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ABSTRACT

The primary purpose of the Conference was to emphasize the value of technical information to leaders of British industries by relating the use of technical information to economic development, showing that there are weaknesses in the collection and use of technical information, trying to cost these failings, and indicating some of the remedial measures. The report includes papers entitled: "Scientific Information and Economic Success," "Weaknesses in the Flow of Information. What Do They Cost?," "Economic Success: the Contribution of the Information Scientist," and "The Literature of Science and Technology: Putting System into Searches." The ensuing discussion and the Chairman's Summary are included. (AB)

THE VALUE OF TECHNICAL INFORMATION TO NATIONAL AND INDUSTRIAL ECONOMIC DEVELOPMENT IN BRITAIN

A report on the proceedings of a Conference held in the Adelphi Hotel, Liverpool on 3rd March, 1969.

Chairman : Mr. J.B. Lancaster (Chairman, Unilever Merseyside).

INSTITUTE OF INFORMATION SCIENTISTS

NORTHERN BRANCH

May, 1969.

INTRODUCTION

Technical information, embracing scientific and technological knowledge is a valuable raw material having a significance that is perhaps not widely recognised in this country. The primary purpose of the Conference was to emphasise the value of this information to the leaders of British industries, for they alone can provide the required stimulus for improved and proper use.

The Conference aimed to secure emphasis by :-

(1) Relating the proper appreciation and use of technical information to economic development in Britain.

(2) Showing that there are weaknesses in the collection and use of technical information in Britain.

(3) Trying to cost these failings.

(4) Indicating some of the remedial measures.

If the Conference provoked managers into thinking that an efficient technical information system should be an essential feature of their organisations, then it has half succeeded. If the managers do something positive about it, then it has succeeded completely.

SCIENTIFIC INFORMATION AND ECONOMIC SUCCESS

C.F.Carter

Mr.Carter said there was a strongly-held belief that economic progress and success were the direct result of discovering things (products and processes) and of marketing new products ahead of your rivals. Consequently, a nation should have within its boundaries as large and active a force of discoverers as possible. This could only be a half-truth because it would imply that big nations, by covering a larger, more integrated range of scientific and technological discovery, would always have an advantage over smaller ones. On the contrary, however, some small nations have done very well without having any great flow of their own inventions.

There were several reasons for this:-

First, economic success does not depend only on the discovery and exploitation of new ideas, but also on the effectiveness of organisation, vigour, labour relations, skill in investment and such like. It follows that for a period a nation might be able to live on its fat so far as new knowledge is concerned.

Second, improvements in products and processes spread only slowly, but over a short time a nation can improve its economic position by stepping up the exploitation of what was already known.

Third, it is possible for a nation to live on the brains of other nations; sometimes knowledge can be bought and sometimes loaned without charge. Sometimes the flow of knowledge between nations is better than within a nation.

On the first point, that economic success does not depend only on the discovery of new things but also on the spread of information, information officers should not get swelled heads. They can say, however, that they command an area of significance in achieving that success.

The second and third points contain the real message - how to ensure that proper use is made of the brains of others and that expeditious use is made of existing knowledge.

It is a fact that those people who most need good information services are not only the least likely to have them but they are also least likely to have management processes which will tell them of their own backwardness. Some research associations find that firms who make the best use of their services are often the large firms which have large and progressive establishments of their own. Small firms lacking their own technical libraries are often those who fail to take advantage of outside services.

There are complicated reasons why some firms are unable to improve themselves. It has been suggested by some people that the market forces would deal with these companies and that all one has to do is to wait for the unprogressive firms to die. However, the forces which tend to eliminate unprogressive firms are, in many areas, extremely slow to operate and it seems to be inevitable that at any rate in a country which operates a pretty high system of protection against foreign trade, these forces could be ineffective in a good many corners of industry. It is possible, therefore, to identify many firms which have managed to hang on for many long years while they were demonstrably inefficient. Furthermore, the pool of inefficient firms is constantly being replenished so that it is unlikely that leaving the problem to the market forces will result in a solution. It is a question of persuading people to recognise the need for information. Sometimes the need for help is disguised by the fact that a firm is profitable in some other area.

Mr. Carter then referred to a policy of feeding information generally to an industry. He mentioned that the progressive advisory service to farmers had resulted in a farming industry which technically was as up-to-date as any in the world.

It is not always sufficient for firms, either by self discovery or salesmanship, to be brought to accept the idea of having a need for information. It is necessary for firms to have some sort of conductor or reception point which would enable them to receive a relevant range of information and learn quickly how to adopt it to their own use.

One of the problems in this country is the high concentration of technically qualified people in the research and development functions, as opposed to marketing and general management. Many small firms, although they might have excellent practical people, lack a person at any point in the firm with the systematic and reasoned knowledge necessary to make them efficient receivers of information. As a result, when some new idea to improve the specification of a product or some new process technique comes along, they might miss opportunities.

While it would be nonsense to suggest that every small or medium-sized firm should command expert knowledge in every field that might possibly be of use, it is important that a firm should have people whose minds are open to receive hints of important ideas coming from outside, and if qualified personnel were more widely spread through production departments and different types and sizes of

firms this would become a great deal easier. It would always be true, however, that the smaller the firm the more inadequate would be its conductors. If it were large enough to employ information officers it could get material sifted and collated. If it were below this size it would need the public service of research associations and other such bodies or the technical and general press. The kinds of information which are the most valuable are those which are closest to the point of application and those which are set out in a manner which shows the advantages of application.

A lot of undeveloped scientific information is useful only to those capable of making a big development effort and there is also a lot of information which fails to give any scale to its importance because it has no costings attached to it. For example, you could read in gardening books elaborate rules as to what you should do to ensure that your cabbages do not become diseased or attacked by various pests. What the books do not tell you is that if you were to do everything that the books said, cabbages would cost about 4s. 6d. each. This is typical of a good deal of information which is apparently ready for application, produced by people who were enthusiastic for it technically, without giving any attention

to the question of how much it is really worth having. It is quite possible to spend time developing an instrument which might save say £50 a year when you might, for the same time and effort, have produced an instrument that would save £10,000 a year. This kind of wasted effort is frequently to be seen.

Referring to computers, Mr.Carter said that if one asked a computer a vague question it might produce far more information than could possibly be used, or it might fail to answer the question at all. The ability to answer a precise question often required a great deal of knowledge and the individual who selects information using his knowledge of the needs of his particular firm is likely to remain of importance. Mr.Carter did not suppose that there was anything in sight that would get rid of the need for a good deal of imagination in the selection of information.

Turning to the problem of secrecy between firms, Mr.Carter stated that, on the whole, it was the less progressive firms that were most secretive. The more progressive firms tended to rely on the time lag to keep them ahead, rather than on strict control of commercial security. The problem of security could be over-emphasised because there were a number of ways in which it could be got round. Sometimes information could be bought from abroad if it were not available in one's own country.

Mr. Carter emphasised the difficulty in deciding the true value or importance to be attached to the use of technical information. Firms managed to remain in business with cost levels which in particular activities varied very widely. If one took a figure of 25 per cent as the cost differentiation, a better flow of information would probably achieve cost reductions of the order of 10 per cent in the worst areas. Taking the whole of production distributed over the range of good and bad firms over a period of a few years, it was plausible that improved absorption and exploitation of knowledge already in existence and in use somewhere in the country could lead to an average cost reduction of 2 or 3 per cent with a simultaneous improvement of product. If this were applied to £20,000 million of the national product, 2 percent gives £400 million and if this were to be viewed as a commercial proposition it might be thought worthwhile to invest large sums of money in services which not only provided information but actively sold good techniques.

The question arises as to whether we should generalise our information services in the way that we did for agriculture. This view has been pressed by many people for a number of years but has never been popular with the Treasury, who tend to take the line that if industry

can get these advantages why do firms not seek them for their own partioular produots. It is, however, those most in need of help who are the least likely to realise the need.

Mr.Carter believed that it would be a valuable use of the national resources if the country were to raise the level of these services. This would have a valuable effect on the balance of payments, on the quality of exports and the relevance of the markets to which they were going. There would also be an improvement in the goods manufactured for home consumption and this could in turn lead to a reduction in imports. He attributed our lack of attention to this problem to our insularity as a nation and to the lack of the traditional Japanese enthusiasm for picking other people's brains. If we were a smaller country we would have to pick other people's brains and he instanced Ireland who, in recent years, had made considerable technical advances through getting out and pulling in ideas from outside. He concluded by saying that perhaps this was something which those nations with memories of imperial grandeur were not yet ready to do.

DISCUSSION

Mr.P.F.Cole (B.P. Research) asked to what extent the wide variations in costs between different firms in the building industry might be due to differences in accounting procedures which tended to product different conclusions.

Mr.Carter said that a study made by the Building Research Association into levels of costs of different operators in different parts of the country showed that the reason for large cost differences in building was that at a particular time within a particular locality only a limited range of contractors would contract for a particular type of job.

Mr.J.Farradene (City University, London) said he had recently been engaged on research into what sort of information firms were getting and how they were using it. His researches led him to believe that the problem was not so much an economic one as a psychological problem of attitude. Many small firms did not want more information, they were happy as they were, they were afraid of becoming bigger, were doing very nicely but did not see why they should bother. It appeared that in this country we were not nearly so ready to accept innovation as in the United States. He thought that Mr.Carter's suggestions should be implemented in

order to change the general attitude in this particular area.

Mr.Carter said he fully agreed with what Mr.Farradene had said. On the question of what was to be done to change the attitude, he believed that one should never under-estimate the possibility of changing an attitude simply by identifying the attitude that needed to be changed, then going all out to change it. This happened every day, as could be seen in the efforts of a margarine manufacturer, for instance, whose current advertising was telling us of the advantages of "Blue Band".

Mr.A.H.Stodhart (Electrical Research Association) pointed out that if a large commercial undertaking wished to sell a product it would invest a large sum in sales promotion. On the other hand, research associations had only a limited amount of money at their disposal for selling ideas but increased monetary contributions from firms would ensure a better feedback.

Mr.Emerson (Pressed Steel Fisher) asked if the reason that information was not used to a large extent in small firms was that, even with money to spend on innovation, so many people have had their fingers burnt with new ideas that small companies tended to be afraid to adopt them.

Mr.Carter agreed that there were some innovations which were much too big to be carried out by the kind of firm which existed in a trade at a particular time: this was one of the reasons for changes occurring in the structure of industry. However, there was a whole series of smaller things which probably were within the firm's means but which were not adopted; there are lots of ideas which really cost hardly anything to instal but were rather changes in practice.

Mr.J.M.Myers (Scientific Instrument Research Association), referring to the conservative attitude of some small firms, noted that all firms tended to watch what others were doing. He suggested that in marketing technical information, the more economic strategy might be to concentrate on the innovative firms and accept that the other firms would take it up later.

Mr.Carter said that this process was far too slow. There also appeared to be some confusion about what was meant by "small" and "big" firms. The small firms he had been referring to were not those with three or four employees but those which were medium-sized, although well below the level of the giant leaders of industry. He thought that attention should be concentrated on firms of a size such that they were able to have a fair range of personnel of different kinds, but not large enough to have a separate research and development function.

He agreed that the higher one started, the easier was the task and to some extent ideas would spread downwards.

Dr.G.Chandler (Liverpool City Libraries) said that to make information attractive it needed to be easily accessible and it was of little use to have information available in research associations unless one were expert in using these media. Some of the Communist countries used public libraries in a very dynamic way as points of access to technical information: the public library network in this country is such that it could also be used to help spread technical information more significantly.

Mr.Carter agreed that one had to try to impart the idea that the public libraries could be used more in this way.

Professor W.L.Saunders (University of Sheffield) said he was interested in Mr.Carter's figure of 10 per cent by which costs might be reduced in bad areas and asked if this figure was based on actual investigation.

Mr.Carter said that his figure was based upon hunches which were themselves based upon particular cases. It was an unanswerable question to ask what improvements one might have achieved in a year in which one had not tried to achieve them. All one could do was to examine some particular cases where firms had had

a sudden change of top management and brought in a whole new technical scheme in this way. He believed that his figures gave something like the right order of magnitude and that the value of the change was of the order of hundreds of millions of pounds and not tens of millions of pounds.

Mr.I.S.Simpson (College of Commerce, Newcastle-upon-Tyne) assumed that the possible cost savings which Mr.Carter had suggested would accrue partly from a wider spread of information on management practices as opposed to technical information. If this were so, he wondered if information scientists should have a background of social science or management techniques in place of the physical sciences.

Mr.Carter said he would prefer the phrase "as well as" rather than "opposed to" in this connection. The idea would be for an information scientist to be equally effective in all areas, not only in the physical sciences and management practice, but also in mathematics, the application of computer science, systems research and engineering. There was a good deal to be exploited in these areas.

Mr.V.C.Watts (Production Engineering Research Association), referring to management attitude towards the effectiveness of information, said he believed that most managements were always looking

for a financial return for the money that they had spent. What they wanted was something that was tangible. Although there had been a tremendous amount of research done in a whole variety of information supply and retrieval techniques in recent years, very little attention had been given to assessing cost effectiveness. If it were desired to sell information in terms of business investment, the information scientists should try to get more information back from the information users on ways in which the utilisation of supplied information has resulted in a reduction in the cost of a process or in the price of a product. In this way it should be possible to build up a set of case histories to help effectively to put the idea over to management.

Mr. Carter agreed. He thought that management liked to give financial justification even for a decision that they had made on grounds other than financial. One did not have to go far to discover that management decisions were not always made on financial grounds, but since this was the way that decisions had to be justified, this was an important method of selling an idea.

Dr.A.K.Kent (University of Nottingham) referred to Mr.Carter's figure of £400 million that might be saved if all the available knowledge were applied to production. He asked what sort of level of investment would be necessary in order to gather this amount and whether the investments should come from industry, the Government or other sources.

Mr.Carter said that the level of investment would be determined by the availability of the right people to undertake the work, rather than by reaching a point at which the use of extra men could be shown to be no longer worth-while. His guess was that the expansion of information-selling services would go on being profitable far beyond the limits to which they could conceivably be expanded, in view of the personnel available, but this was not a view popular with the Treasury. Improvements were needed both within industry and outside, not just in Central Government. The public library services, the universities and polytechnics all had a contribution to make and since the most important aim was to sell information to people who were only just beginning to realise that they might need it, a substantial amount of Government financial flow would be necessary to improve the information services.

Mr.J.Farradene referred to the question of establishing the economic value of information. He said that information services should be considered a source of research. Industry did not expect every piece of research to be a winner and adequate information services were a form of insurance against being out-of-date.

WEAKNESSES IN THE FLOW OF INFORMATION.

I. INFORMATION FOR RESEARCH AND DEVELOPMENT

P.Spear.

Mr.Spear began by describing instances known to him of how the use of technical information had saved money in research and development: these included a saving of £50,000 on a project for BRM following the location and study of some well-hidden papers on the "gulp factor". He described the setting up of an information service which had subsequently expanded to include a standards department, a patents establishment and a metrication unit. He considered that information people, market research people and patents people, as appropriate, should be involved at the beginning of any project.

Mr. Spear sought to dispel some misconceptions concerning weaknesses in the flow of information in industrial research and development. Speaking particularly of the engineering industry, he said they had to work scientifically in order to make money and he believed that in industry the tendency was to back research in relation to fundamental design and development: research was usually done some years beforehand or ten years after the practical thinking. He regarded development as the creation of new components or improvements in existing products or existing processes. It was extremely difficult to put a real pounds, shillings and pence value on information work. It accounted for ten per cent of his particular research and development budget but, without this expenditure, money would be lost in other ways. Staff time would be wasted on jobs that they were not trained to do and time thus wasted would be relative to competition and this would lead to a loss of real profit.

Referring to some of the weaknesses in information systems, Mr. Spear said that the information user often did not define the precise problem. For example,

his information department had recently been asked by a man from one of the production departments what they had got on lubrication: it eventually transpired that he wanted information on upper cylinder lubricants for steam engines. Mr.Spear stressed that a 90 per cent answer now was more important than a 100 per cent answer next year and the answer needed to be meaningful, not a collection of books, references and pamphlets. The user did not understand abstract services, and he himself abhorred the ever-increasing flow of abstract services. The user wanted to know broadly the state of the market and, above all, he required sympathetic encouragement. Fundamentally it was a problem of management, and one often found that the admission of ignorance was the beginning of w sdom.

With regard to the supply of information, Mr.Spear thought that the biggest weakness was due to information work being an evolving profession which tended to forget the strong personal relationships which exist across the whole structure of industry. There was a form of overt snobbishness in information work and this was inclined to be manifest in its over-exaggerated, pseudo-scientific jargon. Much more could be done in the way of presenting

information so that it could readily be understood by the user. He thought that in this respect the information scientist would do well to note how in a supermarket the goods were arranged in the order in which the housewife was likely to want to purchase them. There was a lot to be said for information services being arranged in a parallel fashion. It was also true that, in many instances, information scientists did not fully understand all the tools of their own profession. For example, it was often the case that insufficient attention was given to patents as practical ways of providing information. In carrying out research into new linkages for caravans, his organisation studied 146 patents and, as a result, it was found that they could have wasted £1,100,000 if they had not spent £200 having a thorough look at the patents. It could be said that most problems were small, and the information scientist should not be snobbish about looking at small problems, for by solving a small problem intelligently and quickly he was probably demonstrating his best form of salesmanship. Also, too much attention was given to the

printed word and it should be remembered that information was not necessarily obtainable only in this form. The value of personal contacts could not be overestimated.

Mr. Spear concluded by making three points:-

First, he was conscious of the fact that he had not talked much about pounds, shillings and pence. He believed that, fundamentally, information was cheap but that industry tended to be nervous of the gift horse. Allied to this was the feeling that a £200 a week consultant must be worth more than a £40 a week engineer.

Second, as regards training, the Conference recognised the vital need for training students in the use of libraries. One of the things he would like to see would be a 10 per cent reduction in the syllabus for qualification for some of the professional engineering bodies to allow for the introduction of a new subject "The use and handling of sources of information". He was sure that the time so spent would be more than amply recovered.

Third, he quoted the author's note to a book he had recently read which stated that although in the course of the preparation of the book, thousands of books and other publications had been examined, only

a few of those consulted had been found to contain material which was original. Therefore, only a few sources of information had actually been used.

II. INFORMATION FOR DESIGN AND PRODUCTION

B.T.Turner

Mr.Turner described the various phases at which engineers required information, beginning with basic research and extending down the line through ideas, determination of method, issuing the necessary instructions and the subsequent hard work involved in design and production. As they moved from the abstract to the concrete there had to be translation at the various interfaces of the different phases. There was also a need to interpret the findings of research so that they were recognised and understood by designers in industry.

Engineering designers were beginning to realise the potential of the information scientist to produce relevant information speedily and in a way in which it could be understood. The number of technical journals being produced to-day is such that it is almost impossible for the designer himself to glance through them,

lst alone study them all in detail. A relatively few journals contain about one-third of the information available on a given subject, while various other journals contain little tit-bits of information which need to be gathered together. Modern systematic design methods required the presentation of information in graphic form for engineers who prefer to have information in pictorial form wherever possible. The problem of communication, getting the message down the line after the initial design had been done, could not be over-estimated. In the design and production of missiles in the United States, the paper work generated by the projects amounted to seven and a half tons of paper per missile; there was clearly a need for control in this aspect.

Mr.Turner then turned to the cost of not having all relevant information available in design projects. He instanced the case of the Comet Mark 1 jet airliner in which a fault had been discovered only after a crash which had killed many people. This fault could have been rectified if the right information had been available and, in addition to the loss of lives, this country had lost a lead of five years in the field, a substantial amount of capital and a great deal of reputation.

A second case was that of a water wheel generator. It had been discovered that the performance of this generator was not as high as it should have been and as a result the manufacturers found themselves liable under a penalty clause in a contract. Subsequent investigations showed the faulty performance to be due to an incorrect specification resulting from a wrong number quoted in a letter.

At Hinckley Point Power Station trouble had been caused by an acoustic noise. After considerable expenditure on the problem, it was discovered that Boeing had earlier spent ten million dollars on investigating a similar problem. There was also the tragedy of Aberfan: as far back as 1939 engineers had published information on the instability of slag heaps, yet this information seemed to have been disregarded.

Mr. Turner then referred to the duplication of effort that could be caused through not having an exchange of information. During the war he had been engaged on a project for a considerable length of time, and after the war was over he had made it his business to find out if this particular job had been tackled by anyone else. He discovered that the problem had been investigated and solved by the

Americans without their being aware of the work being done in this country. This was clearly a case where security restrictions had prevented a sharing of available knowledge between Allies.

Another example of duplication of effort had occurred in connection with a certain project on ballistic missile systems. A great deal of work had been done before it was discovered that identical work had been done and the problem eventually solved by high altitude balloon researchers. Engineers themselves need to be encouraged to go and find out what other people were doing about particular problems. Information scientists are also needed to help engineers in this work.

Mr.Turner hoped that when computer design was practised in a real way it should be possible to circumvent a lot of the information problems, but it would require considerable effort to put the information into computer store.

Mr.Turner concluded by summarising the information needs of engineers. He considered that information scientists should try to sell to the engineer the idea that they could help and, to achieve this, they should try to understand the

engineer's needs. Irrelevant information should be sifted out and relevant information should be presented speedily and, wherever possible, graphically. He appealed to information scientists not to "over-gild" the lily: engineers do not want hundreds of pamphlets thrown at them. Finally he said, "Let us encourage people to grab other people's ideas in the same way that others have done in the past."

DISCUSSION

Mr.J.Farradene (City University, London) agreed that information should be presented in a suitably digested form and that there was a need for training in the use of information sources. All efforts to introduce training of this kind at universities seemed to meet with resistance on the grounds that there was not time in the curriculum and he thought that industry should bring pressure to bear on universities to see that time was found for this important work. Efforts were being made at the City University to enlarge this type of training and he believed that it was important that the information scientist be regarded as part and parcel of the research team and accepted as such in the engineering industry.

Mr.Turner agreed about the need for information scientists to be part of the design team. In his company there were 20-25 professional information officers but many engineers would not employ them at all. This was an attitude that needed to be broken down. Equally, there was a general resistance on the part of industry towards the use of research establishments. He believed people should establish contacts with them on a face-to-face basis.

Mr.Spear also agreed with Mr.Farradene, but he thought that training in the use of information sources should begin not at university but at the eleven-plus stage.

Mr.R.D.Mannix (Unilever Research Laboratory, Port Sunlight) thought that the idea of the information scientist being part of a team and providing digested information to other parts of the team was "pie in the sky". He considered that in doing an appraisal, an information scientist spent 25% of the time in discovering the documents on which to base further development and a further 75% of the time in reading the documents and arriving at a conclusion which he felt safely confident to put forward. He believed that the information scientist was much more usefully employed in deciding the relevant information sources, eliminating things that were

not relevant to the subject and passing the information on as quickly as possible to the people who wanted it. He urged less appraisal and more document selection on the part of the information scientist.

Mr.Spear said that to a large extent he was sympathetic to the point of view expressed by Mr.Mannix, but he wondered if sufficient time was being given to evaluating requirements. He did not really think that one asked a question and got an answer back. It was more a step-by-step process and it seemed possible that the questions referred to were being phrased wrongly.

Mr.D.J.Campbell (Pressed Steel Fisher) said the question of what one could reasonably expect from an information service was largely a matter of staffing. The two speakers were from firms that took a high view of information science. One speaker had said that his firm spent ten per cent of its research and development budget on information services: most firms, however, had one man and two girls with a total salary bill of £2,500 a year, an establishment that, at best, could provide only a library service. This was part of a problem that many firms had not been willing to take seriously and as a result they had inadequate people; they had draughtsmen who

didn't make it and engineers who didn't make it. If one wanted a service one had to pay for it and this meant employing people who could evaluate. Otherwise, the service simply became a document selection service.

Mr.J.M.Pickering (Shell Chemicals, Carrington) said he was interested in Mr.Turner's point about definition of areas of problems in design. He believed that useful work of this type involved a more active role for the information scientist and this meant recognising at what point the design work was passing out of the field of engineering design and into some other field or technology. He was worried by the implication that information science was something which took place behind a counter. He would like to see the information scientist as more a part of the design team.

Mr.Turner, in reply, said that with the new systematic design method there was a greater opportunity for this recognition. The information scientist should certainly be in at the initial stage of design and he should also be on tap throughout the whole design process because snags were being encountered all the time. Mr.Spear agreed that the information team should be part of the full team and that the information scientist should be involved in many stages of the design process. He would be very much concerned during the first few

months and he would again become involved as the first brunt of design work got under way, but he would always be part of the team. A parallel could be drawn in the case of the metallurgist, it was a team effort with a constantly shifting emphasis.

Miss P.R.Brooks (Pilkington Brothers) asked when a process passed from research to design and from the design stage to obsolescence, what was the position of the information worker at the latter stage? Would he be expected to inform an engineer that a process was obsolescent?

Mr.Turner said this was so. Changes were occurring all the time and as soon as Mark 1 was completed it was necessary to get Mark 2 quickly on the drawing board. Information scientists should help in gathering and collating information which had been accumulated in the design process. It required a great deal of courage to say that it was necessary to change direction.

Mr.Spear described one firm's system of coding service complaints by which they were reviewed regularly with a view to introducing any changes in design that were shown to be necessary.

Mr.N.K.Leigh (I.C.I. Mond Division) said that the information scientist seemed to have to rely to a large extent upon the attitude of management. Mr.Turner seemed to have an enlightened attitude towards information science. He asked what was the typical attitude of British industry?

Mr.Turner said that English Electric takes an enlightened view of information science, but there were hundreds of other firms that did not even use the local library.

Mr.P.F.Cole (B.P. Research) returned to Dr.Campbell's point about getting what one paid for in information work. Mr.Spear's statement that ten per cent of his research and development budget was devoted to information might give rise to a general idea that in British research and development generally more than five per cent of the budget went on information work. However, if one took the total 3,500 information workers and if one assumed that all of these served British research and development, where there were 65,000 qualified scientists and engineers with 100,000 technical supports, the proportion of information workers was less than two and a half per cent. This figure would be a maximum and if one

assumed that 2,000 information workers served research and development the figure would fall to less than one and a half per cent. He suggested, therefore, that only about one and a half per cent of research budgets on average were spent on information work. He thought that industry should be prepared to pay more than this for information.

Professor W.L.Saunders (University of Sheffield) referred to a survey recently completed by the University. Speaking from memory he said that the figures showed that there were five information people per hundred scientists in the industrial sector. This represented a considerable improvement over the last decade; a survey conducted about ten years ago, in which Dr.Campbell had been involved, had come up with a figure of two per cent.

Dr.Campbell pointed out that this survey had not been specifically concerned with research and development.

Mr.Spear asked whether, in his figure of five per hundred, Professor Saunders was taking qu people without support staff. He had a stro picion that in fact the supporting staff per the information field could be much higher th supporting staff per head in the research and

development field. His ten per cent figure had not only included the official library and information unit but had included also the standards department and patents department which he also regarded as information work. Mr. Spear also pointed out that the figure could well be higher because when he had to charge in his budget for work done, the proportion which was not charged was placed under the heading of general advisory work. For example, the visit of a senior research engineer to investigate a customer's plant, where he would be taking on a technical information officer's role without being within the formalised system.

ECONOMIC SUCCESS : THE CONTRIBUTION OF THE INFORMATION SCIENTIST.

W. L. Saunders.

Professor Saunders began by saying that the starting point for any paper on the need for professional information scientists had to be economic. He said that throughout the world thousands of millions of pounds were being spent each year on research and development and the end product of all this activity was new knowledge, new information. A good deal of it found its way into the journal and patent literature and was available for anyone to see

who wished to see it. Additionally, as much of this activity was carried out by industry, it also found its way into the internal reports of firms carrying out the work and was to that extent restricted. In either case, the research and development job was not complete until the new knowledge it had generated was being utilised, or at least was taken account of. If it were not used, then it should be for good and valid reasons. There was, in fact, plenty of evidence of serious under-utilisation and some individual examples of this had been revealed in the earlier papers. At national level an investigation had disclosed a waste of money through duplication of research equivalent to about three times the research effort of the whole of the British steel industry, but probably far more serious than duplication of effort was the amount of work that never got done, the good ideas that were never followed up because of ignorance of the relevant research that could smooth the way and turn a good idea into an actuality. Looking at the wider picture, it was clear that no country, not even the U.S.A. or Russia, could afford substantial research programmes in every field of knowledge, but equally no country, particularly the U.K., could afford to ignore the opportunities of

getting the end product of other people's research, that is to the extent that this end product was available in the literature and elsewhere. Personal sources of information, research associations, etc., should not be overlooked.

This waste of effort is not confined to information that is generally available to everyone through the journal literature: it also applies to research that an organisation may spend its own good money in carrying out. Professor Saunders knew of at least one firm represented at the Conference which did spend quite a lot of money on indexing its own internal reports. No doubt there were many others, but he wondered how many people could put their hands on their hearts and say not only that they used what was immediately available from their own organisation's research, but that they also recorded in easily retrievable form the results of their own researches which might not be immediately relevant but which might be some day.

Undoubtedly information was wasted and neglected and in attempting to answer the question why this was so, one had to accept that, quite often, management attitudes were at fault. Some managements were not sufficiently alive, dynamic or even interested to bother to keep up with technological change and they might even be down-

right resistant to it. Another reason was the sheer scale and complexity of the new knowledge, the new information which was constantly being generated. It could be argued that the problem was a big one and that to some extent it was understandable if industry boggled at it, but industry frequently took on other problems just as big and took them on successfully. A normal reaction to a problem was to bring specialist knowledge to bear on it and here, in large measure, lay a good part of the solution to the information problem. Industry should not be loath to bring in specialist information scientists. He knew that many firms were already doing this but it was true to say that far more were not. One reason was that probably there was no general awareness that such a specialisation existed, or if there was there was a tendency to be sceptical about it. This was perhaps inevitable when a new profession began to emerge, and information science was a new profession, but in some ways the concept was a very old one. In military spheres the importance of good intelligence had been recognised at least since the days of Joshua, and no modern general would think of conducting a war without one. In the economic sphere, surely commercial and scientific intelligence was just as important. He

again stressed that this was not lost on some managements and he quoted a recent national investigation which showed that the importance of information services was best appreciated in the most advanced firms.

Professor Saunders outlined some of the responsibilities normally undertaken by information scientists. A primary duty, possibly in co-operation with libraries, would be to organise and maintain a company's information resources, to be aware of what was relevant, to acquire what was necessary, to store and record it and its contents in easily retrievable form and to disseminate it as and when necessary. This would be linked with another major function, that of interpretation and analysis, for it is their business to sift and sieve all the mass of new material, to ensure that all that is relevant is identified, and to bring it to the attention of those most likely to need it.

He then described what one should look for in senior information staff. Clearly a good outgoing personality was important. A back-room type with a back-room outlook was not much good for this was a job which called for contacts at all levels and with all aspects of a firm's activities. There would often be almost a resistance to new information, and the information officer has a job of selling to do. In addition to a good personality, he

also needs to have a good scientific or technological background, which normally would mean a good degree or membership of a professional institute. It was not easy and perhaps not even essential to match every specialised scientific need with a graduate in the corresponding degree subject, but one needs the type of scientist who is capable of quickly getting into the particular specialised needs. A successful information scientist has something of the artist in him for imagination and intuitive qualities are required to see relatedness and relevance in apparently unrelated things. He is a man who needs to retain overall awareness, the ability to see the organisation's operations as a whole, and to apply their interconnectedness. He needs to know enough about a whole range of scientific fields to be able to help specialists get into fields outside their own specialisations when the need arises, so that in a sense he is a "specialist generalist". Additionally, at the level of real specialisation, he and his colleagues between them need to be capable of analysing and evaluating specialist research findings with sufficient competence for their research colleagues to accept and depend on their analyses, to be confident that nothing relevant had been missed. They

should be used as literature specialists for research teams purposes. Finally, this paragon needs to have professional expertise. His raw material is information in all sorts of forms, largely published, but some of it unpublished which, by its scale and complexity, calls for skills and techniques which are themselves increasing in complexity and sophistication. A bright scientist can certainly pick up a lot as he goes along, but in this day and age "sitting by Nellie" is an uneconomic way of becoming professionally effective. Properly trained information scientists were needed just as much as were properly trained doctors, teachers or managers. There was a good deal to be learned before even a really good scientist was properly equipped to act as the skilled sieve, the intermediary between management and research workers on the one hand and the rising tide of information on the other.

Turning to facilities available for training information scientists, Professor Saunders referred to the M.Sc. courses in Information Science at the University of Sheffield and at the City University, London. Each was a one-year course which catered for about 15 students each year. In selecting students for the course at Sheffield, emphasis was placed on academic attainment, general personality and potential for information work. The

students were generally of very high academic calibre and those taking the current year's course were mostly upper second class honours graduates and, in fact, two had Ph.D.s. All this means that for four or five years now there has been a trickle of quite high level trained information scientists coming out of the Sheffield and City Universities. They are still in very short supply, but in Sheffield at least they plan to step up the numbers as soon as resources permit. In addition to the two M.Sc. courses for the potential high flyers, other full-time training facilities were available in the form of C.N.A.A. bachelor degrees in information science. These courses were established at Newcastle and at Leeds and there were likely to be others before long. The courses were well worked out combinations of science subjects and information science, and once they were firmly established they should bring some very good people into the profession. Library schools also afforded full-time training, though not so specialised, and there were graduates and non-graduates who had qualified as Associates of the Library Association whilst specialising in librarianship with a science and technology bias. There was also an evening course at the City University which led to the

examination for the Certificate of The Institute of Information Scientists. Finally, an increasing number of specialised short courses, such as those run by ASLIB and the Liverpool School of Librarianship, were organised. These were primarily intended for established staff who could not conceivably be released for full-time training but, because of the rate that things were changing in the information world, they were in demand from trained and fully-qualified staff who necessarily have to keep up-to-date with new developments.

Professor Saunders concluded with a plea to the large firms who made major contributions to scientific education and research by way of scholarships and other support, that they might add information science to the list of projects which they support. An industrial organisation which sponsored one or two information science scholarships would certainly be making a most valuable contribution to a new and important scientific specialisation. Even better, if they were to second some of their own staff to one of the M.Sc. courses on full pay, this would be bread very wisely cast on the waters.

DISCUSSION

Mr.J.D.Rushton (I.C.I., Dyestuffs Division) said that Professor Saunders' description of an information scientist left him with the feeling that, ideally, the information scientist was a good research man with the added expertise of being able to sift through literature and recognise important things for the people he is serving. He found it difficult to separate the functions of research and information science in these terms and he suggested that perhaps researchers should have training in information science to help them to do their job more effectively.

Professor Saunders agreed but saw no reason why information work should not be a discipline in its own right and also a rung on the ladder to top management, just as much as other disciplines.

Dr.D.J.Campbell (Pressed Steel Fisher) referred to the question of languages and said that very few technical men had any linguistic ability. It was his opinion that an information man should have a reading knowledge of at least two foreign languages depending on the speciality of the organisation. He was aware of the argument that this was not really

necessary because one could always get translations done outside but how could one assess the importance of a paper in, say, German or Russian without some knowledge of the language?

Professor Saunders said that they laid great stress on language competence at Sheffield and a reading knowledge of two languages was required before a student was admitted to the M.Sc. course. About half the output of the world's scientific and technological literature was in languages other than English.

Mr.A.P.Sundberg (Battelle Memorial Institute, Geneva) asked what Professor Saunders' department did towards encouraging scientists in other departments of the University to learn information techniques.

Professor Saunders said that a lot was being done in passing on information techniques to graduates through courses such as those run by Dr.Urquhart of the National Lending Library. In the long run it was intended to try to work some of the information expertise into undergraduate courses at Universities. The great problem was one of securing time in University curricula.

Dr.A.K.Kent (University of Nottingham) commented that as recently as last year, only about five per cent of final year graduate students had had anything like as much as three hours' formal training in information services and

he thought the system was very deficient in this respect.

Mr. Spear (Rubery Owen) said that the emphasis seemed to be on training people for pure research rather than industrial research and in producing people to assist planning management rather than line management. He wondered if Professor Saunders, in his training courses, put people in touch with a production advisory service such as the Production Engineering Research Association, to let them see some of the problems which arose from the shop floor as opposed to those from management.

Professor Saunders said that the very first visit made by students on his course was to P.E.R.A.

Mr. V.C. Watts (Production Engineering Research Association) remarked that great emphasis had been laid on research and development and to the different scientifically based parts of industry. Could Professor Saunders say whether, in fact, there was any indication yet that within the engineering fraternity there was likely to be any demand for the type of course offered by the Sheffield and City Universities? So far as engineering graduates were concerned, he believed there had been very few requests from that quarter, yet there was a tremendous

need in the production and manufacturing field for information science. Did Professor Saunders find that the engineering profession just was not interested in information activities?

Professor Saunders said that he did not as yet see much light in this direction. They had had two engineering technologists only on courses during the last five years. He thought that this reflected the information consciousness of this disciplne. He had found that the primary group in respect of information consciousness were chemists, followed by biologists.

Dr.R.L.Hall (Allied Breweries) asked what had happened to the successful graduates from Professor Saunders' school over the last few years. Had they gone back into industry doing research or had they gone into libraries?

Professor Saunders said that they had two streams of students, science students taking the M.Sc. course, and arts and social science people following the more traditional librarian courses. In their first year, with a very small number of science students, most of them had done into universities. Subsequently the majority of science students were going back into industry and industrial types of activity such as research associations. A number each year went into universities.

Mr. J. Farradene said that his experience at City University was very similar. There were still very few engineers but people like mathematicians were beginning to come forward and these, he thought, would contribute much in the future. Industry could and did help, by supporting researches in universities on technical problems. There was a great need also for research on technical information problems.

Mr. S. A. Gerrard (I.C.I., Mond Division) asked what were the best ways in which the chemical industry might help people to use information. He agreed with Professor Saunders that the user of information was not interested in the specialist techniques of the process and that it was the information scientist's job to get the information across in simple and easily digestible form. When his organisation recruited chemists and engineers for research they took them in small groups on an induction course on what research involves and when they had an information problem they were taken through the whole system to see what facilities existed. Another move was to second one or two people from the information group to work closely with a research team engaged on a particular topic, being available to help with information problems as they arose and thus becoming part of the team.

Mr.H.E.Airey (Unilever Research Laboratory, Port Sunlight) noted that most of the present discussion on the function of the information scientist had concentrated on how he was expected to perform when given a specific enquiry to handle, but he had understood that one of the aims of the Conference was to promote a greater awareness of the value of information particularly among managers. Two speakers that morning had complained that much of the technical information given to managers was unattractively presented. Mr.Spear had mentioned abstracting services and Mr.Carter had referred to the responsibility of the information scientist to try to convert information into more palatable form. He asked Professor Saunders what was his attitude towards this aspect and what was included in the courses at Sheffield in the way of enabling the information scientist to dress up information so that it would be attractive to the user?

Professor Saunders said that he would prefer to hear from practitioners exactly what they did in this respect. He felt that this was an area in which the people who were actually practising as information scientists would have very definite views.

Mr.Owen (Wiggins Teape) said that in his firm it was the practice to present information in the form of

discussions. After familiarising themselves with the subject, they would talk to the scientists concerned, pointing out the main areas of knowledge. This encouraged the scientist in the use of information services.

Mr.R.L.Ballard (Metal Box Company) thought that it was useless to produce a long report for management. A manager did not have time to read a lengthy document and a one-page summary which was attractive to read would often give as much information about that particular bit of work as he needed for his own purpose. It was his experience that only those managers who were very closely connected with a particular piece of research work needed more than that.

Dr.W.M.C.Morgan (Monsanto Chemicals) said he was disturbed about the suggestion that information should be dressed up. If information were to be of any value it had to be very closely related to the needs of the enquirer. The aim of the information scientist should be to help the potential enquirer to accurately determine his needs. The need was not for more information but for better information related to the specific needs of the enquirer.

Mr.Farradane thought that what was meant by dressing up information was providing a combination of library and information service in the right manner.

Mr. Emerson (Pressed Steel Fisher) asked how information scientists could assist engineers, bearing in mind that, with engineers, information men had a rather "arty-crafty" image.

Professor Saunders referred to his earlier comments that the real need was for more information scientists with an engineering background.

THE LITERATURE OF SCIENCE AND TECHNOLOGY: PUTTING SYSTEM INTO SEARCHERS.

D. J. Urquhart.

Dr. Urquhart began by stating that he agreed with Mr. Spear's observations on the value of literature. Talking to Joe was often a useful way of getting information but one could not always find the right Joe: if one studied the literature, perhaps it would lead him to the right Joe. He said that scientists and technologists generally were amateurs when it came to using the literature but he believed that with a little training they could become much more effective: he quoted his own experiences with a course for Ph.D. students, held at the National Lending Library, to illustrate the point.

Dr.Urquhart reminded delegates of the purpose of the Conference which was to try to bring home the importance of the information problem. Previous speakers had talked about the economic consequences of having or not having information and Professor Saunders had reflected upon how the problem had arisen. Three hundred years ago it had been possible for one man to read the whole of the accumulated scientific and technological knowledge of the age: Newton had been able to do this. In 1665 there were two scientific periodicals, whereas to-day the National Lending Library of Science and Technology collected 32,000 different titles. In addition to what had been termed a scientific explosion there was also an information explosion and the real problem arose because this explosion had been going on for two centuries and particularly so during the course of the twentieth century. The task, so far as industry was concerned, was to discover information that would make for a better product, a cheaper product or a new product altogether and sometimes one could be quite specific about what was needed. This is straightforward but at other times one might be looking for a needle in a haystack and the real problem arose because often one did not know exactly what was wanted. Specific problems could be passed to an information scientist, but if the problem could not be defined then one could not immediately make use of an

information scientist. It was necessary to be able to use the libraries oneself, at least well enough to obtain sufficient information to define a particular problem. Following up an idea by reading a few papers often clarifie one's mind as to what one was really after. It was this process of pinpointing the problem by browsing in the literature that was extremely difficult.

Dr.Urquhart underlined the importance of establishing with management the idea that obtaining and using information was an essential function of management itself. If the firm was large, the information function would fit into the organisational structure. However, this was not the general pattern of British industry, for a lot of industry was tied up in relatively small firms who were not likely to want to employ information scientists. It would be of considerable advantage to smaller firms for their scientists and technologists to know a great deal more about the use of the literature. This would also be of advantage in larger firms because it would allow for problems to be defined better before they were handed over to the information scientists. He thought that one should not worry too much about the problem of language since half the scientific literature of the world was in English and this gave the British a clear advantage.

Experience in the National Lending Library had shown that after taking a special one-week course, a scientist or technologist was able to use the literature intelligently. However, the National Lending Library did not have sufficient resources to tackle the whole problem and if the universities continued to turn out scientists and technologists who were not trained to use the literature properly, then research associations, libraries, etc., should take more interest in running courses for scientists on this subject. The National Lending Library would certainly offer help in the way of training the trainers.

DISCUSSION

Dr. J.G.Reynolds (Shell Research) described an experiment which had been conducted in his organisation. Their graduate computer programmers, of varying degrees of seniority, had more work than they could handle. He canvassed throughout the laboratories for wives of graduates who were willing to be trained for this type of work. About sixteen such wives volunteered and took a special three-month course. Of these, about a dozen had stayed the course and they now worked on contract for about

£20 a week to do the more simple type of programming. Thus, special training had enabled his organisation to get a lot more programming done for a very economic sum.

Mr.A.P.Swedberg (Battelle Memorial Institute) said that in the process of trying to collect information, if one could be clear as to where the information sources might lie, one could come up with interesting answers. It was useful, considering the many different kinds of information sources, not only to see what had already been published, but to find out who were the major people who were writing on a particular subject and to contact these people personally rather than to wait until their work was published. The publishers of various journals could also provide useful sources of information.

Dr.G.Chandler (Liverpool City Libraries) noted that there appeared to be a disunity between librarianship and information science which he put down to excessive Anglo-Saxon individualism in this country. In Russia the national library network, the information network and the public libraries network were all unified by common authority. It would be an enormous simplification of the task of the scientist and technologist if they had only one system for the arrangement of literature to learn. He thought that Mr.Spear had been rightly impatient of the specialism and jargon of the various groups in which those concerned with

scientific information worked. There was a profusion of organisations which had come into existence because librarianship and information science had not been able to stand on their own feet as a profession. The information scientist, he thought, could not help the very specialised research team. One needed a subject specialist for that, and that specialist needed some training in searching the literature. Side by side with that, one needed a truly unified profession which would lift information science and librarianship to the status that was merited. He thought the solution to the problem lay (1) in training the subject specialist to use the literature, and (2) in the unification of the profession so that it could be regarded as a competent authority.

Dr. Urquhart agreed that unity in the profession would be a good thing but thought that in this country the divergence between the libraries and the people who used them was rather more serious. He was a little surprised to hear Dr. Chandler's remarks about Communist countries because he himself had found that there was a bigger gulf between information scientists and librarians in Communist countries than there was in Britain. The people who were concerned with the Academy of Science in Russia hardly spoke to

the people in the Soviet Ministry of Culture responsible for libraries. They did not think the same way. In this country we were fortunate in having only one Ministry, the Department of Education and Science, to cover the same ground as two Soviet Ministeries.

Dr. D. J. Campbell (Pressed Steel Fisher) said that the information officer's job was to know about published sources of information and also to know about inside sources of information. One of his most useful functions in a big organisation was to act as contact man. He described a survey which he had undertaken in which he had come across a number of cases where people were working in such water-tight compartments that Dr. A. and Mr. B. might well be working on the same thing without knowing about the work that the other was doing. It should be part of the information officer's job to bring these people into contact and he should know who are the firm's experts on various subjects.

Mr. Spear (Rubery Owen) said that to a large extent he agreed with some of the things that had been said about information services in Russia. On a recent visit he had been extremely impressed by the speed with which some material which his firm had sent over a short time previously had been processed.

Mr.Spear was a little disturbed by what appeared to be a bias towards the printed word in information science. He had two enquiries at the moment and the answers would not be available in printed form. One concerned the date at which certain literature on metrication would be available. The other was concerned with a project to spend £100,000 on some new plant, where he was interested in the measure of reliability, cash flow and total market if capacity were increased. Some of this kind of information should come from the information service, but not very much of it would be available in stereotyped printed form.

Dr.Urquhart said that it was to be expected that there would be delays in publication and that a certain amount of information would not get published at all.

Mr.J.Farradene (City University) remarked that many people had skirted round the word "information" without defining it: they were really only on the threshold of understanding exactly what they had to do. As regards unity within the profession he believed that what was needed was understanding between those who were trying to help and those who needed the help. This was the reason for the present Conference. It would be many years before a really

reliable technique of information science emerged, that is, one that is 100 per cent efficient, and even then the human element would come into it. An enquirer might change his mind about what he wanted and the process was one of feed back and continual growth. The lesson was that there must be much greater co-operation between all types of people concerned with getting information across.

Dr.Urquhart said that Mr.Farradene's comments reminded him of the problem of formulating questions. It was possible sometimes to formulate questions so accurately that one did not get any information at all.

Mr.J.H.Myers (Scientific Instrument Research Association) referred to the point that had been made about "asking Joe". He realised that Dr.Urquhart had pointed out that although talking to Joe was one of the best means of getting information, it was sometimes difficult to find out who Joe was. The alternative solution was to expose the scientist to the literature so that he could formulate the problem more accurately. Mr.Myers thought, however, that the information scientist ought to be able to help the scientist or technologist to formulate his problem more accurately at an earlier stage. Referring to a point made by Mr.Spear, Mr.Myers thought that the telephone interview

and the field interview as means of getting information should be regarded as being within the province of the information scientist.

Dr.Urquhart said he did not disagree with Mr.Myers but observed that many people were reluctant to ask for something when they did not really know what they wanted.

Mr.A.H.Stodhart (Production Engineering Research Association) said that a lot of people came under the classification of "Joe" in research associations universities and Government research establishments and information existed there in their knowledge and understanding of a subject, but this was not tapped frequently enough. Within research associations enquiries for information were being received continually and frequently the most important service the information staff could give was to put the enquirer directly in touch with a person who had the information required and who could reduce the enquirer's heterogeneous problem to something which was quite specific and produce the answer. He said that when he visited the smaller firms he often came away with enquiries in which his organisation could help, but it was only in talking to people in the firms that their problem emerged clearly in a form in which it could be answered.

Mr.R.Foster (Computer Time Sharing, Manchester) asked what had been the impact of computers on information science: what were the benefits and what were the drawbacks?

Dr.Urquhart described some courses which the National Lending Library had run for senior medical people who were studying computer science. One professor taking the course had remarked that he had been both interested and humbled to realise that he had not known how to use the library. Dr.Urquhart said that people were attracted to courses that were linked with learning about computers.

Mr.P.H.Vickers(Aslib) said that computers had gradually invaded the information field and many people now knew enough about the use of computers in their work to run some sort of instruction on how they might be used. Computers could be used to facilitate library techniques and it was part of the service provided by Aslib to advise people on how to set up and improve information and library services.

CHAIRMAN'S SUMMARY

Mr.Lancaster said he understood that the Conference commenced with the aim of converting the unconverted, but the emphasis had changed to discussing ways in which we,

the converted, should try to convert the unconverted. Having been an electrical engineer, then a mechanical engineer and finally working in the administrative field, he himself was one of those people who had got to know less and less about more and more. He had just learned a lot about information scientists and their work which he had not known previously, and he wondered why this should be. For the last 30 years he had worked in an organisation which had used information scientists, but, before to-day, he had never had contact with an information scientist. Perhaps one of the faults of information scientists was that they were too inclined to sit in their libraries surveying literature and turning out articles and reports. Perhaps they should get out now and again and find out what people wanted to know and impress on them the value of their services.

In most things of this nature the difficulty was in making a start. He suggested that it would be a good idea to compile a list of 30 or so people whom it would pay to make aware of the services offered and then make a point of seeing these people. Speaking as a representative of management and an engineer, he suggested that if they were going to collaborate with other people information scientists should start

off by not being so damned rude about them. One heard criticism from all sides; the Government was for ever lamenting that managements were inefficient, the Trade Unions too were critical, and to come and hear the Institute of Information Scientists telling him so as well was more than he could bear!

The Chairman said that, in a way, he seemed to detect in the Institute of Information Scientists the same sort of thinking that he had detected in institutes of which he was a member. They were forever bewailing the fact that the public did not recognise them as such and did not regard them as professional gentlemen. It was no good sitting on one side and saying what people ought to be doing - it was the information scientists themselves who had to do something about it. The remedy was in their own hands and nobody else's. He recalled that, some years ago, he had undergone a course and learned for the first time how to tie an electrician's knot. If the instructed had not learnt, it was because the instructor had not taught. He had often remembered the electrician's knot when he had felt like blaming other people, and he had then thought that the fault had perhaps been his in not giving adequate instructions in the first place.

Referring to the language barrier, the Chairman said he was in touch with all sorts of people and they all spoke a different language, so, he advised information scientists, they should try not to be too abstruse when they spoke to the uninitiated.

In one of the discussions there had been some reference to margarine which was among the products of his company. The reference had been made in connection with advertising and the method of getting the message across to small industries by adopting a follow-my-leader approach, concentrating on getting the big ones to adopt the idea first. This was certainly a very successful advertising gimmick, as had been proved by the way sales of Lux toilet soap had increased since the introduction into advertising of the theme that nine out of ten film stars used it. If one could impress on the small people that something was used by the big people, that was one of the best ways of getting a message across.

CLOSURE OF CONFERENCE

Mrs. E. B. M. Wilkinson said that the delegates could not have failed to be impressed by the smooth

way in which the Conference had proceeded. She payed tribute to the organisers, Mr.Grout, Mr.Leigh and Mr.Yates, to the Chairman, Mr.Lancaster, and to all the back-room people who contributed towards making the Conference a success.

CONFERENCE ORGANISERS

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F.A. Grout — Confederation of British Industry

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