Universities Can Help Industry

More and more university-industry joint effort is being seen, and more yet is expected in future as successes mount

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Until fairly recently British industry tended to regard the universities as institutions which would once a year produce a crop of new graduates in a variety of disciplines who would be available to industry for employment, preceded frequently by a period of training or indoctrination which was intended to give both the new graduate experience of a number of jobs in his company and the company an opportunity to decide where the graduate best fitted. Industry also looked to the universities to undertake research programs which were both directly funded and jointly funded by industry and the Science Research Council.

The more senior members of academic staffs of the universities undertook occasional consultancy work, often for the same company over a long period of time, and certainly a number of academics have become sufficiently established in their field to be regarded as the experts who would need to be consulted in matters concerned with patents and other forms of litigation.

With the growth of the universities in Britain during the 1960s, this pool of expertise began to expand rapidly and there was an apparent need for some formality to be introduced in marketing this expertise to industry and in establishing proper contractual relationships between the parties.

Establishment of industrial liaison officer posts in many universities and polytechnics indicated a recognition by the government that the contact between industry and universities would be facilitated by the presence of a liaison officer. This scheme prospered and many universities which were involved in it took over the Ministry of Technology-funded post and created an industrial liaison director's office in the university. It was often attached to the registrar's or finance officer's department, indicating the importance that the universities were beginning to put on commercial arrangements which needed to be made both for research and for consultancy.

From 1968 to 1972 most universities examined their attitude toward industry. They responded by creating a post or by establishing a group concerned primarily with work for industry. These organizations took many forms. The director of industrial liaison who had previously been funded by the Ministry of Technology was seen by many universities to be the ideal way of establishing a link. Half of the 35 or so industrial liaison posts in the universities are of this type.

The director of industrial liaison introduces industrial inquiries to academic staff or departments who are then free to negotiate the best method of collaboration. This might result in consultancy, establishing undergraduate or post-graduate student projects, or establishing a research program which would give a large organization the opportunity to study some aspect of the technology of its business in depth over an extended period. The director of industrial liaison in a university will be concerned frequently with establishing specialist short courses and insuring that industry, particularly local industry, is aware of developments in academic departments.

A number of universities saw that if their collaboration was to be on a more commercial basis, a quasicommercial organization was probably the best way of developing the links. Among these universities are Loughborough, which established the first university company in the United Kingdom, and Lancaster, which established a number of companies to promote particular aspects of that university's work. Other companies similar to that in Loughborough are those at Bath and Leeds, while Queen Mary College in London, having started with a university-based industrial research unit recently converted that organization into a university company in its own right. Most of the companies act as agents for academic staff in the university, but Loughborough and Queen Mary have significant numbers of people employed by the company itself.

Universities Fund

The companies and the offices of directors of industrial liaison have mostly been funded by the university or by the university grants committee. Frequently, university support is in the form of a loan on which interest at a rate close to commercial rates is charged. The profits of the organization are paid back into the university funds.

Other sources of initial funding have been the department of industry and the Wolfson Foundation. They have been particularly generous in their support of a number of universities, particularly Southampton. This type of funding has tended to result in establish-

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ment of one or more specialist units within the university with its own staff. It makes use of university people as expert advisers with the bulk of the work of the unit being carried out by the full-time staff. The total number of universities with units of this type is 14, but in all there must be some 30 such activities established in United Kingdom universities. These range from the Electronics Unit at Essex University, whose services are likely to be used by a wide range of industries, to the Wolfson Marine Craft Unit at Southampton, which has extensive facilities for the use of both large and small companies in the marine industry.

Despite the substantial support from the Wolfson Foundation and the Department of Industry, it is interesting to note that more than half of the universities with industrial liaison activities have either funded themselves, or have used funds made available for this purpose by the university grants committee.

HOW DOES ONE MEASURE SUCCESS?

It is frequently claimed that there is an almost limitless market for universities to exploit in industry. So far, as each university organization has come into existence and become viable, it has found a plentiful supply of work of all sorts from industry. University/industry liaison is generally regarded as a "good thing," but nobody has attempted to define how much collaboration there should be, expressed either in terms of time spent or money passing from one side to the other. There seems to be a universal acceptance by both sides that the universities have skills and equipment that industry would find useful, and the universities have all been willing to respond. One recent survey of 20 universities showed that excluding research funds, the industrial liaison activity in eight cases earned up to £100,000, a further seven earned up to £300,000 while two earned between £300,000 and £500,000 and three earned in excess of £ 1/2m per annum for the parent university. It is interesting to note that of the three whose income was the largest, one was an industrial liaison office, one was a unit offering a particular technology, and the third was a university-owned company.

Having failed to establish how much university/industry collaboration is desirable it must also be admitted that no person engaged in this activity can make an honest estimate of how much of the activity that passes across his desk would have passed into the university had he not been there. In some cases the industrial liaison director is there to help the collaboration along and therefore might claim that he does nothing to increase the amount of collaboration.

In other cases the amount of time that the director of industrial liaison spends in his motor car visiting industry on behalf of the university would suggest that it is possible to generate a very large amount of activity, which might not have occurred in his absence. There is no doubt that at Loughborough much of the work undertaken by the university company would not have found its way on to the campus in the absence of the company, but apart from the project work undertaken in the university the work undertaken by the company is frequently slightly removed from that which would normally be associated with the the university.

A positive effort has been made to encourage companies who would not normally have sought assistance in universities and a number of those companies are now significant sponsors of research work, engage graduates of the university and sponsor students into particular university disciplines. Thus, an inquiry which could well be for some technical assistance which can be undertaken under the terms of a commercial contract with a clearly defined objective, can be succeeded by longer term research which the academic is pleased to handle because he is able to see the relevance of the research program to the needs of a particular industrial sector.

WHY DO IT?

It is fairly easy to see why industry encourages establishment and development of industrial liaison activities. There is a feeling that universities have expertise and resources; a feeling that these physical resources are not always employed as intensively as they might be in an industrial research laboratory and that the academic who is not engaged in the hurly-burly of a company's day-to-day affairs, will have the opportunity to think about his client's technical and managerial problems in a detached and unpressurized fashion.

From the point of view of the university the motives are less clear, and the principal incentive varies both from university to university and also from academic to academic. There are a few who maintain that establishment of an industrial liaison activity will increase the income of the university although, as the figures show, university income from industrial liaison units and companies is not enormous compared with the grant income from the Science Research Council and government agencies.

A second motive that is easy to identify is a feeling held by many people in universities that, since the universities are supported by public funds opportunities should be taken to play an active part in the community. For many academics consultancy work and research work for industry provides them with an opportunity to maintain close contact with the profession of which they are members and to keep them abreast of current industrial developments in their subjects.

The obvious possibility of generating case studies and examples for students would figure in the attitude of academics who take this view. For many, the maintenance of close contact with professional work is the sole significant justification for collaboration with industry.

Linking

Given this willingness to collaborate with industry, one must also justify establishment of a linking activity which might, at first sight, appear to stand in the way of collaboration rather than to aid it. In the very obvious commercial area the director of industrial liaison in a university is there to insure that, in appropriate cases, a proper commercial rate is charged by the academic for his time which, of course, in the last analysis belongs to his employing institution. He also insures that the liabilities assumed by the member of staff and the university are realistic in view of the type of work that is being undertaken. Finally, he sees that benefits such as patentable inventions or publications are obtained on the best terms possible for the university.

The other side of the coin is the duty that the director of industrial liaison has to the industrial sponsor or client. It is important that the best source of help is found within the university and that the member of staff who is asked to undertake the work, not only has the expertise but also that the time available from his other responsibilities to devote an appropriate amount of effort to the industrialist's task. It follows then that the director of industrial liaison is there to insure that work done for industry is carried out in a professional manner, that proper responsibility is assumed, deliveries are made on time and any follow-up or subsequent work is handled with appropriate enthusiasm.

WHAT HELP IS AVAILABLE

Within the university system one can say with some certainty that there will be found an expert in almost any subject that is likely to be of interest to technologists, managers and other professional people in industry. Those active in a particular field will know where to find an appropriate expert and will, either from their own knowledge, or knowledge of colleagues, know which of, say, two people one would choose to be an expert witness in a patents case and which one would choose to carry out a long-term study of all the ramifications of a particular technical matter.

Any university director of industrial liaison will tell you that he is called on average three times a week by people who do not know of an expert and are trying to find somebody to whom they can put their problem in order to form some sort of judgment as to whether the particular university is able to offer them the help that they need. The presence of a well advertised industrial liaison service within the university tends to attract inquiries of this sort, not only from local industry but also from companies elsewhere in the country and from overseas countries and international agencies. The task that the director of liaison is then faced with is to find an appropriate staff member in his university often on the basis of a brief statement over the telephone of the problem, and to insure that his university's response is a proper professional response to the potential client.

In the case of a large contract this may mean a visit by a team of people, possibly four or five in number, to look at the problem on the potential client's premises and sometimes will lead to the preparation of outline proposals in order to attempt to determine the true nature of the problem that is being posed. While it is often true that the client's original statement of his problem is not his final statement, one has to beware of the tendency of academics whose wish to start with a clean sheet of paper is so strong that one wonders what would have happened at the Creation if a university had been called in to help!

Very large numbers of contracts involving quite significant sums of money are now established by this means on behalf of companies who may well be making their first approaches to academic institutions. The university side has to remember that it is often on the experience of the first contact that the entire relationship and the prospect for the university of serious involvement with an industrial organization will depend. Very careful matching, therefore, of the technical requirements, the matching of the personalities who are to become involved and the establishment of a clear brief or specification for the work is of vital importance.

The result of all this activity is the placing of well over £5m of business each year via industrial liaison activities in British universities.

LOUGHBOROUGH CONSULTANTS LIMITED

In order to illustrate how one university has tackled the problem of liaison it is inevitable that Loughborough Consultants Limited will be chosen as the example.

In 1969 when the company was first established it was the intention of the university that the company would market the expertise of its academic staff, the skills of its technical staff and the physical resources that the university possessed, particularly the major items of equipment and instrumentation that the university had obtained as a result of its extensive programs of industrial research work.

There was no great desire to undertake routine test work, although on occasions it has been very helpful both to the university and to local industrial organizations to provide access to tensile testing machines, compression testing machines for testing concrete blocks and specimens, and routine chemical analysis services. Simply because the university has these facilities, people expect them to be available and it would be ungracious of the university to turn a client away, particularly since that person might eventually become the sponsor of a substantial five-year research programs.

As the company grew and appoached its first £250,000 worth of annual turnover it became apparent that if the service that had been offered was to develop, it was essential that the company should have its own staff and that these people should be used to support academic staff in their endeavors. It comes as a surprise for many people to know that in our early days university engineering departments did not employ draftsmen and were thus unable to communicate via the medium of drawings with their clients.

One saw professional engineers, who had long since left the rigorous environment of the drawing office, carrying home large bundles of drawing paper in order to spend a weekend drawing up ideas they wished to put to their clients.

Loughborough Consultants then began to engage draftsmen, electronics technicians and similar staff simply to provide the essential support for engineering consultancy work. As the company developed these groups became more formally established and, at present, the company organization includes two groups of full-time staff, one in design and the other in electronics and instrumentation. A third group manager is responsible for project work undertaken in the university and is also responsible for the four or five specialist staff that the company employs, all of whom are engaged in work closely associated with facilities or people in university departments.

Annual Turnover

The annual turnover of the company is now of the order of £700,000 of which one third is work carried out by university staff on behalf of the company. The company has its own building, financed by bank loans and plans have been laid to increase the volume of business and to provide additional accommodation in the course of the present year.

The Electronics and Instrumentation Group is the largest group of staff. This group undertakes development work for clients to enable them to introduce new technologies such as microprocessors, or to convert existing mechanical devices into electronic systems. The group is currently engaged on several microprocessor development projects including a system for the control of a scientific instrument, a new control system for a major item of production machinery and several projects in the consumer goods area. Among its conversions to electronics is a turntable ladder control system developed for a manufacturer supplying the Fire Service whose previous entirely mechanical system has been gradually converted into a fully electronic system offering additional features to the users.

This group also undertakes the building of special purpose instrumentation and has recently supplied Vickers with the instrumentation for a tire and brake dynamometer, which that company was supplying to China. (Figure 1)

The Design Group which includes both mechanical designers and industrial designers undertakes manipulative machinery design, ranging from packaging machinery to equipment for pharmaceutical processing. Projects concerned with agricultural and construction equipment, with Company staff, sometimes in association with academic staff of the university, have now resulted in the design of five or six new vehicles. (Figures 2 and 3). The industrial designers, as well as supporting the mechanical design projects, also undertake industrial design work for clients. Here, the skills that have been developed inevitably are concerned with capital goods and with products which include electronics as a substantial element.

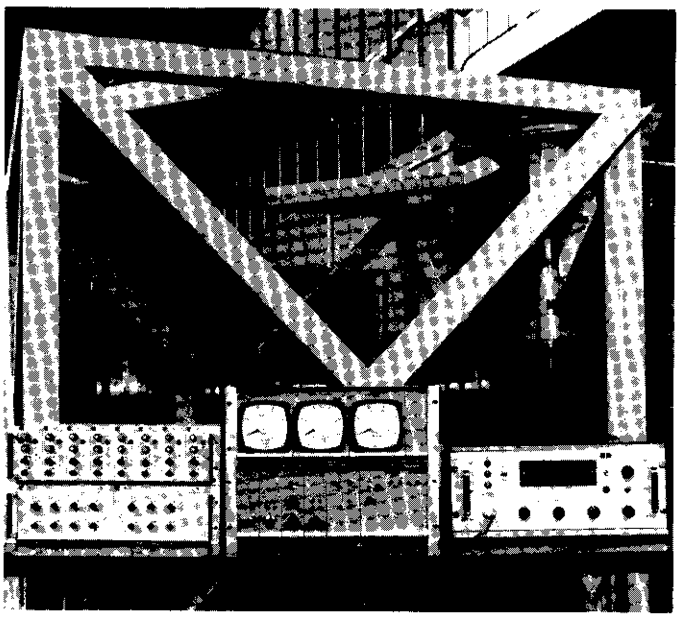

Figure 1

Figure 2

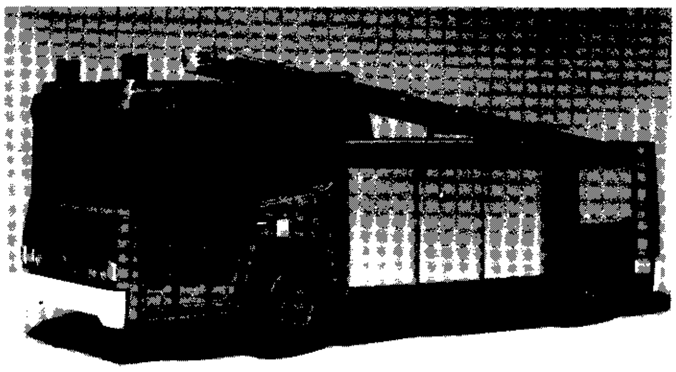

Figure 3

The activities of the two groups described above depend on the possession of skills by people employed by the company, a situation which arises in every commercial organization. On the other hand, the University Projects Groups has access to a much wider range of expertise and the type of project work which is undertaken varies widely. With the support of full-time staff very substantial projects can be undertaken, but a large number of the projects in any one year engage the consultants for only a few days.

The university, through the company, has become a source of expertise for a number of firms of patent agents and solicitors engaged in cases which require a technical expert. Formal technical evaluations have been undertaken as well as subjective studies exemplified by a project in the course of which we were asked to consider whether a particular patented commercial product could have been made with materials which were available 30 or 40 years ago in order to assist a firm of patent agents in the defense of a case.

ACCESS TO UNIVERSITY EXPERTISE

In a very large number of cases it is not necessary for an industrialist to obtain the world's expert in a particular field and the assistance of the local university is often more than adequate for the particular problem that has arisen. It would seem, therefore, that for anybody who has a problem for which either technical, economic, legal or managerial advice is required, the first approach should be to the university that is geographically nearest to the inquirer. It is only after the resources of the local university have been exhausted that in most cases is it necessary to go further afield.

The Directory of University/Industry Liaison services published by Brunel University provides the name and telephone number of the director of industrial liaison or similar officer in each university which operates a formal service. These people will be able either to locate within their own university the necessary expertise and often more importantly someone who is willing to undertake the project in the timescale of the inquirer and also the director of industrial liaison will know of the sorts of things being undertaken in other universities and will guide the industrial inquirer to an appropriate source if he hasn't the skills available himself.

Directors of industrial liaison are also well informed on the sources of funding for major projects such as those provided by the Science Research Council, Department of Industry and the National Research Development Corporation, and will be able to assist inquirers with approaches to these organizations if necessary.

Even though the logical thing is to approach one's local university it is apparent from the geographical spread of the business undertaken by virtually every university that the universities operate on both a national and international scale. In Loughborough, for example, 25% or more of the business comes from abroad, frequently indirectly through the U.K. base of an international company, but also to an increasing extent directly from potential clients in overseas countries.

The use of the universities as a source of help is certainly not new, indeed the older universities are able to point to examples which are 300-400 years old of the university offering to help the community. However, it is probably during the last 10-15 years that the significant growth has occurred and it would seem that now the industrial liaison services are well established, that there is likely to be increased growth over the next few years. This, of course, will coincide with the reduction in the number of undergraduate students which is predicted and clearly it is in the interests of the universities to diversify into this area and into the area of post-experience courses, where there also has been considerable growth in the university system over the last decade.