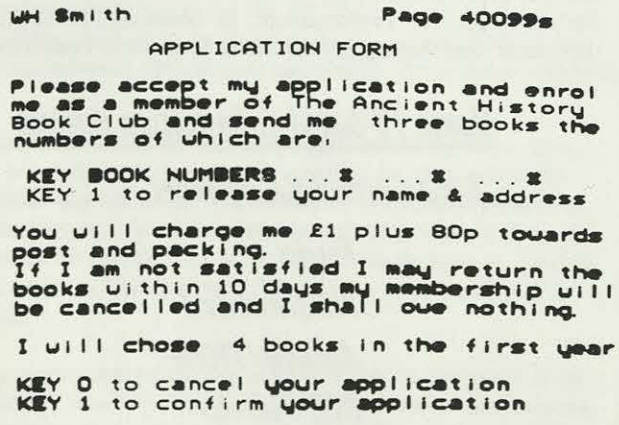
This slide is about two-way viewdata systems. Like teletext, viewdata systems allow viewers with modified TVs to

display selected pages of information on their screens, but unlike teletext they are two-way using the telephone or cable. The two-way capability opens the door to improved, and wider, services: for example, more information pages, because users can search their way through the choices interactively, using a keypad; ordering from the home, because users can request information for display, make a selection, and place an order. Thirdly, by entering their credit card number they can effect a purchase transaction on the spot. Signatureless credit card transactions are already widely used in the US, for example for telephone ordering, and are already being used over here.

Next, messages between users; also calculations; and quizzes and games. There are several viewdata services under development throughout the world. The first one to discuss is the UK system, Prestel. The UK service developed by the Post Office is now starting its test service, which will continue until the end of 1979.



This is typical Prestel information, from ABC's rail timetable, showing quite detailed information for Waterloo to Southampton. I will come back to that later.



That is an example of a W. H. Smith form page. If you had that on your screen, you could complete it yourself using a keypad to enter information. As a result a message would go through to the information provider — in this case W. H. Smith — who will respond. It happens to be an order form for a W. H. Smith book club.

About 1600 televisions will be involved in the Prestel test, distributed to selected domestic and business users. Around 150 information providers are supplying pages, of which about 20,000 are now in place. All the UK set manufacturers are involved, and the Post Office is allowing modems to be built into sets so that they can be connected to standard telephone jacks.

The public service is planned to start at the end of the first quarter of 1979. The intention is to open a number of Prestel centres across the land, at first each holding identical databases updated simultaneously from the centre, which will be in London, and each with a capacity of around 250,000 information pages. Later the centres will hold different databases containing a mix of national and local data.

Let us move on to Bildschirmtext. Germany purchased the Prestel software and know how in August 1977 and demonstrated it at the 1977 Funkausstellung, which is the Berlin radio and television exhibition. There are now around forty information providers and a public service is planned to start in 1982.

Next the French System, Antiope/Titan. Titan is the French equivalent to Prestel, using their Antiope display system. Because Prestel's display standard is very similar to Ceefax/Oracle, but Ceefax/Oracle is not the same as Antiope as we have already seen, Prestel is necessarily different from Antiope/Titan. In fact the Antiope specification is not yet firm, so comparisons between the two are at this stage still a little premature.

The French have tended to emphasise also that Titan is designed to use Transpac — their packet switching service — for inter-computer communication. This is not really a significant compatibility issue vis-a-vis Prestel because Prestel could, if necessary, do just the same. A major field trial of Antiope/Titan is planned for 1980 with 3000 residential receivers. Talks are already under way with twelve information providers, and computer hardware is being evaluated. There is no theoretical reason why the Prestel hardware should not be chosen for that, though there may be practical reasons why it will not be chosen.

DOC Videotex. Canada's Department of Communication's Videotex service is designed to use either phone or cable. It differs from Prestel/Titan in that data is not stored in the computer in a form ready for mapping directly on to the terminal display, but as a set of descriptive language statements using the IGPL language (Interactive Graphic Programming Language).

Any terminal able to decode the language can present a display and the display resolution becomes a function of the set's resolution capability and not of the data, thereby opening the door to any future changes to TV set resolution without jeopardising the database. In other words it uses a virtual terminal approach.

Japan's Captains telephone viewdata system has just started its public trials, planned to involve 1000 households in Tokyo. Each page shows eight rows of 15 Japanese characters each. Like Prestel, it can display text and simple graphics in up to seven colours. The test service will provide users access to news, stock market data, weather reports,

sports results, theatre and exhibition schedules, shopping guides and so on.

VRS is Japan's Video Response System. Captains is under development by the Ministry of Postal Services in conjunction with Nippon Electric, Hitachi and Matsushita, and uses regular phone lines. But VRS is being developed by Nippon Telegraph & Telephone and can display still and moving video as well as audio using a special telephone line with repeaters to achieve a bandwidth of 4.5 MHz. Users use their regular phones fitted with special keypads, or use the normal push-button dial, to request services from the centre.

The VRS centre contains various kinds of equipment including a microfiche retriever, videodisc equipment, a graphic character generator, a 16 mm cinema film projector and audio and video output equipment. One of the services is a still video and text service — in other words a viewdata service.

My next example is Green Thumb, another American system. Green Thumb is a telephone viewdata system proposed by the National Weather Service in the US to provide highly specific information at low cost to farmers.

It connects a standard television via a Green Thumb telephone interface box, with an integral keypad, to the telephone. It is interesting because it relies on a 'dump and disconnect' mode of operation — receiving a burst of information and disconnecting for subsequent retrieval of the information from a 4K memory inside the box. For this well defined application it is a suitable approach. It minimises the number of ports needed at the database and the time-metered connection.

Green Thumb was demonstrated publicly about two weeks ago on October 24, and although I was not there I believe that it was used to show detailed area weather forecasts, agricultural data including pest management, irrigation and harvesting; and cash crop and livestock market prices.

We have described several different teletext and viewdata systems to indicate that there are in fact a number of developments going on — and I certainly have not attempted to cover them all.

An important point is that the standards of these systems — in terms of what is stored at the computer, transmission standards and display standards — do differ, and not only because the TV set industry has different standards in different parts of the world.

It will be interesting to observe the development of international standards for viewdata and teletext. In the UK we are in the fortunate position of having a virtually identical standard for viewdata and teletext, leading to a potential for component cost reductions and an expectation that most viewdata users will also be able to display teletext.

This is a good moment to summarise the differences between the two systems.

TELETEXT

topical information of general interest

available now

no phone connection

100% user loading

cheaper to buy and run

limited capacity

1 way information only

Teletext, which we have already defined, is appropriate for topical information of general interest. It is available now, in the UK. It involves no phone connection. It can handle 100% user loading, just like television. From the user's point of view, compared with viewdata it is cheaper to buy and to run. But it has a limited capacity and it is a one-way only information system.

VIEWDATA

vast capacity of specific information

2-way services

commercial leverage

available soon

more to buy

phone connection

usage billing

Viewdata, on the other hand, can hold a vast capacity of specific information. It is a two-way service. It offers information providers significant commercial leverage. It will be available soon. From the user's point of view it costs more to buy. It also involves a telephone connection when a user wants to make use of it, and also initially a certain amount of hassle in the household has to take place to connect the TV set to the telephone. Usage billing is also involved, as we shall see shortly. Before we go on to that, I should just like to draw your attention to some other home TV services.

Home TV-based services

Other services

- Apple - Dow Jones
- Infocast
- Qube
- Hi-Ovis

This slide shows four systems which I think are particularly interesting. The first is an American system, the Apple-Dow Jones system, which illustrates the convergence of personal computer and viewdata systems.

In this case the users of an Apple II personal computer can plug into the TV and use it as a video display, and can also connect over the telephone with a database — in this case the DJS (Dow Jones News Retrieval Service) — via Tymnet, a US packet network with a distance-independent tariff. Users can get two kinds of information at the moment: financial news and a quotation service.

The second example is Infocast. This is proposed by DBC (Digital Broadcasting Corporation) of McLean, Virginia as a multi-point message delivery system using, at present, sideband radio and radio printers. It could be developed as a viewdata-like message service using television sets.

The third example is Qube. This is Warner's much publicised two-way cable television service now being received by over 20,000 subscribers in Columbus, Ohio. It has received a considerable amount of press coverage world wide. It was featured on an ITV news programme about two months ago, when the last five minutes of the News at Ten was devoted to it. The 20 channels offer some degree of participation; viewers can use a 5-button keypad to respond to questions, quiz shows and panel discussions; they can participate in auctions, education tests and so on.

But it is not a viewdata system because it does not offer information, only entertainment. However the first Qube will not be the last, and I expect Warner to develop a Qube 2 in a different location, probably with a 10-digit keypad and possibly with a viewdata capability.

The final example here is the Japanese Hi-OVIS system, Higashi Ikoma's two-way optical fibre system, to which nearly 200 homes are now connected. The high bandwidth of the optical fibres allows two-way video. The homes participating in the test service are fitted with cameras as well as television sets. As with VRS, the TVs are connected to a centre equipped with a wide range of devices so that users can call up still and moving video pictures, and also viewdata information.

Hi-OVIS is a rather more ambitious experiment than one which has been similarly evolved by the 'Living-Visual Information System Development Association', at Tama New Town. It is called the CCIS system and uses conventional coaxial cable. Recently, a two year test phase was completed involving 500 households. There were ten experimental services, all of which were monitored. The experiment is being continued in a second phase, but with the number of services reduced to six.

The four that have been dropped are pay television; facsimile newspaper; auxilliary television, with a black and white monitor that was dedicated to alert services such as catastrophes; and broadcast and response, a two-way information exchange service.

The viewdata service, though it was the least popular of the remainder, is being kept on.

TV-based services: The Driving Forces

- Programme service profit
- Terminal product sales
- Users' desires
- Social benefits
- Business information economies

What are the driving forces behind these experiments and the planned new public services? There are several. The first one is programme service profit. Let us take Prestel as an example, now that the public service tariffs have been announced.

Each dual computer centre will cost £600,000 per annum to run, says the Post Office, but the Post Office will recover that from its user connect time charge of 2p per minute, which was agreed with the information providers just a few weeks ago. That is additional to the phone charge which is at normal rates.

The Post Office plans to profit from its storage charges on IPs which should amount to over £1 million per annum from ten Prestel centres: and that disregards the extra telephone revenue that will accrue to the Post Office. The IPs themselves expect a gross revenue of around £600,000 per annum from each Prestel centre, or £30 per frame on average, duplicated at ten centres.

Next, terminal product sales. At first when TV adaptors cost £150 each or thereabouts, the depreciated cost will be £50 each per year. That is equivalent to what the average domestic Prestel user is expected to spend on telephone and access charges. At that stage some 50% of the Prestel business will be in terminals. This is very interesting to the semiconductor industry and the TV manufacturers, as well as to the manufacturers of traditional VDUs.

In fact the UK TV industry, at roughly 1½ million units per annum output, is running well below capacity, and is

deeply interested in new products to revitalise the market. The difficulty is that it is a low profit business with few funds to invest, so the question is: of the enhancements which we have already discussed, including viewdata and teletext, which is the best one to back?

While the industry ponders the options, it is aware of the threat from other quarters: the Japanese industry, which is pushing VCRs very hard, but conducting experiments with all the other alternatives including some that we have not discussed this afternoon; and secondly, the big semi-conductor, computer terminal and office equipment manufacturers.

ITT's recent move into the market with Apple II systems is a clear indication of the company's intentions. IBM has been rumoured for some time to be looking closely at the market. Exxon is well placed following its moves into micros, storage devices and low cost office equipment. Texas Instruments will be ready to launch its first home computer product early in 1979 according to industry sources, and will probably follow with other products during next year.

TI's first product, a 'home information centre', will be designed to operate with a home TV and will probably be priced in the $300 to $400 range. It is expected to use plug-in ROM software packages, and although it will not come with peripherals at the basic price, they will be available to go with it.

Later in 1979 TI will announce a small business computer with a larger data storage selling at around $700 to $900. It will be sold off-the-shelf by retailers and business equipment dealers and will probably operate with plug-in software modules.

What implications will the fast growing market for personal computing have for viewdata? The answer is that the implications will be considerable because the two systems will converge.

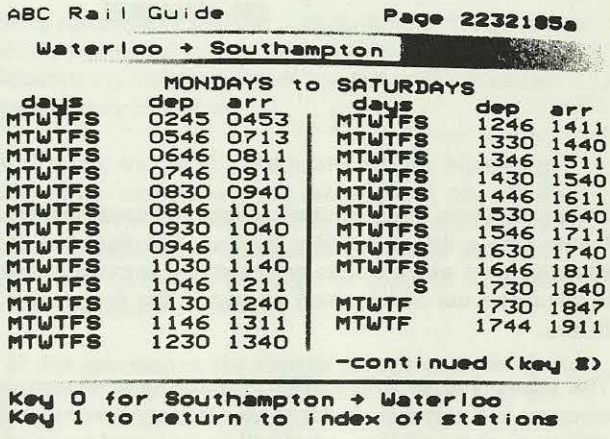
Personal computers, with keyboard, storage, processing power, and the TV as a display, will require data and software to be useful. Data, for example in the form of home or business accounting information, can be entered through the keyboard. The software, for example to perform a tax calculation, can be entered through an exchangeable plug-in module.

But the ability to communicate over the telephone network will greatly enhance the personal computer's capabilities by permitting access to external information databases, and external software sources.

This sort of communicating personal computer will be virtually identical to a 'smart' viewdata terminal, with built-in processing power, receiving 'telesoftware' distributed through the telephone network.

The major practical problems associated with this description lie in the difficulties of providing truly portable software to a range of non-standardised devices. The fact is that standards in the personal computer market are unlikely to be established within the next few years, although viewdata, if it were widely implemented quickly enough in a standard form, could become the means for resolving that problem.

On the other hand, progress is being made with machine-independent software. Already in the UK the potential for mass distribution of packaged software via Prestel has been demonstrated using Microcobol. A computer program can be called up from the viewdatabase via the regular telephone link, loaded into an 'intelligent' viewdata TV with an attached microprocessor, and used for processing information also received from the viewdatabase.



The applications demonstrated have included keyword searching on ABC's railway timetable which we saw earlier. The demonstration to which I refer took place last Friday. It was designed to show how a not untypical information provider's database, which can be a little complex to work through using the regular tree structure, can be manipulated using keyword indexing by using an index program that can be taken off the viewdatabase and used in conjunction with local storage in the way that I have just described.

Let us move on to the third in the list of driving forces — users' desires. The big problem with television information services is that there is no established user need — which is only to be expected when the service has never existed before. I suppose that it is inevitable that the results of tests so far are somewhat inconclusive. We will come back to that in a moment.

Social benefits. These include education, which could be coupled with normal video; medicare, like self-diagnosis; entitlements; fire and burglar services and so on.

Business information economies. Both cable teletext and cable or phone viewdata can be competitive with established business services using conventional computer terminals. I do not want to go into this because I said at the beginning that we would talk about home, not business, TV services. If I go into business it will just raise another huge subject area.

Home TV-based services

Applications

- *entertainment*
- *information*
- *transactions*
- *education*
- *messages*
- *personal*

I want to return now to users' desires and applications. I have here a list of possible services. The first one is entertainment which will, in my judgment anyway, continue as the major use of television at least in the foreseeable future.

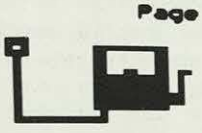
The others include information, transactions, education, messages and personal. As for these other applications, will viewers want them? If so, what will be their preference and how much will they be prepared to pay?

It is questions like these which the Prestel test service sets out to try to answer, but as yet the answers are not forthcoming because it is too early. Nonetheless, there are some pointers.

For example, the Consumers' Association performed a series of tests with over 100 people and concluded amongst other things that people welcomed the convenience of potted information like best buy on their screens.

Which? Page 33314a

Electric kettles



0 Ordinary kettles cost from about £6 to about £15

1 Automatic kettles have a thermostat which switches the kettle off when it boils. They cost from about £10 to £21, but are:

* more convenient
* safer
* slightly cheaper to run

Key number for type of kettle you want

_:SE BUYS

Which? Page 3331418

Automatic kettles

WHICH TYPE DO YOU PREFER?

0 ALUMINIUM Cheapest kettles & light, but can dent or scratch fairly easily Polished, matt or coloured finish. Aluminium tends to corrode where copper is present in the water supply Ask your local water authority or electricity showroom.
1 CHROME-PLATED COPPER Dents, but does not scratch as easily as aluminium. Polished finish.
2 STAINLESS STEEL More expensive. Less likely to dent or scratch. Polished or matt finish.
No ENAMELLED STEEL kettles tested in this category

Key number for type you prefer

_:SE BUYS ELECTRIC KETTLES

Which? Page 3331412a

Stainless steel KETTLES

More **** the better

CARMEN COMPLEMENT CP001 £10.95 - £18.95
3 pints - ease of use rating **** ; uncomfortable handle

HOOVER B6006 £12.95 to £21.86
3 pints - ease of use rating *** ; handle got hot - pouring poor

RUSSELL HOBBS K2S £10.95 to £20.81
3 pints - ease of use rating ***** - safety cut-out slow to operate

RUSSELL HOBBS K2SPW £13.95 to £23.57
or K2R 3 pints - similar to K2S above

Key 0 for Good value for money advice

_:SE BUYS ELECTRIC KETTLES AUTOMATIC

Which? Page 33314120a

Good value FOR MONEY

For a stainless steel electric kettle with a thermostat, Which? recommends:

* RUSSELL HOBBS K2S £10.95 to £20.81 liked a lot by users, but cut-out rather slow-acting

Data from Which? magazine, July 1977

Key
1 go back for list of s/steel kettles
9 for other types of kettles
0 for TeleWhich? index

_:SE BUYS ELECTRIC KETTLES S/ STEEL

Consider the four Consumers' Association example pages here, about selecting an electric kettle. The viewer is led on through the tree structure, being fed information at each stage rather than being given routing pages with an end page containing the information at the end.

That is the sort of thing that CA demonstrated last year in a series of consumer tests. The participants agreed that a service of that sort, both on their home TVs and also possibly on public coin-operated TVs, would be very helpful. They said that they would be prepared to pay up to 30p for good, timely information of the right sort; and that £50 for an adaptor was acceptable. Another interesting

point is that C1C2s were more enthusiastic than ABs, who tended to see themselves as already well informed.

What will users have to pay? With Prestel, now that the public tariffs have been announced, the minimum charge will be 5p for one minute. That is 3p for the phone call which is the minimum unit, and 2p for the connect time. That assumes the pages to be free. For two minutes the minimum charge will be 7p; that is 3p plus twice 2p. The minimum charge for a representative two-minute session, assuming access to eight pages at 15 seconds a page at 1p each, will be 15p. Those are some early pointers from the UK.

In Germany, based on 1600 responses to questionnaires about Bildschirmtext, the conclusions were that 5DM a month as a basic charge was fairly acceptable. The preferred application sequence was: first, topical information, news, sport, what's on; next, information on goods and services, tests results, market prices, and special offers; next, home education; next, games; and next, domestic information, including hobbies, recipes, and encyclopaedic information.

In the US, the advent of TV information services based on two-way cable has been discussed for years. Cable reaches 17% of US TV households and the penetration is still growing.

Since the late '60s there have been a number of two-way experiments but they have been characterised by low capital investment and somewhat inconclusive results. The problem of the classic chicken and egg situation — the need for high capital investment in a risk venture — has persisted.

But the interest is certainly continuing, and at least one major US cable operator is actively planning a viewdata system which will be oriented towards shopping from the home. That has not yet been announced and I cannot reveal the name of the company.

Meanwhile, Insac's agreement with the UK Post Office, which gives it exclusive rights to the sale of Prestel software and know how in the US, has further catalysed interest in viewdata systems in general, and telephone viewdata in particular.

In the US we recently completed tests with a representative cross section of potential viewdata users using Prestel. We discovered that over 90% of the respondees liked it and would use it, at the realistic prices which we quoted and which ought to be achievable.

Their main concerns, in order of priority, were: first, the nature of the information, which they were very worried about; next, the price, including the price structure; thirdly, the difficulty of launching the service, marketing it and educating people to use it; and next, fears of invasion of privacy.

We demonstrated viewdata and interviewed around one hundred experts from different industries in the US — all of which were in a position either to be threatened or benefited by viewdata's advent. Their responses varied very widely. One of the many interesting things that we learned was that virtually all of them who could see a future for viewdata saw it in an industry other than their own! For example, the classified advertising people thought that it would be great for banking; and the newsletter publishers agreed that it was just right for education.

The US IRD report on the home terminal, published a few months ago, asserts that

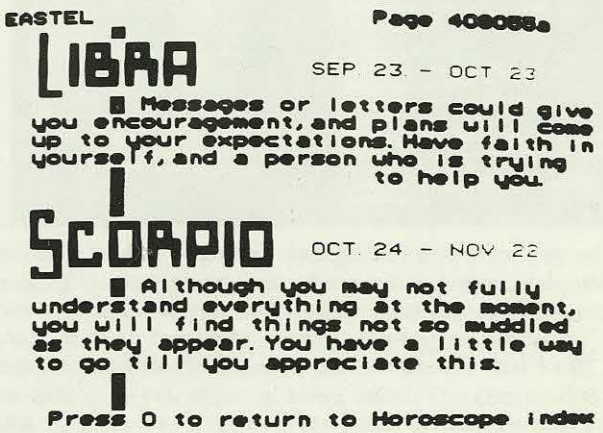
> "the trend of integration is moving toward a home Integrated Video Terminal — IVT — which will perform the functions of telephoning, TV display, VCR storage, hard copy printing and home computing. It will be headquartered in the kitchen and will be an operating tool of the housewife in the administration of the house, its appliances, environment, bookkeeping, planning and control."

It will be the primary tool for a whole host of things: entertainment; publishing access; home environment scheduling; administration; home appliance control; self education; correspondence and so on.

In conclusion, we are at a stage where some interesting, even exciting, experiments are taking place, the results of which are by no means predictable. The era of low cost multiple information systems into the home based on developments of today's TV might be about to burst upon us — but we cannot be certain.

For all the speculation the experts remain confused about the impact of this new generation TV. Perhaps they are really just as blinkered as their predecessors were originally, over TV as we know it today. After witnessing a demonstration of the invention at the 1939 World Fair, a New York Times reporter commented sourly:

> "The problem with TV is that the people must sit and keep their eyes glued on a screen; the average American family hasn't time for it . . .
> TV will never be a serious competitor of radio."



I am also one of the confused, though happily there is hope yet. I am a Scorpio, and I took this off Prestel quite recently. It says:

"Although you may not fully understand everything at the moment you will find things not so muddled as they appear. You have a little way to go till you appreciate this."

QUESTION: In your research in the States have you talked to people who have really looked at the viewdata terminal, television set, whatever you like to call it, and considered developing it as a communications centre for everything else? Have you found any evidence of any schemes for taking any of the elementary terminals we have now much further?

WOOLFE: I think that frankly, the honest answer to that one is no. I think that if we had we would still be there, and be there for a long time. We restricted the study that I happen to have been involved with recently in the US to the Prestel service pretty much as it stands at the moment with regard to testing the reaction of a wide range of people. Although we did discuss to a limited extent with a small number of experts the possibilities for taking viewdata a few steps further down the line, this was not our prime aim. I'm sorry I can't answer your question more fully.

Perhaps one of Prestel's great strengths is that it is pretty simple and limited at this stage. To take the example of the French competing system to which I alluded briefly and which does have rather greater capabilities, one of its problems is that not only is it potentially more expensive but it also is not in place. You can go on improving things ad infinitum, can't you, but what remains to be done is to establish a basic market for a cheap basic device. That has not been done yet. My own opinion is that it will be difficult enough to do that without looking ahead to the next stages.

BUTLER: Gentlemen, may I on your behalf thank Roger for a rapid, but very orderly and well structured review of the services which are coming along. It is almost as if one sees a tidal wave coming over the horizon and somebody says, "Just exactly how tall is it going to be?" I don't think we can answer that. I think that what we can say is that it is coming, and if you have any means of preparing for it then you had better do so. Roger, thank you very much.

SATELLITES — IS EUROPE MISSING OUT ?

G. R. Engel
Satellite Business Systems

Gerard Engel is Director of Tariffs and Economic Analysis for Satellite Business Systems where he is responsible for managing rate and tariff development, competitive analyses and system economic analyses.

Prior to joining SBS, Mr. Engel was Director of Economic and Regulatory Planning at COMSAT, where he had similar responsibilities and appeared before Federal regulatory agencies as an expert witness on pricing, economic and marketing policies.

BUTLER: Gentlemen, welcome to this, the last formal session of our conference. The list of inventions or concepts which were originated either in this country or by citizens of this country only to be developed elsewhere, to the inestimable cost of this country, is depressingly long. It was an Englishman, in fact a man born not so very far from where we now sit, Arthur Clark, who first formulated the concept of a geosynchronous communications satellite.

In the next hour I hope that we will be able to shed some light on whether this is a British turkey that has been sold to the United States, or whether it is another item to be added to that list of inventions coming from this country but profitably developed elsewhere.

I think that it is true to say that the attitude of the European PTTs towards satellites in the past has broadly been that most or all of the requirements of users can be met by terrestrial communication, and that there is therefore no case for a costly investment in widespread use of communication satellites. We shall hear what arguments and what industrial and economic logic exist to challenge that viewpoint.

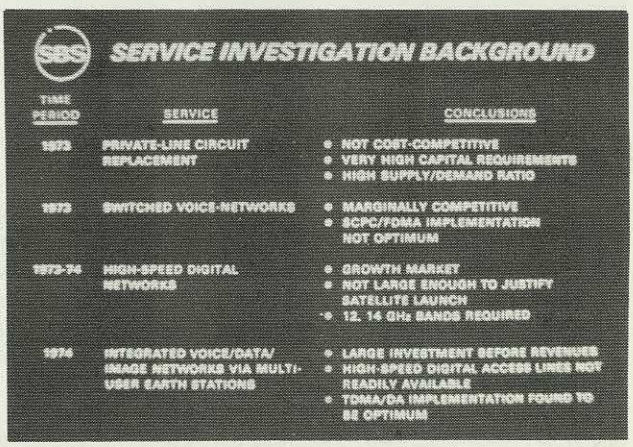
There are three partners in the enterprise about which we are to hear this afternoon. One is IBM, which needs no introduction to anyone in this room; one is COMSAT General, a satellite company; and one is Aetna, the insurance company. It has been said that there is a profound logic in the choice of these three partners, because the business of COMSAT is to put up the satellites; the business of the insurance company is to put up the money; and the business of IBM is to put up the prices.

Be that as it may, we are delighted and privileged to have with us today a member of the top management of Satellite Business Systems Inc., to tell us about the plans of his company, Gerry Engel.

ENGEL: The title of the talk that I am to give this afternoon is "Satellites — Is Europe Missing Out?" I believe that I can get to the point of that question immediately, without wasting anybody's time, by saying that I have absolutely no idea! I have a lot of time left. Are there any questions?

Well, let me tell you about Satellite Business Systems. Let me tell you about them in a way that I hope will allow you to draw the appropriate parallels to your own requirements, and you can draw your own conclusions as to whether the satellite system is of benefit to Europe.

David has already indicated that Satellite Business Systems is owned by Aetna, which is the largest financial institution in the United States; COMSAT General Corporation, which is a wholly-owned subsidiary of COMSAT (Communications Satellite Corporation) which has for many years managed the INTELSAT organisation (International Communications Satellite Organisation); and of course IBM.



In order to give you some background and some way of judging the key parameters of a satellite system, I should like to indicate to you that we have gone through for many years various feasibility studies, looking at numerous markets, and finally come to the conclusions that I will be talking to you about in some detail. The first market that we looked at is the point to point, private line market. The key elements that we have to look at with respect to a satellite system are the design of the satellite, the design of the ground stations, and at the terrestrial requirements that exist in order to provide service to a particular market place.

The point to point private line market is a very large market in the United States. It also is very economical in price. So in order for a satellite system to be competitive in that

market place we must put up a very large satellite, one that demonstrates significant economies of scale. We must put up relatively large earth stations in order to derive the maximum amount of capacity from the satellite. That immediately implies that you have a limited number of earth stations, so you have a geographic limitation. They tend to put up those earth stations in the key population centres, and therefore have a very heavy reliance on terrestrial lines to get to the customers' premises.

That, as the chart indicates, was not a business that seemed attractive. The next thing that we looked at was rather complex — switched voice networks. There we found very much the same characteristics. It was priced quite competitively, quite low; they were very efficient; and the geographic requirements were very substantial. In other words, the telephones are all over, we must reach every place in the United States; and the basic concept required in order to make that cost competitive did not seem feasible — particularly because the major competitor to a system like this would be the Bell System. The Bell System controls the terrestrial interconnects, so the prices of those terrestrial interconnects would have a very significant negative impact on the potential competitiveness of that kind of service.

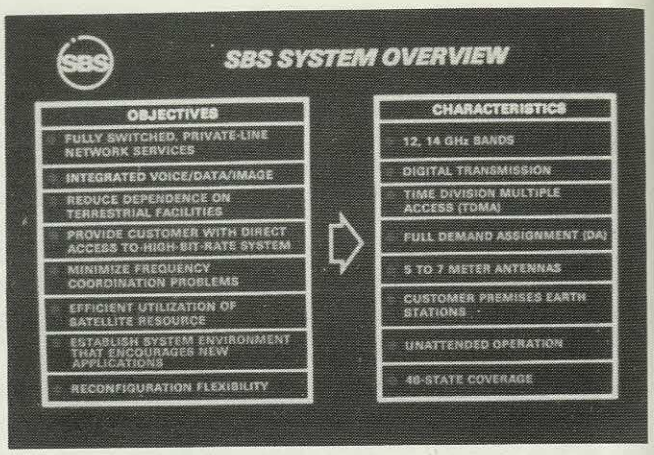
We looked at high speed digital networks, the emerging market. This gets to the theme that has been expressed many times throughout this conference: that we are now experiencing an information explosion; that we need to increase corporate productivity; that the focus to that increase in productivity should be on the professional and management sector of corporations. There is a need for a tool to be placed in the hands of management that will help management to realise real productivity gains and increase their profits.

The whole basic thrust of communications in the future will be towards these high speed digital networks. This was the realisation of people who were behind Satellite Business Systems, and was very much looked upon as the future and providing great potential business.

However, the implementation of satellite systems for just that particular kind of requirement is not feasible, because there is not enough of it in existence today. It is a future thing which must be developed over time.

However, in looking at that we began to see a need for a different kind of satellite system, one different from the one that I have described. There are no high speed terrestrial interconnections available from the Bell System, or anyone else. There began to be a need to find low cost earth stations and place them next to the customer premises, where the customer needs this digital information. So we began to look at a satellite that had a different frequency, 12 or 14 GHz. The reason that that frequency is picked is that there would be no interference with terrestrial or other satellite microwave systems. We began to design smaller and less expensive earth stations that could be put on customers' premises.

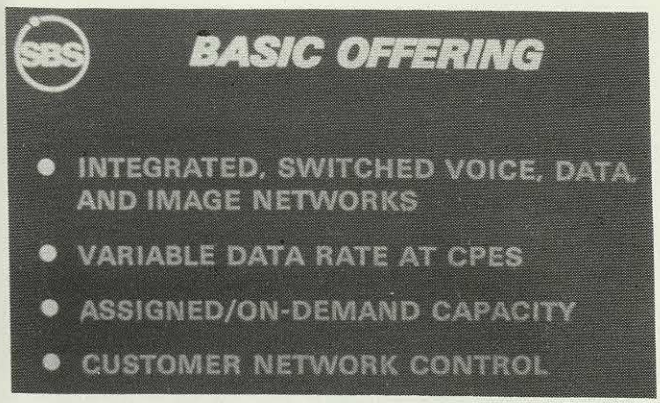
Finally, the decision became obvious: that we must supply virtually all of the private line requirements, those that exist today, and provide the customer with a potential for expanding into the new, high speed, digital communications requirements.



Out of those studies came certain objectives, which resulted in satellite characteristics as shown on the chart. We had to reduce the dependencies on terrestrial facilities — very important. Even though we were providing a switched telephone service and high speed data, we decided that we needed to get very close to the customer's premises. That resulted in 12 or 14 GHz satellite design and small earth stations, which we call "customer premise earth stations", which have 5 metre antennae associated with them and eventual unattended operation. The idea was that the system would be designed in such a way that we would not have to have maintenance individuals at the premises or the earth station.

One of the key problems in all specialist common carriers that are trying to compete with the Bell System or with the existing telephone companies is that there is a limitation to the geographic coverage that can be attained. Most of the competitors now are competitors that are using terrestrial facilities, not satellites. The other satellite carriers that are in existence or plan to be in existence are using systems such as I explained with the large earth stations, and therefore have very significant limitations as to their terrestrial coverage. No matter where you put your earth stations or where you grow your microwave facilities, it seems that the customer is some place else. That inhibits the ability to compete with Bell very significantly. Datran went out of business, and that was one of the key reasons; they had to put in a huge amount of investment and they had to pick a particular route, a high density customer route, and they just were not able to reach a significant portion of the locations that each of their particular customers wanted to reach.

There is another point that is very significant with respect to a satellite system, and that is that, particularly when you are implementing the system with small earth stations, you find that you can reconfigure a customer's network very simply. When you have designed a customer's network with a terrestrial facility, you are actually putting in place wires, microwave towers, whatever other means there are of communicating back and forth, that are difficult to adapt, that will not move if you move your location. If you want to extend, it is difficult. You have to re-route and reconfigure the network, which is quite complex, whereas with the satellite you just move the earth station. The transmission vehicle is way up in the air and there is absolutely no reason why it cannot see the earth station, regardless of its location.

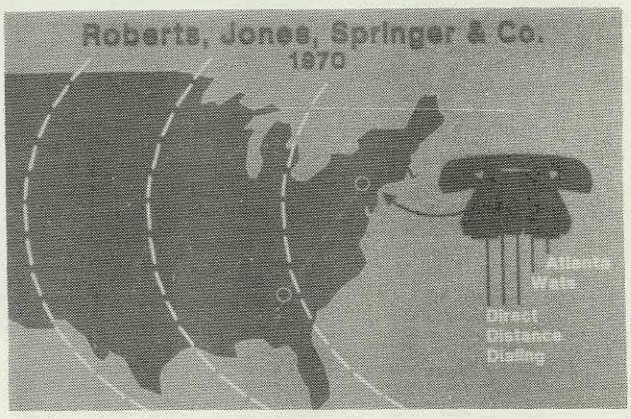


So the basic offering that SBS came up with is an all-digital offering. It will provide switched voice, data, and image transmission capability. It will allow variable data rates at each CPES (Customer Premise Earth Station). That is important. I will demonstrate as I go through here how a lot of these features are used by a particular customer, but what I am saying here is that a customer would buy certain transmission capability, so much bandwidth. He would also lease the earth stations at the various locations that he would need. He could then, through the customer network control, vary the bandwidth that he needs between or among any of the locations in his network, depending upon the magnitude of the traffic at any given time. That is important not only if you think about a voice network which has peak requirements at various times in the day — and in the United States there are time differences of three hours which I will demonstrate — but it is important when it comes to thinking about leasing a certain amount of bandwidth for, say, a basic voice application and then using maybe 3 megabits or 6 megabits or some very high amount of bandwidth for a teleconference. They can move the capacity that is required among the earth stations to accommodate these kinds of things.

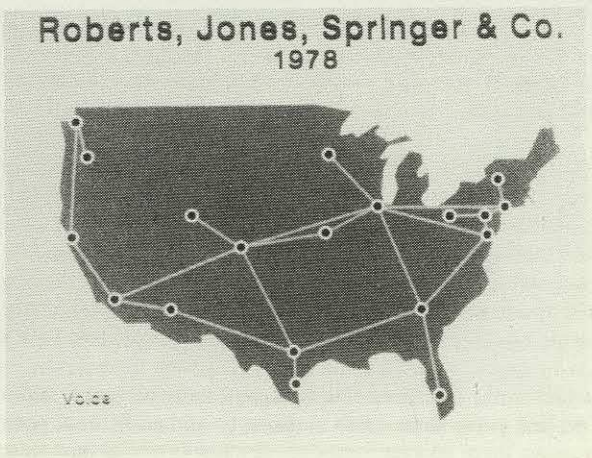
I have spoken basically about assigned capacity that the customer will lease, and that is on a monthly basis. What we are talking about in addition is providing an on-demand capability. That means that if, at a peak time, he has a special requirement to implement a teleconference or to implement a high speed facsimile or a computer-to-computer application, he can access a pool of capacity set aside for this purpose, and pay for it on a demand basis; in other words, by the minute, by the half hour, or whatever point is required.

Let us take a look at that service and how it applies to the various applications that we will be discussing. I will talk about voice and low speed data, which is today the largest single application. Then I will talk about teleconferencing, about mail facsimile, and about computer-to-computer data transmission. I might make the point right up front that as I go through these things, these are the simplest applications that can be identified. We feel as though the user will be identifying far more of these applications on his own than we will, even though we do spend time in looking at them and trying to help the user through the communications problem, to see how he can use this as a management tool.

The way that we go about this is that SBS sends in a team of people to a potential user. The user agrees to share the responsibility for the study that is undertaken. In other words, we put in a few people; he puts in at least that many people, and the money that is required in order to look at the potential for this kind of system. As such, we get his views as to how he runs his business and how he might best implement applications to help him in his business. We find that the applications that come out of an approach like that are very helpful to him and, of course, help to sell our system more effectively than if we were to try to tell him how to use it.

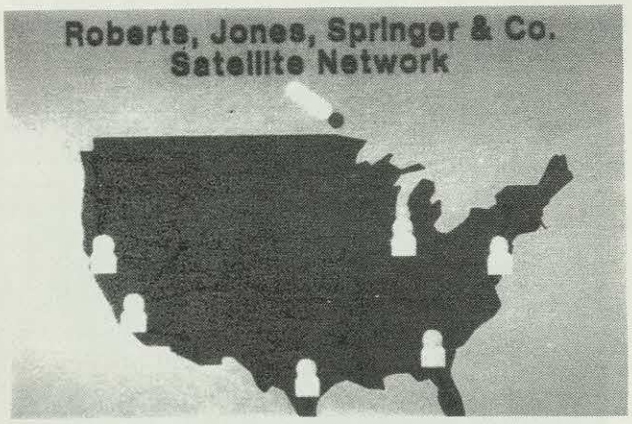


Let us take a look at a typical customer, a hypothetic customer, and how he might have been in 1970. This says that he was small; he had one private line between New York and Atlanta; but basically he was using the switched telephone network. WATS service is a special discount service provided to large users of the voice trunk network.



However, as he grows between 1970 and 1978 he finds that it becomes less expensive and more efficient for him to implement a private voice network, looking something like that. It is a tandem network. In order to make certain calls you have to go through various switching points. He is always making compromises in terms of the grade of service that he is getting and the cost that he is incurring. He can get an absolute non-blocking system if he connects up all the nodes that you see there with every other node; but of course that would be far too expensive. So he decides on the grade of service that he is willing to live with and connects it up in a fashion such as this, and that gives him a more economical service than it would if he just used the public telephone system.

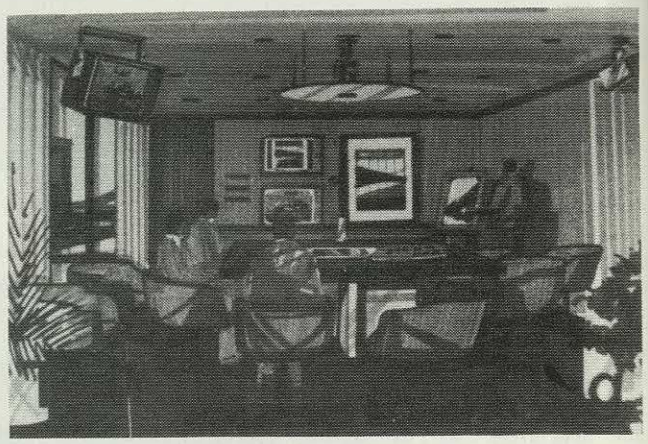
By adding his data networks, we find that he has a few computers in his network. He begins to connect up these computers with low speed lines. These are the lines that are available today, basically up to 56 kilobits but that is not available extensively. The key route for low speed data coincides substantially with the routes on his voice network.



If he were to put a satellite system in it would look like that. We look for his principal concentration points, put in earth stations such that the number and length of the terrestrial interconnections are minimised. You find that there is an optimum solution. We run programs for just voice and we can come up with an optimum solution for a voice network that tells us exactly the number of earth stations that give him a miminum bill. As you move out and get more earth stations (of course this depends on the pricing of both the interconnections from the Bell system and the pricing of the earth stations of SBS), the price starts to go up again because the earth stations begin to become too lightly loaded.

I might indicate that these concentration points become economical for a customer when there is traffic amounting to about the equivalent of 30 voice grade circuits per node. Satellite Business Systems is looking at the Fortune 200 companies where that kind of thing is in evidence. As you talk about high speed applications, that is also relatively simple to achieve. I might also show on this picture how easy it is to reconfigure a network. There is very little in the way of terrestrial interconnects that you have to worry about. You just move these earth stations to add additional coverage or move them to accommodate the needs of the customer.

Teleconferencing. As we began these studies with the customers, teleconferencing was not one of the high priority applications. Virtually no one in the management of our owning companies believed that teleconferencing was a viable application. But as we went into more and more companies, it was the companies themselves that found very interesting and rewarding applications for teleconferencing. Since that time, teleconferencing has become a very attractive potential application for SBS.



We spent a significant amount of time with the users to human engineer the conference room. In other words, what we are doing here is making a conference room that will as much as possible look like a conference room under normal conditions and can be used as a conference room even when you are not in the teleconferencing mode. You can see that they have microphones that are hidden so that you are not conscious of them. There are cameras that focus on a chart that somebody is presenting. The main picture is a picture of the remote conference room, so you can be facing and seeing people at that particular location. The other two television sets are there to show the others; in case there are more than two locations at a conference, if there are three or four, it shows those.

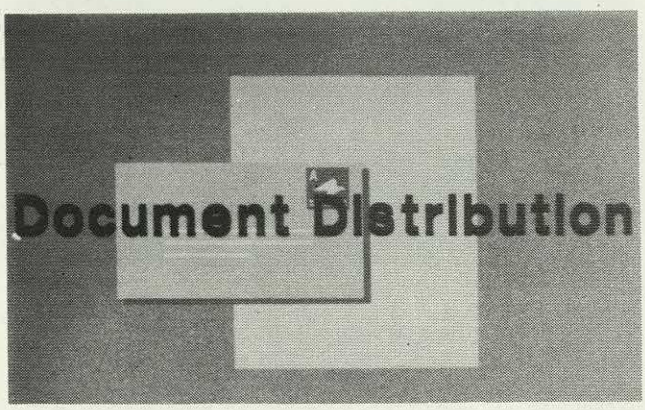
In line with the conversation that took place here earlier, nobody is saying in this particular application that these conferences will replace travel. There is no way that that will happen. But there are applications. One particular application was demonstrated in a project that we call Project Prelude, where we actually implemented using an advanced technology satellite and equipment of various vendors. One of the companies that participated in it with us was Montgomery Ward. They found a teleconferencing application that was very useful to give sales demonstrations to their salesmen. They introduced a new product, a tractor or something like that. They had all their salesmen, all over the country, stay in their home locations, in a conference room similar to this. The new product was introduced at a remote location, where the man actually sat on the tractor, operated the tractor, pointed with his hands to the various parts of the tractor, and showed everything that he would have been able to show had they all been transported to a central place. The executives at Montgomery Ward were particularly excited about this application. That was a full motion teleconference.

There was another application — the Caterpillar tractor — that they were interested in. They say that they have some very talented individuals that are virtually troubleshooters in their plant. They say that they make more money by

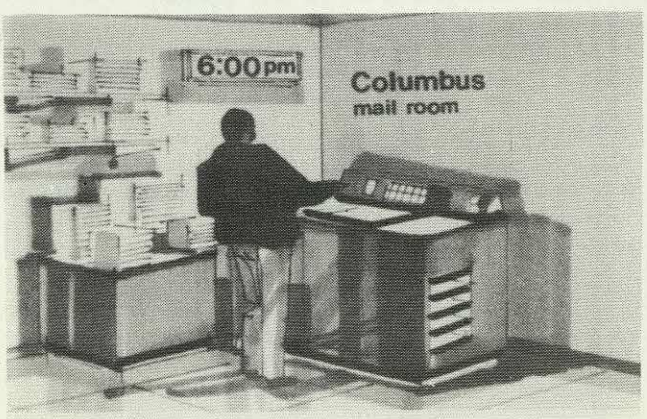
maintaining the products that they sell than they do by the initial sales. When a particular product is in trouble, many times they have to take these specialists and fly them from here to there, all over the place, to find the problem and fix it. They find that they do not have enough specialists. They cannot make best use of these people's time.

You can see what we are coming to. We find that they can actually take the part, put it in front of a camera — this would be fixed frame not full motion — and have the drawings laid out on a good quality facsimile. The individual can begin to trouble shoot that part from his home location, and any other part that might come up in that particular day. So those are ways that companies have identified that amount to millions of dollars for them.

So the point of it is that we see a big void between communications effectiveness of the facilities and capabilities that are available today and the person-to-person meetings that are represented by travelling from one place to another. We believe that void can be filled with full motion, interactive TV of the type that I described. Freeze frame TV. Again, I gave an application in the high speed, high quality facsimile engineering drawings. What we are talking about is good quality transmission to fulfil very special applications that have a high value to the user.



Document distribution. Here I will talk about a very simple application. We have talked about the office of the future and the fantastic things that lie ahead for facsimile.

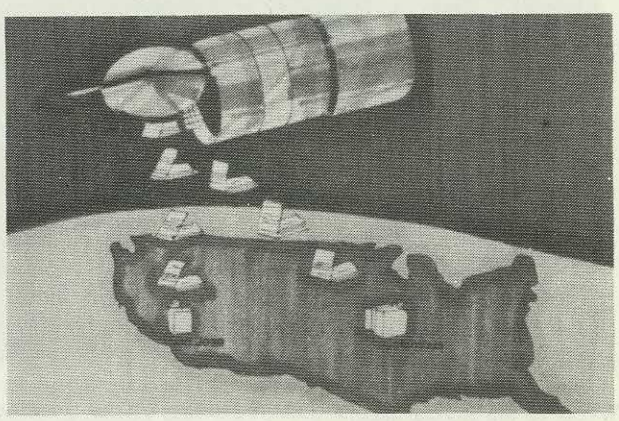


We agree with all that. However, we are talking about getting into business in 1981, that is when we will first have our system available. We are very anxious to have implemented very fundamental applications, those things that we know will not be held up because of the possible non-availability of terminal equipment and other such things that could hold up these applications. So we believe that the simplest application for document distribution is mail room to mail room transmission. In the United States the mail is becoming a problem. The price has been increasing and the service has been declining.

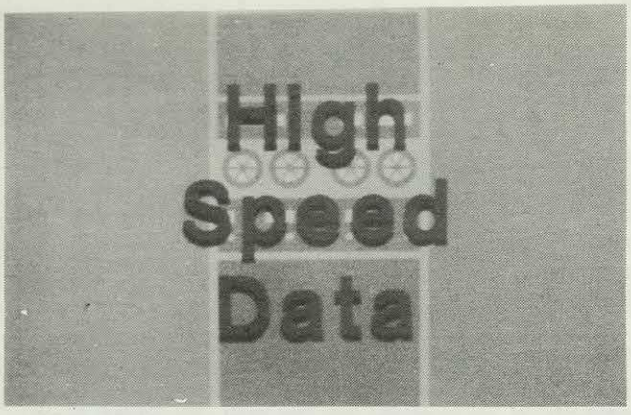
There are all kinds of people looking to take advantage of that, and this is one way that we can see that is a very economical replacement for the mail. We found in our studies that 20% of the mail originating in a particular location is a potential for satellite transmission. What we are saying here is that there is a certain amount of mail that goes inter-plant; then we look at how much of it is private and that is eliminated; and we begin to say, "OK, but there are lots of mailings that can be transmitted inter-plant. This kind of thing can be done overnight, and from mail room to mail room, at a very economical cost."

There is a clock up there that says 6 p.m. What we are talking about here is that they have, when they subscribe to a voice network such as I described earlier, the capacity already in place. It is not being used at night and what we are looking for here is no incremental cost. The incremental cost would be just that which can be attributable to the actual facsimile machine here. So that is extremely economical. That is the originating location.

Here is the terminating location, San Jose, California.

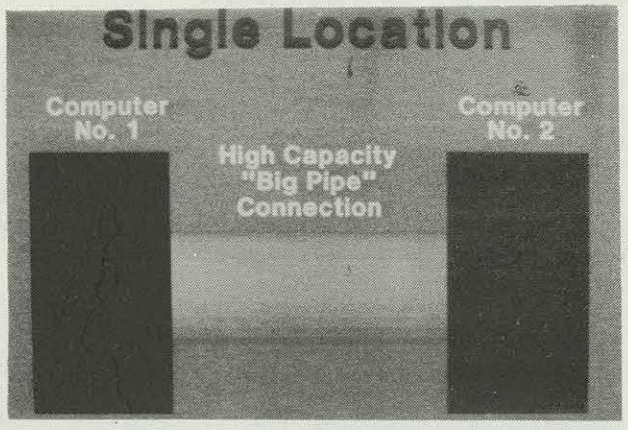


That is a simple way to provide a mail service.

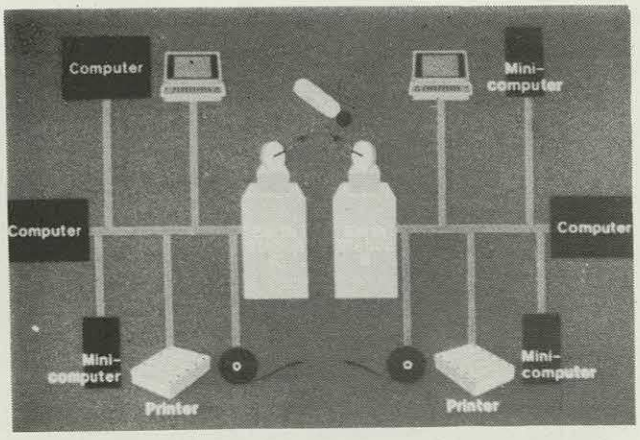


People have different types of data networks today. They have centralised networks, one computer, and people access that computer via low speed lines from all over the country.

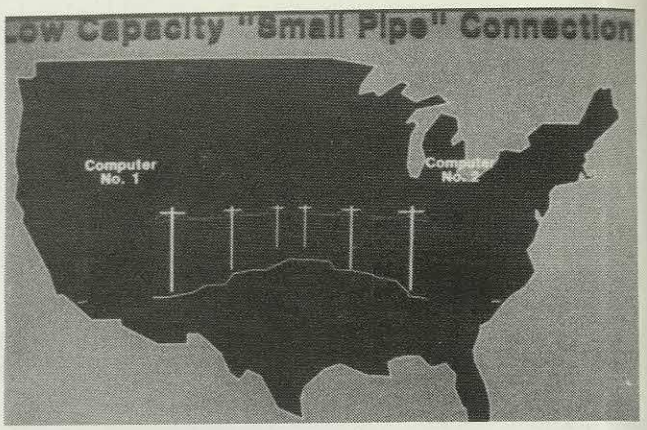
Others have distributed data networks, a number of computer centres, all access regionally by low speed lines.



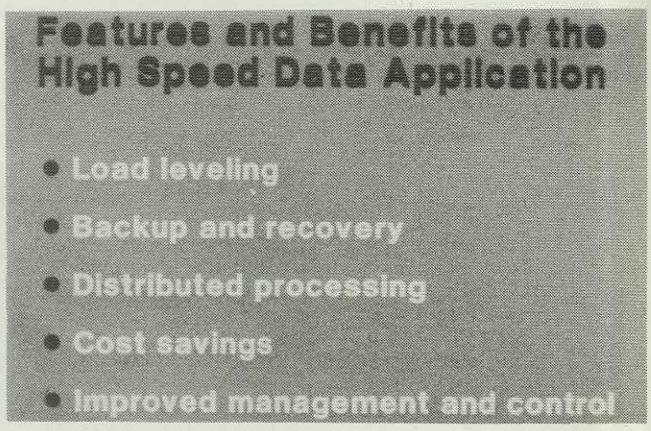
The only time that two computers can operate together at the megabit speeds with which they are used to operating is when they are in the same room, connected together with a cable. We feel as though there are real advantages to having this happen regardless of location; in other words, what we want to do is make computer networks where all the computers feel as though they are in the same room; and we can do that via satellites.



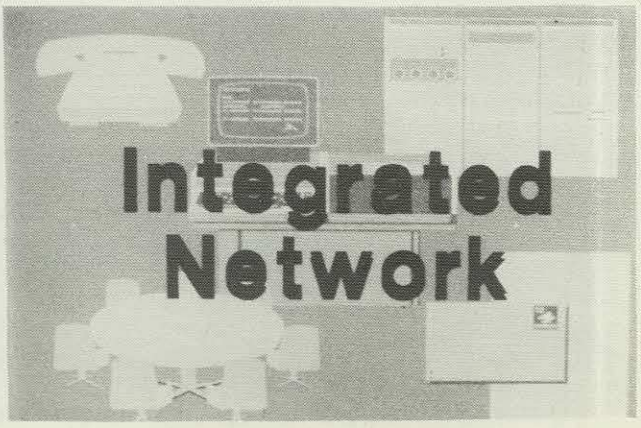
What we are saying here is that, regardless of the location of the computers, we can connect them very reliably with a satellite capability in the high megabit range.



When we look at this diagram of a conventional communications system with central offices (exchanges) all along the route and various other equipment, we find that there are all kinds of potential ways to introduce errors into that data stream. When you look at a satellite it just has one microwave, a one microwave link. It is very simple and the potential for introduction of external errors is limited.

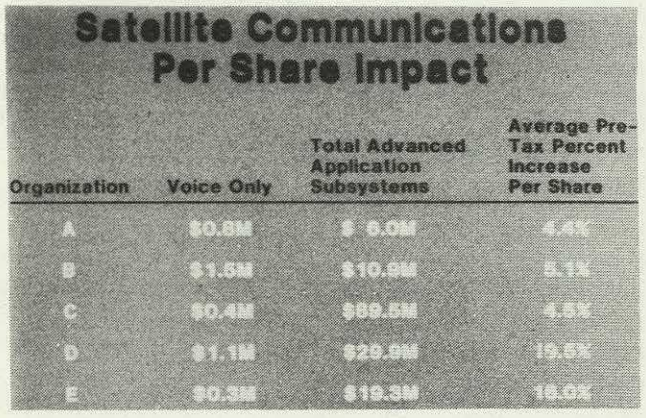


So we feel that there are significant benefits to be achieved by linking computers. But the key point of the chart is improved management and control. We are looking to provide to management a tool that he can use — and he knows best how — to improve the productivity and increase the efficiency of his own business. We do not want him to continue to look at communications as an overhead expense, but to look at it as an opportunity to increase or to improve the way that he does his current business.



So what SBS is all about is to provide this very flexible, very efficient communications transmission capability, which will allow customers to implement all their applications on one network. Obviously, from this presentation we find that it is very important to the success of this business that people who provide terminals, people who provide software services, all the other connected and ancillary functions, are very well tuned to the availability of a system like this.

A Government-imposed condition of SBS being allowed to be in business has been that they will make all their specifications, basically their interfaces, public. We hold vendor conferences which are designed to encourage vendors to see the opportunities afforded to them by this particular system. We want to feel comfortable that there will be the kind of terminal equipment and capability out there that is required for customers to implement this system. We feel that is an additional benefit to us, because we will be thinking about applications, customers will be thinking about applications, and other vendors will be thinking about applications — all hopefully to implement a system like the one that we are talking about.

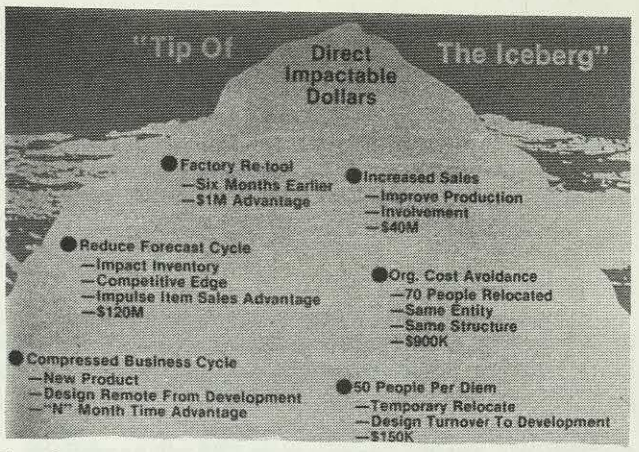


This slide refers to the customers that we have been working with. These are numbers that we put in conjunction with the customer. It does not do us any good to go in and do a study and say, "This is what we think you're saving." If they do not agree, those numbers are worthless.

So these are the numbers that the people in the companies calculate and show to their management. We implement this thing on what we call a "voice plus" strategy. For the various organisations we look at the benefit to them of implementing a voice only situation. You can see that they are marginal for the size of company that we are talking about here. They have maybe $12 to $15 million in communications bills a year, and basically on voice. So we are talking about very marginal savings in voice.

What we say is that if you implement or change a voice network, then what you have is the opportunity to realise the kinds of savings that show up there, in the total advanced applications subsystems column. You can see that that is substantially more.

Again I might indicate that we are talking about anywhere from a 4% to a 20% pre-tax increase per share in the companies that we have looked at. I think — and I believe that our potential customers would agree — that we have been conservative in that particular estimate.



We talk about the fact that the dollars we were showing in the previous chart are the direct impactable dollars. We have measured the amount of travel from one place to another for a particular application. We have measured the change in the cost of mail. We have measured all the various things that the people in these companies will agree to. But even more important is the rest of the iceberg, the fact that there are huge savings in the way they would do business that can come from an innovative implementation of the Satellite Business Systems design.

BUTLER: Gentlemen, we have several minutes left to pose some questions to Gerry Engel.

QUESTION: You did not say anything about standby. What happens when anything fails in the system?

ENGEL: First of all, the satellite is redundant. We put up two, so they switch over from one satellite to the other. The earth stations are redundant too. That is why we go into the big companies first. It is a rather extensive design with lots of redundancy in it. But in addition to that we have on-site maintenance people for the first year or two, until we get to the point where we can say that unattended operation is feasible.

In addition to that, under certain conditions the next nearest earth station in a particular customer's network can be connected terrestrially as a back up, so that we can get traffic from one to the other in the event of a failure.

BUTLER: Gerry, may I pose a question? We have heard a lot of figures both today and from other sources about the reliability of satellites, and I think that in a sense that is beyond doubt. This is a really dumb question, I'm afraid. The only direct experience that most of us have of using a satellite channel is either using the Transatlantic telephone channel or watching direct live TV broadcasts. In the first case you often get very bad echo back; in the second case the picture tends to break up far more often than it does with a terrestrial link to the transmitting station. Why is that?

ENGEL: That's a good question, and a difficult one to answer. I can answer the one by saying that COMSAT provides those international satellite links for voice to which you refer. In terms of the statistics involved the outage is far better on a satellite than it is on a transoceanic cable. The echo means that they do not have the proper echo cancellers in place. They just have not conditioned the lines sufficiently to provide good service.

The experience that we have had in television, particularly of the Olympics: in the United States they broadcast the Olympics via satellite and it was a very heavily advertised event. COMSAT was the carrier and were constantly on television saying that COMSAT was providing all this. The reception was good, except in a couple of instances when the picture did go out. It turned out that it was Bell Systems' terrestrial link that went out.

BUTLER: Sabotage!

ENGEL: Therein lies the fundamental policy of SBS to avoid terrestrial interconnections and put in customer premise earth stations to the maximum extent possible.

QUESTION: Satellite services from SBS will be available in 1982. Can you make any gut feel guess when similar services might be available in Europe?

ENGEL: The answer is that I can't. SBS is expected to be in service in the United States in 1981. SBS has to get authority from the Federal Communications Commission in the United States to provide service strictly in the 48 states of the United States. We are not allowed to provide service any place else. So I do not know under what conditions a similar satellite system would be available any place else but the United States.

QUESTION: What are the possibilities of interference by other organisations with an SBS satellite?

ENGEL: First, it is an all-digital system, and it is time division. So there is a certain amount of inherent security in the system itself. It would take someone who knew the exact timing of the various messages to be able to get out information that you were looking for. But secondly, and in direct answer to your question, we have an encryption capability as an option. It is provided by IBM and is said to be extremely reliable in terms of not permitting people access to confidential data.

BUTLER: That's the privacy aspect, Gerry, but what about Bolshevik lasers and things like that? We have been hearing a lot in the press in Britain recently about Russians interfering with communications satellites by laser transmissions.

ENGEL: You mean just knocking out the communications?

BUTLER: Just zapping them out of the sky.

ENGEL: I don't think I have an answer to that. Obviously that can be done. That can be done to a terrestrial network as well. Anybody can do that. You would have to knock out more than one satellite. If one is knocked out we can switch to the other one. We will have three of them up in a relatively short time. But there is nothing that I can say about the fact that if an enemy country wanted to interfere or knock out a communications satellite that couldn't be done.

QUESTION: I have heard that satellite communications are affected by the weather. To what extent is this true?

ENGEL: That is a general question. I might as well go right through them. At 4 and 6 GHz, which are the lower frequencies, that is not a significant item. It does not happen. First, weather does not have any real impact; and, secondly, the antennae are very large which again inhibits wear. At 12 and 14 GHz there is a potential for rain outage. Very, very heavy rain could impact the service. We cover that in much the same way as I answered the question about outages caused by faulty parts. There are a couple of ways. First, they can shape the transmission beam from the satellite so that more power is projected to those areas where the heavy rainfall is expected, down in the south east in particular in the United States. So when it rains heavily they can call up extra power and, unless it is extreme, they will not have any trouble. But in addition, in those particular areas, we have earth stations that are located in two separate places, relatively close together but connected by terrestrial lines, so that in the event that something like that happens, we can get outside that particular rain belt and still have transmission.

The only place where something like that is significant is, of course, voice, which happens to be a major part of our business in the early stages; with voice you cannot afford to have any outages like that. Running many data applications, for instance, and other things, a very short outage might not be a problem.

BUTLER: And you have the corresponding advantage that it is not possible for a navvy to put his shovel through a satellite.

Gentlemen, the time has come to close this session and to turn over the meeting to my colleague, George Cox, who will attempt the unenviable task of summarising and drawing out the message of this conference. I should like to thank Gerry very much on your behalf for a most interesting and exciting presentation. I believe that everybody here has learned a great deal from it. I think that whatever our commitments and interests in various different systems, we would all join together in thanking him and hoping that his bird flies and is a great success. Thank you, Gerry.

CONFERENCE CLOSE

G. E. Cox
Butler Cox & Partners Limited

COX: Gentlemen, if you look at your agenda for the conference you will notice what I noticed when I first saw it: that we allowed five minutes at the start of the conference for 'Conference Opening' by David Butler; at the end of the conference, 'Conference Close' by George Cox: half an hour. Perhaps that shows that these things are much easier to start than to stop. It caused me some trepidation.

We have covered a lot of ground over the last two days. We have covered some diverse fields. What I should like to do is to tie these together within an overall framework: it is more than just a number of random looks at subjects of passing interest. I think that the easiest way to do this is to relate what we have seen, and the question of policy in the '80s, to the company environment.

The companies in which we work operate in an environment where there are a number of pressures, pressures particularly affecting our choice of systems.

Economic pressure. We opened the conference with an examination of the economic scene in the industrial world. If you look at these pressures there is the question of what is happening to world trade, this terrible cycle of 'stagflation', going through price control, labour costs, reduced margins, reduced investment, round the cycle again.

We have pressures in the form of people and society. Quite clearly there are problems in terms of employment. Many of the systems that we are designing now affect people. They affect the number of jobs; they affect the type of jobs. They affect job structure. One or two fascinating points came out in terms of what some of our technologies and our new systems do to employee status. It had not actually occurred to me before that for a girl working in a company there is a status point at which she loses her typewriter. It just had not struck me that way. The concept that you might in the future reach a point as an executive where your status is recognised by the *absence* of a VDU or a multi-function work terminal at your desk was quite fascinating. The question of security. The question of scarcity of skills. The question of productivity.

We have pressures coming from institutions which are beginning to awake to some of the things that are happening, some of the effects of technology. The trade unions. The union movement is, perhaps surprisingly, well aware of some of the effects of the systems we are planning — in many cases more aware than management in general. Regulations. The Post Office. Government regulations. Much of what was said yesterday by Pat Hewitt was a revelation to me personally. Pressures from 'harmonisers': for example the European Commission, which is concerned about harmonising the various national approaches to viewdata, harmonising the various standards that Roger Woolfe mentioned; trying to bring together various standards that affect other things like EURONET with standards that the Post Office are developing, that the French are developing, that IBM are developing, and so on. Pressures from pressure groups, groups such as the National Council for Civil Liberties — very articulate, very strong, and increasingly very aware.

In the past we have been able to develop systems very much free of legislation and remarkably free of union pressure: I think that these days are disappearing.

Pressures, too, in terms of the search for efficiency. Part of our role today. Looking at our planning and control; the skills that we employ and the way that these are changing; better communications; questions of organisation and motivation; questions concerned with our understanding of information and how to use it; given the plethora of information that is being created both from inside the company and from without — the remarkable amount of proprietory information which is being made available on the market that Haines Gaffner described this morning; the variety of forms in which you can present it; a real understanding of what information to present graphically or in colour, on either a screen or in hard copy. Far greater understanding will be demanded in terms of how we use information.

Pressures from technology. We are aware of convergence: the spread of computer technology into telecommunications, the office automation area — its major effects still to be felt. The effects of competition; quite remarkable. I found Carl Amdahl's presentation yesterday fascinating. It was fascinating — and I mean this in the nicest sense — to see someone actually acting out a fantasy.

In the area of technology, too, I find that it is interesting the pressures that are coming about where we are still learning to use and live with technologies that we have had for some time. Our research team that looked at Jay Stoffer's operation in the United States came back very impressed. It was illuminating yesterday just to hear how badly we use the telephone at present and how much we take that for granted; how little we exploit it. The figure of 28% of calls which actually make contact with the person you are after. I am sure that is right, and I take it for granted. An inefficiency, a problem of the system that we live with.

Technology, too, in terms of the growth of the market: the tremendous appetite that the market has — incidentally an appetite which outgrows the associated implementation skills to satisfy it.

Many of the pressures in this area, concerned with applying technology, really come round to understanding better how people will use it: predicting how they will use it; the question of people learning to live with different devices.

It is an area in which we as a company have grown more and more aware of the need for skills.

I was very pleased to see Tom Stewart calling in on us today. Tom Stewart has a very fine reputation in this area. I am delighted to say that he has accepted an invitation to join our staff from the start of next year, because this new skill is needed — actually assessing *how* people react and *how* they use systems.

If you look at some of the first applications and trials of word processing, it is quite clear that text processing will become a common tool. But you can see some of the problems. The problems initially with silent keyboards and the effect this had on people. The problems relating to people still feeling accountable for their work.

This leads to another pressure: risk. Risk not in the terms of the technology or the equipment actually letting us down, but rather the risk of putting in systems that are ineffective or badly used. We could list many technologies and many uncertainties in this area and say that these are all things which are generating pressures on our systems decisions.

My own view is that overall the situation presents an exciting picture — an exciting picture certainly for the people here, who are at the heart of the changes to come. It clearly means that there will be changes in administrative systems; changes in communications generally. It will also take our systems expertise into new areas. There are areas of business at present of which we have fought shy, because the data processing systems that we have had in the past, with their limitations — wanting codified, quantified information, and mainly suited to systems which were already highly structured — have not applied. For example, moving systems into the areas of product development and marketing will present new opportunities to help the business.

Certainly we can look forward and we can see, in the fairly near future, text processing being a common tool. We can certainly look forward to more flexible, more reliable voice networks. I think that we can look forward to extensive use of the television set as a device for communication, education, entertainment, and a variety of new uses. I was very glad that Roger Woolfe was able to come today and talk to us, because the amount of work that is going on in that area, worldwide, is very exciting. A lot of it will rub off not just on our private lives, but on the way that we communicate between businesses and with the public. It will affect whole attitudes towards taking information off screens. It will become commonplace.

What we have done over these last two days, when we have been examining some of the influences on policies in the '80s with regard to our systems, is that we have looked at aspects of that total picture. In some cases we have gone for a summary — where it stands now. The Post Office: an authoritative summary on the office of the future and where they see it standing. An authoritative summary, too, from Roger Woolfe on developments in the TV area. In other areas we have chosen to illustrate what is happening by looking at a particular development, asking someone who is offering a particular product or service, to come along and illustrate what is happening in that area. The area of satellites. The area yesterday of Jay Stoffer's equipment and its effect on an existing telephone network.

I would stress that in every case we have gone out of our way to get an *authoritative* speaker. Now I disagree with a number of the views put forward at this conference, a number of things where you say, "that's not so," or "he's missed that," or "he's off the beam there." But I think that they have all been opinions that were well worth hearing, and they have all been based on real experience.

It is the purpose of the Foundation to track these developments. Many of the areas that we have examined, we will be returning to. Some of them we will return to just to keep ourselves abreast of what has happened — why something has *not* taken place, or why it is going off in an unexpected direction, or how it has moved down the line that we were expecting. In other areas we will come back and go into subjects in more depth.

That leads me on to an important consideration. The Foundation is intended to be an interactive body and very flexible. The areas that we look at, the way we look at them, the reports we present, subjects covered at conferences, how we organise our professional and technical seminars, are decided by the people here; by the people in Butler Cox and by the members. Therefore, it can be re-directed to meet the perceived needs.

We do not have a formal feedback system. There are no forms to fill in; no administrative meetings where we discuss things and get bogged down in small points. But we are looking for feedback from the members. I have heard suggestions at this conference already that one or two of the speakers would be worthy to bring back to one of our professional and technical seminars, where we could spend a day going through a particular area in more depth. That is something that we could certainly arrange. I think that in the cases mentioned, the speakers would be delighted to participate.

We have had other suggestions for a slight change of format for future conferences. We have had suggestions that at least one of the topics would form a very good subject for a research report. We are looking to you for feedback on such things. Feedback is informal. We plan over the next couple of months to visit, or invite to visit us, each of the members of the Foundation, to discuss this question; to discuss how they use the information coming out of the Foundation; how they circulate reports; what they would like changed; what they would like more of. But at any time you will find that if you have any suggestions you will get a very warm and rapid response from us. If you want to discuss it, we would be delighted to visit you, or for you to visit us. We would be delighted if, after the conference, you have any thoughts you would like to drop us a line. I think that the success of the Foundation depends on the way that we build up this relationship and our ability to satisfy these demands.

It only remains for me to say on behalf of the staff of Butler Cox, and on behalf of David and myself, that we very much hope that you have enjoyed the conference. We certainly have. We have found the whole event immensely enjoyable. I should like to thank our speakers. I think that we have had an exceptionally good group of uniformly interesting speakers at this conference. We thank you very much for your participation and look forward to seeing you at future events within the Foundation.