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Technicians For Irish Industry : Technical Education Report Phamplet

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CITY OF DUBLIN VOCATIONAL
EDUCATION COMMITTEE

“TECHNICIANS
FOR
IRISH INDUSTRY”

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CITY OF DUBLIN VOCATIONAL EDUCATION
COMMITTEE

LECTURE

under the auspices of

THE BOARD OF STUDIES

on

“TECHNICIANS FOR IRISH INDUSTRY”

Delivered by

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BOLTON STREET, DUBLIN

in

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This lecture was the second in the series of special lectures organised by the Board of Studies of the City of Dublin Vocational Education Committee during the session 1961/62.

Mr. Hugh Healy, Chairman, Board of Studies, introduced Lieutenant-General M. J. Costello, General Manager, Comhlucht Siuicre Eireann Teo., who took the Chair.

“TECHNICIANS FOR IRISH INDUSTRY”

This paper attempts to explain what the current conception of a technician is and how his activities impinge on other personnel in industry. I have also endeavoured to show that it is possible that this conception may need to be modified to suit Irish conditions. Finally, I indicate some of the considerations relevant to our present national problem of providing an adequate supply of these technicians.

Introduction

In the technical operations of industry it is now generally considered possible to distinguish between four types of skill and consequently between four different types of skilled persons, i.e. :

1. The Technologist.
2. The Technician.
3. The Craftsman.
4. The Operative.

This division of technical personnel establishes a hierarchy of a sort, in that the intellectual content and level of the skills involved generally decrease as we move down the list, while the manual or machine content of the operations involved increase. This does not mean that the higher man on the list is necessarily just an enriched version of the next lower down, though this may well be true in many cases. It is clear, for example, that craftsmen and technologists are both vital to many industries, but we would not expect the technologists to be skilled craftsmen, as we use the words in the present context.

Such vertical ranking as usually exists in industrial organisation arises mainly from the level of responsibility accorded to the various groups, the operative normally having the lowest level of responsibility.

In this paper we are concerned with the second group of the four—technicians. Most people concerned with the problems of technical personnel in industry will be very familiar with the growing clamour for more technicians. Many of the statements made on the subject of “Technical Manpower,” etc., have centred around the need for more technicians and how the demand for technicians might be satisfied. Discussion on these problems has been widespread and extensive in England and has engaged the attention of people at the highest level of industry and government. In this country there has also been considerable discussion among particular groups but no organised attack on the problems to be faced has yet been mounted. It would seem that this should now be done.

We have seen that in the grouping of skills referred to at the outset, the technician occupies the position between the technologist and the craftsman-operative groups. The extremely rapid growth of modern engineering and scientific techniques has resulted in an equally rapidly widening gap

between the technologist and the industrial craftsman and operative. The more sophisticated concepts of modern science and technology and modern technical language itself make even the communication of ideas between the back room and the shop floor more and more difficult. As well as that, the complexity of the techniques which are now in everyday use increases considerably the demand for suitably trained personnel. To satisfy this demand we require what are now known as technicians.

Definitions

The word "technician" is not new, nor are people doing what is nowadays considered to be technician's work new in industry. However, it is only since the last war that these people have been recognised as forming an individual and important group. The Institution of Electrical Engineers recognised technician functions in 1943, and the same institution referred to the different educational requirements of craftsmen, technicians and professional engineers in 1948. Chemical technicians were specifically referred to by the Chemical Education Advisory Board in England in 1944. It is possible that recognition of the separate identity of the technician was due to experience gained in the technical branches of the armed forces during the war. Whatever the origins of the present concept of technicians as a group, their position was firmly established by the British White Paper on Technical Education in 1956.

The use of the word "technician" in the British White Paper was "defined broadly", to use its own phrase, as follows:

"A technician is qualified by specialist technical education to work under the general direction of a technologist. Consequently, he will require a good knowledge of mathematics and science related to his own speciality. Examples of technicians in the factory are assistant designers and the junior ranks of management on the shop floor."

In the body of the White Paper the need for more technicians is referred to in a section headed "Technicians and Craftsmen" (p. 19) and apprenticeship is there stated to be "the traditional method of training technicians and craftsmen." On the face of it, it would appear that the technician at that time was envisaged to be essentially a craftsman, who by acquiring additional mathematical and scientific knowledge, was capable of meeting the requirements.

The abilities demanded of technicians have, however, increased since then. In the 1961 White Paper, "Better opportunities in Technical Education," it is stated that "the term technician is applied to a wide range of responsible jobs involving a higher level of scientific and technical knowledge than is needed by a craftsman but below that needed by a technologist. Examples of work done by technicians include the design of plant and equipment under the direction of a technologist, supervising the erection and construction and maintenance of plant, testing, surveying and inspection." (p. 5). It further states in the same section: "The needs of the technician cannot be satisfactorily met by courses which are primarily designed for craftsmen or technologists. There must be courses specifically

adapted to his requirements and co-ordinated with his industrial training. The level of the courses will vary greatly according to the job. It may sometimes be sufficient to supplement a craft course with an additional course. At the other extreme, the high grade technician may require a qualification approaching degree standard in the subjects covered."

It appears then that the idea of a technician has since 1956 developed from that of an enriched craftsman and moved markedly in the direction of the limited technologist. This view of the technician as a limited technologist is very apparent in the definition of the technician which is probably most commonly used at present, viz., that formulated by the Conference of Representatives of the Engineering Societies of Western Europe and the U.S.A. (EUSEC) for an engineering technician: (See Appendix A for a definition of "Technologist".)

"An engineering technician is one who can apply in a reasonable manner proven techniques which are commonly understood by those who are expert in a branch of engineering, or those techniques specially prescribed by professional engineers.

Under a general professional engineering direction, or following established engineering techniques, he is capable of carrying out duties which may be found among the list of examples set out below.

In carrying out many of those duties, competent supervision of the work of skilled craftsmen will be necessary. The techniques employed demand acquired experience and knowledge of a particular branch of engineering, combined with the ability to work out the details of a task in the light of well-established practice.

An engineering technician requires an education and training sufficient to enable him to understand the reasons for and purposes of the operations for which he is responsible."

The following duties are typical of those carried out by engineering technicians:

"Working on design and development of engineering plant and structures; erecting and commissioning of engineering equipment and structures; engineering drawing; estimating; inspecting and testing engineering construction and equipment; use of surveying instruments; operating, maintaining and repairing engineering machinery, plant and engineering services and locating defects therein; activities connected with research and development; testing of materials and components; sales engineering; servicing equipment and advising customers."

From the foregoing it is evident that the exemplary technician is now thought of as a person aligned more closely with the technologist than with craftsmen and operatives, and his practical knowledge and experience is more likely to be related to industrial processes rather than craft techniques.

The Idea and the Reality

The importance of a person of the sort described by these definitions is very great, particularly when there is a shortage of technologists as there

is in England. The technician then becomes the technologist's substitute when the technologist's full abilities are not required, his agent in supervisory work, and his complementary self when specialised and detailed practical skills are required. To a considerable extent both here and in England, those trained as technologists have been and are being used as technicians. The demands made on very many graduate engineers, physicists and chemists in industry both here and in England are no greater than those envisaged by EUSEC for the technician. Many graduates in chemistry for example do little more than routine batch testing. Graduates in engineering are often employed as sales engineers or as maintenance engineers or performing tasks "in the light of well-established practice." It is true that in many cases their work is not done "under the direction of a technologist" and to that extent they shoulder more responsibility than we might think appropriate to a technician. On the other hand, EUSEC envisage a technician as "one who can apply in a responsible manner proven techniques."

There is perhaps some reason to protest that EUSEC requires too much of the technician, and that a person who could fulfill all the requirements would be at one and the same time a technical expert and a "Jack-of-all trades." Any definition of a technician, however, must, if it is to be adequately inclusive, accent the highest form that its realisation may take. Lower levels with broadly similar characteristics must of necessity occur, though EUSEC does not make much room for them. We must also remember that a technician is a specialist with a high-level competence over a narrow technical front. An electronic "technologist," for example, will require knowledge ranging from advanced physics on the one hand to advanced mathematics on the other, covering in between all the engineering content of his subject as well as a more or less detailed appreciation of related engineering fields. An electronic "technician" on the other hand will normally be a specialist in some particular aspect of the subject without the broad and deep theoretical background of the technologist. A studio technician, for example, in a broadcasting station, would have a high competence in the electronic work involved therein, but would not be expected to display competence when faced with radar equipment, which would be the province of an equally specialised radar technician. The electronic technologist may be more or less competent in both applications of his subject but at a different level.

Authoritative definitions of what a technician is may be very impressive, but the practical problem is one of interpreting the definitions and identifying technicians and technician functions in a vast number of special situations. For the industrialist, it is probably more usual than not to find that workers whom he is convinced are technicians do not in fact satisfy the terms of any of the definitions. The difficulties are not made any easier by the fact that in some industries the word "technician" is already in use but not in the present sense. For example: a "laboratory technician" is very often merely a fetcher and carrier of apparatus in a laboratory and in that case no significant technical demands are made on him. There will also be understandably considerable resistance to the apparent demotion of a whole

host of "engineers," etc., when it is suggested that they are in fact technicians. For example, most "site engineers," "shift chemists" and "shift engineers," so far as their work is concerned, are technicians in the EUSEC sense, though their education may have been directed towards the technologist level. At the other end of the scale the superior craftsman or even operative at foreman level, is also often performing technician functions insofar as he occupies some part of the area between technologists and craftsmen and operatives.

A useful guide in distinguishing the technician from the craftsman or operative is the more or less general criterion that the technician, like the technologist, utilises predominantly intellectual skill, whereas the craftsman and operative utilise essentially manual and machine skills.

In the long run there seems to be no escape from the situation that when you have identified your craftsmen and operatives and also your technologists the remainder in the intermediate level will be regarded as technicians. This takes the form of a definition of what technicians are not, rather than a definition of what they are, and may be too loose, but in practice there is likely to be too much hair-splitting in any other approach. This view of the technician class brings out very clearly the enormous range and level of skills included in it and since we have seen that progress makes it inevitable that the gap between technologists and craftsmen will continue to widen, it is also clear that the demand on the technician class will be a growing one.

The Need for Information on Technician Requirements

In the light of what has been said about the technicians, it should be apparent that agitation for more technicians without further specification is unlikely to be very successful. We recognise immediately that a considerable amount of factual information is required before we can begin even to plan a technician supply. We require to know, for example, what the present state of employment of technicians is; in what industries they are employed, and in what activities in those industries; what the order of magnitude of the deficiency in numbers is, and in what areas; what levels of ability are required, and so on. In the absence of soundly based information on these matters, we cannot know how and in what quantities prospective technicians are to be trained, and the best that we shall be able to do so is to provide a product which may or may not turn out to be suitable. The diversity of technician types and levels is so great that even intelligent guesses are unlikely to be sufficient. It is not unreasonable to take a look at our neighbours' experiences in these matters and I have considered it worthwhile to direct your attention to a particularly interesting report published in the British Ministry of Labour Gazette for December, 1960. This is a report of a survey of the employment of technicians in the chemical and engineering industries in England and is interesting not only for the information it provides, but also as an example of how a survey of this kind might be conducted. (A condensed version of the tabulated information in the report, together with some observations on it, is given in Appendix B.)

The report shows that the commonly quoted ratio of five technicians for every technologist is generally justified, at least for the types of industry considered, though it does not take account of technologically-trained people in technician jobs.

To suppose that these figures are directly significant for industry in Ireland—even similar industries—would not necessarily be justified, however. For one thing, the size of the industrial unit here is in most cases much smaller. For another, there may be some features inherent in our industries which would radically change the ratios. In the motor car industry, for example, one might expect differences between a complete design, research, development and manufacturing industry and one largely devoted to assembly and service only. Industries operating on a small scale here very often cannot afford the luxury of employing people to perform only technician functions. There will probably be many Jacks-of-all-trades, performing functions which cannot readily be fitted into the pattern mentioned at the outset. The thought occurs that the notion of a technician that we have discussed may not be entirely appropriate to many Irish industries—and the technologist-to-operative structure itself may not be fully applicable in some conditions here. If we attempt to conduct a survey of the type mentioned above we may find that we have to formulate our own idea of a technician to suit our own industrial scene. Other interesting points arise—for example: our major industry is agriculture; has technicianship a place in agriculture? Then there is the question of foremanship, which many people consider to be an individual function not necessarily contained within the idea of technicianship. There are probably many industries in which craftsmen, in the usual sense, are practically non-existent, except possibly for maintenance work which may only be occasional. Similarly there may be industries in which the technician has no place.

Nevertheless, the value of the information that could be produced by a survey of this sort here, can scarcely be overestimated. We would be able to see in what areas the deficiencies lie and we could plan accordingly. In my opinion a national survey of this type is an urgent necessity in Ireland. I do not believe that it can be satisfactorily conducted by any industrial agency or educational authority—in the case of the latter, it is not its function, though technical education representation would be able to render valuable assistance and advice. Since economic, industrial, educational and possibly even social factors may be involved on a national scale, it would seem that it should be handled at Government level. The information obtained would be an important national statistic and, in view of the Government's present responsibilities in marshalling our productive forces for the Common Market era, we might expect that they would be most concerned to undertake it.

Supplying the Demand

In the meantime we may profitably discuss some matters relevant to the production of technicians in general.

So far as the education needs of technicians are concerned they are obviously the business of the Technical School system. Technical schools and colleges have, since their earliest days, provided tuition at levels and in subjects appropriate to the technician grade. It is true that organisation of the courses concerned was not as coherent as we would now like it to have been. Large numbers of students attended only those individual classes in which from time to time they were interested. Their objectives were usually limited ones, motivated by the necessity to be able to understand new equipment or processes that had come within their ambit at work, or to enable them to acquire some qualification with which to bargain for a higher wage or promotion or perhaps a job. Some worked more methodically towards the examination requirements of the professional institutions. None, until comparatively recently, set out explicitly to become "technicians." There were two reasons for this: firstly, the idea of a technician was not consciously recognised, and, secondly, specifically "technician" qualifications were not there to be aimed at. At various times enlightened industrial or professional groups sponsored special courses of technician type and often the "intensive" sort, both within their own organisation and in the technical schools or colleges. Some undertakings have, because of their special needs, found it necessary to ask the technical education Authorities to establish, as a permanent facility, Technician courses for their recruits in fields appropriate to their interests. This the technical schools have always been very willing to do when the requirements were specified and when the numbers of students were shown to be sufficient to make the proposition anyway economic. In recent years, for example, the E.S.B. asked for an electrical technician's course and was accommodated; since the start of the present year a course for aircraft technicians has been established at the request of Aer Lingus. The courses which have been provided from time to time for special purposes have often been availed of with varying degrees of satisfaction, by people other than those for whom they were originally designed.

If the technical education system is to undertake the school end of technician education in a more general way, its first requirement is a specification of what is needed. This must be worked out on the basis of some survey of industrial needs, such as I have suggested, together with an appreciation of what future developments are likely to be. Then suitable courses can be designed and initiated.

The Partnership : Industry

The formulation of suitable courses must be the responsibility of education authorities and industry jointly, each paying due respect to the interests and experience of the other. Many people in industry do not sufficiently appreciate the distinction between mere training and education. It is possible to train a person to do a particular job according to a set of rules or as an unthinking routine without any great background of understanding. This may sometimes satisfy the employer, but it can scarcely be satisfactory for the employee. He must be able to experience personal satisfaction in his work and for this his qualities of intellect and personality

should be exercised and developed to the maximum extent. To ensure this mere training is not enough—truly educational influences must also be present. It is necessary also to remember that unless the education and training a technician receives is broader than the requirements of his prospective job he will lack the versatility which could be one of his greatest assets, and his abilities may be marketable only in an uncomfortably narrow field.

Industry must also recognise that a school or college cannot provide the practical training and experience which is an essential feature of many kinds of technicianship. Appreciation of this fact has been, and is still, deplorably lacking. Employers are only too ready to employ well-trained young people but as a general rule, display a marked reluctance to participate in the training. Attitudes in this respect will have to change, and it must eventually be accepted that industry is not only a user of technicians but also an essential partner in their production. The ultimate ideal would be that each industry should appreciate that its co-operation in the training of industrial personnel, even beyond its own specific needs, performs a service for industry as a whole, and thus ultimately benefits each individual enterprise.

There are other areas in which understanding between these partners will be necessary. Courses for technicians can be organised in many ways. One might follow a wholetime school course and subsequently obtain the necessary industrial training or the sequence might be reversed. It seems to me that in general neither of these can be entirely satisfactory. The first is liable to give the prospective technician too academic an outlook, and will not permit him to appreciate the practical industrial implications of his studies as he undertakes them. The second also raises objections, e.g., a hiatus occurs in the young person's studies, which makes it unnecessarily difficult for him to take them up again. As well as that there does not seem to be anything to be gained by throwing him into the industrial operations without some tuition to enable him to understand what goes on. Night classes are another possibility, but all experience goes to show that they are not successful unless the student possesses qualities of application, tenacity and physical and mental stamina of an exceptional kind. For adults already well established in their work the night class method may be quite acceptable for refresher courses with limited objectives. But broad primary technician education should not depend on the powers a student can bring to bear on his classwork after sunset.

Generally speaking, the Sandwich Course system is probably the most effective. It allows the student to concentrate on his theoretical studies without interruption during the period he spends in College, and he is not lumbered inconveniently with these studies while he is in the factory. In this respect the part-time day release system, where students attend school courses for one or two days per week, though effective in craft apprenticeship training schemes, does not provide sufficient connected time for the College content of courses for technicians, who require so much more theoretical studies. The great advantage of the part-time day release system is that it makes it possible for the trainee to earn some money

while studying and this requirement must be kept in mind in the otherwise more suitable sandwich schemes. A further advantage of the Sandwich Course is that it makes it possible to assemble for their College studies, trainees from industries widely scattered geographically. This is obviously of considerable importance since not every technical school can be staffed and equipped for technician work.

The sandwich system can only work, of course, if industry is willing to organise its trainee activities in accordance with it.

At this point there arises also the questions of recruitment and basic educational requirements. We may expect that industry will recruit its prospective technicians with a conservative view of what its needs will be. If, therefore, entry to technician courses is open only to those who are recruited by industrial organisations, as would be the case if only works-based sandwich courses exist, then the supply of technicians is never likely to approach the demand at any one time. I feel that more technicians should always be undergoing training than the stated demand indicates. The apparent surplus, unless it reaches unreasonable proportions, will then be absorbed by the unpredicted demand which will usually be present. In Cork, for example, a course for chemical technicians was provided with a view to employment in the Oil Refinery, and more people went through the course than were required by that particular firm. But the surplus was rapidly absorbed by other industries in the area, who may never have realised that they could use these technicians until they offered themselves for employment. Thus College-based courses are also very desirable, and in the case of students following courses in this way, industry must be willing, in its own eventual interest, to provide works training for them, where necessary, even though they have not been recruited by the industry.

All of these things emphasise strongly the close co-operation that must exist between the industrial and educational partners in order to produce success. I believe that in the main those of us engaged in technical education realise the part we must play. I fear, however, that a similar realisation is not anything like as widespread or as deeply felt in industry. To establish it a diplomatic but vigorous campaign of enlightenment will be needed, and the sooner it gets under way, the better.

The Partnership : Education

I do not wish to imply that all the deficiencies exist only in the industrial camp, and that all is well in technical education or in our education system generally. While resisting the temptation to "have a go" at the wider educational issues which perennially invite discussion, the relevance of basic education to the recruitment problem cannot be ignored. Basic vocational and technical education is provided in technical schools by means of the Day Junior Courses and there is a considerable body of teaching opinion at least, that the existing forms and objectives are no longer adequate for modern needs. Criticisms have been voiced that they have become dominated by the examinations, that they do not succeed in being of truly educational value, and that they are not an adequate foundation for further studies. If this is true, then it is vital that they should be put

in order. The quality of the final product in any production system can be directly influenced by the quality of the raw material and this is no less true of the product of technician courses than any other. Thus the education that our recruits obtain before embarking on technician courses is of prime importance, and we must make sure that the work of these technician courses is not impaired by the necessity of spending time in making up for deficiencies in basic education.

There are other shocks for which the educational authorities will have to prepare themselves. They will have to equip adequately a reasonable number of colleges throughout the country for technician training. The cost will not be small—the experience in the Dublin Colleges of Technology indicates that equipment for technician courses will prove to be more expensive than that required for professional courses, and many of my colleagues feel that if we were adequately equipped for technician work we would need very little extra for technological work. The education authorities will also have to be able to attract and retain people with the qualifications and practical experience required for teaching technicians. Sooner or later it must dawn on them that they must compete with their partner industry, in the acquisition of the best people. They will also have to see that the teachers they do acquire will be facilitated in keeping abreast of new techniques by periodic return to industry. They will ask, of course, where the money is to come from, and no doubt they will very properly expect some to come from their industrial partners. But ultimately it must be recognised that education in general, and this type of education above all, is more than the citizens' right—it is also a worthwhile national investment. This is probably more true in this country than others since without an abundance of valuable raw materials, we have nothing to guarantee our prosperity except the skills we can acquire.

Qualifications

Then we must provide the appropriate qualifications targets for the students, the various technician certificates for which the student will work and by which he will subsequently be recognised to be trained as a technician. At present, there are courses for the various Department of Education certificates which are in permanent operation in the Colleges of Technology and some other schools. Though these certificates are called "technological certificates" they could not be said to be qualifying instruments of technology, as it is now conceived in terms of membership level of professional institutions. These certificates are available in Mechanical Engineering, Electrical Engineering and in Mathematics, and at Elementary, Intermediate, Advanced and Higher Technological levels. The standards in the subjects involved at Advanced and Higher Technological level are roughly comparable with the standards of the Ordinary and Higher National Certificates in England. The survey of technician employment in England shows that the Ordinary and Higher National Certificates and Diplomas are the most common qualification among technicians there, though they may not necessarily be the most suitable. It would appear, therefore, that there is already a foundation on which to build at least one

kind of Technician qualification. The suitability of the subjects involved and the curricula used would undoubtedly need reappraisal. There are certain obvious changes that should be considered; for example, it would not appear to be in the interest of the technician grade to permit people to proceed through the various examination levels in one or two subjects only, as is usual at present. Nor does it seem right that certificates should be awarded without considering whether the student has obtained appropriate industrial training.

Qualifications might also be made available in certain sections of the more general fields covered by these certificates. For example, in Draughtsmanship and Design, Materials Testing, or other divisions which could be shown to be useful. There should also be coverage of other fields, e.g., chemical technicians, surveying technicians, technicians for construction work and others. Standardisation in terms of qualifications would be desirable, but where there is such a variety of forms, complete standardisation is likely to be impossible. This and many other problems will be a job for the partnership. Whatever the qualifications it is important that they should be known as *technician* qualifications.

Conclusion

In this paper I have attempted to show some of the factors dominating the technician question. You have seen the definitions and the many-sided reality behind them. I have attempted also to show you the necessity of finding out exactly where we stand and determining where we want to go. I have emphasised the necessity for Industry and Education to undertake the journey as a joint venture. I have also tried to show some of the requirements that must be met by each of the partners. It is true that I have pointed out many difficulties and posed many problems without giving any solutions. However, if my approach is valid you will see that the technical education system itself, not to say one man in it, could not alone provide the solutions. If, however, the active co-operation of which I have spoken is organised in a business-like way, then solutions can be found and we will have technicians for Irish Industry.

APPENDIX A

The following is the EUSEC definition of a Professional Engineer and may be used to define generally the meaning of the "Technologist":

"A professional engineer is competent by virtue of his fundamental education and training to apply the scientific method and outlook to the analysis and solution of engineering problems. He is able to assume personal responsibility for the development and application of engineering science and knowledge, notably in research, designing construction, manufacturing, superintending, managing and in the education of the engineer. His work is predominantly intellectual and varied, and not of a routine mental or physical character. It requires the exercise of original thought and judgment, and the ability to supervise the technical and administrative work of others.

His education will have been such as to make him capable of closely and continuously following progress in his branch of engineering science by consulting newly published work on a world-wide basis, assimilating such information and applying it independently. He is thus placed in a position to make contributions to the development of engineering science or its application.

His education and training will have been such that he will have acquired a broad and general appreciation of the engineering sciences as well as a thorough insight into the special features of his own branch. In due time he will be able to give authoritative technical advice and to assume responsibility for the direction of important tasks in his branch."

APPENDIX B

The survey was conducted on a sampling basis among the industries concerned and some 400 private firms, selected essentially at random, were asked to take part. All of these industries employed over 100 workers and in fact three-quarters employed over 1,000. Adequate replies were received from 77% of these firms. The sample, therefore, covered some 22% of the total number of people employed in all industries of the types specified with more than 100 employees. The industries are grouped in accordance with the Standard Industrial Classification with the exception of the Engineering Goods (Order VI) industry which was divided into two; Electrical and Electronic goods and Engineering goods other than Electrical. Before considering the implications of the information gathered in the survey certain factors should be borne in mind. An explanatory memorandum was issued with the enquiry forms and this opened with the statement: "Because there is no accepted definition of the Technician, one of the main problems in preparing the survey has been to identify the categories of work people who should be included." It then went on to quote the EUSEC definition as "a good definition of Engineering technician," and suggested that it could be extrapolated to other fields. It is stated that the qualifications of technicians included Ordinary and Higher

National Certificates and Diplomas, City and Guilds Certificates and General Certificates of Education at Advanced level, though it was recognised many employed as technicians would have no qualifications, in this sense. Persons training as technicians were to be included as technicians. A point of particular importance was that "in the technological fringe area, persons who hold university degrees, or who had the educational requirements of the major engineering or scientific institutions, were to be excluded."

Thus the problem of identifying the technicians was left to the industries themselves and the precise reasons for designating particular people "technicians" is not clear though the results are probably no less significant for that. The exclusion of people trained essentially as technologists (i.e., university graduates, etc.) but used as technicians is more serious however since it is known that many such people exist. The British Iron and Steel Federation, for instance, in their report on "Recruitment and Training of Technicians" (April, 1961, p. 9) state that one of the four broad groups of jobs for which technicians are needed is that group of jobs at this level "at present filled by qualified Technologists."

Table I gives an overall picture of the staffing situation in the industries considered. Immediately the table shows the special nature of the Chemical and Allied industries (including mineral oil refining). They have the highest percentage of qualified scientists and technologists of all the industries considered. Their percentage of technicians is slightly lower than the average. Also evident from this table is the large spread in the rate of employment of qualified scientists and technologists in the different industries, ranging from 5% in the Chemical industries to 0.8% in the Shipbuilding industries. If the Chemical industries are omitted from the table the highest percentage of scientists and technologists occurs in the Engineering Goods industries, and more particularly in the Electrical Engineering and Electronics industries. In general, it is seen that the more scientists and technologists an industry employs the more technicians that industry employs. This justifies the attention commonly paid to the ratio of technicians to scientists and technologists.

Table II shows how this ratio varies in the different industries. Again the special nature of the Chemical industries is evident from the table. We see that the average ratio for all of the industries works out at 4.2 technicians for each scientist or technologist. If the Chemical industries were omitted the ratio works out at 5.2. Thus the commonly accepted ratio of 5 technicians to each technologist is justified for these types of industry. It will also be seen that the spread in this ratio is not excessive. If the future requirements of both technicians and technologists are added to the existing strength the ratio is not significantly changed. In passing, we might also note that on the basis of percentage of existing strength, scientists and technologists are in greater demand than technicians.

In Table III we are given a picture of the way technicians are utilised in the various industries. It is evident that the largest body of technicians are employed as design assistants and draughtsmen. This is true for all the industries, excepting the Metal Manufacture industry and again the

Chemical industries. The next largest areas of technician utilisation are in Testing, Inspection and Analysis, Plant Engineering, and in Planning and Estimating. The overall figure of 11.2% for Laboratory technicians is heavily weighted by the higher rate in the Chemical industries.

In Table IV we see that in the area where technicians are most used—i.e., as Design Assistants and Draughtsmen—the demand for technicians is also greatest. The Report of the Survey says that this area “accounted for 40.7% of all vacancies for technicians.” The greatest demand in this area occurs in the Shipbuilding industries. The next highest percentages of vacancies occurs in Testing, Inspection and Analysis, and again the vacancies for Laboratory technicians are strongly dominated by the situation in the Chemical industries.

Tables V and VI are of considerable interest in connection with technician qualifications. From Table V we find that the Ordinary and Higher National Certificates and Diplomas are the qualifications held by more than a quarter of all technicians. The figure of 3.6% for the City and Guilds of London qualifications will appear unexpectedly low to many people. It will also come as a surprise to many that the General Certificate of Education at Advanced Level is a technician qualification held by almost as many technicians as hold the City and Guilds of London qualifications, although it must be realised that this figure is again dominated by the Chemical industries. Of considerable interest is the fact that almost 60% of all technicians hold no specific technician qualification at all. This leads one to conclude that perhaps the most important feature in producing a technician will be the experience that he acquires in the appropriate field in his industry and not necessarily the examinations that he succeeds in passing. It certainly emphasises the importance of the training technicians receive in industry itself.

From Table VI we may conclude that Ordinary and Higher National Diplomas and Certificates are apparently particularly suitable for Design assistants and Draughtsmen in all industries, followed by City and Guilds qualifications. For laboratory technicians the General Certificate of Education at Advanced Level in suitable subjects is apparently the most popular qualification, though possibly only in the Chemical industries. For Plant Engineering, Plant Operation and Maintenance work the largest single group have no specific qualification.

TABLE I—GENERAL ANALYSIS OF STAFF

S.I.C. Order No.	INDUSTRY GROUP	Total No. Employed	As a percentage of Total Employed			
			Qualified Scientists and Technologists	Technicians	Manag. Admin. and Clerical	Others
IV	Chemical and Allied Industries (including Mineral Oil Refining)	91,781	5.0	7.9	16.6	70.5
V	Metal Manufacture	78,102	0.9	4.4	16.4	78.3
VI	Engineering Goods (other than Electrical)	128,116	1.6	8.9	21.1	68.4
(part)						
VIII	Shipbuilding and Repairing, and Marine Engineering	52,264	0.8	5.5	9.4	84.3
VIII	Motor Vehicles, Aircraft and Railway Equipment	177,914	1.3	10.0	16.9	71.8
IX	Other Metal Goods	51,876	0.8	4.1	17.5	77.6
VI	Electrical Engineering and Electronics	197,966	2.9	11.6	20.4	65.1
(part)						
	Total	778,019	2.1	8.7 av.	17.9 av.	71.3 av.

TABLE II—NUMBERS EMPLOYED AND FUTURE REQUIREMENTS

INDUSTRY GROUP	No. of Technicians employed for each qualified Scientist or Engineer	Current vacancies as a percentage of existing strength		Forecast requirements as a percentage of existing strength	
		Technicians (as at 1.1.60)	Scientists and Engineers (as at 1.1.59)	Technicians 1960-1 (2 Yrs.)	Scientists and Engineers 1959-61 (3 Yrs.)
Chemical and Allied Industries	1.6	5.4	5.3	10.9	16.9
Metal Manufacture	5.0	5.1	7.3	19.3	24.0
Engineering Goods (other than Electrical)	5.5	5.9	8.6	12.2	29.6
Shipbuilding and Repairing and Marine Engineering	6.7	4.2	5.1	5.4	11.0
Motor Vehicles and Railway Equipment	7.6	7.0	14.3	13.7	31.6
Other Metal Goods	5.4	4.8	7.6	10.5	34.5
Electrical Engineering and Electronics	4.0	10.9	12.6	24.0	36.0
All Groups	4.2	7.7	9.6	16.4	27.5

TABLE III—TECHNICIANS ANALYSED BY TYPE OF WORK

OCCUPATION	Chemical and Allied Industries (including Mineral Oil Refining)	Metal Manufacture	Engineering Goods (other than Electrical)	Shipbuilding and Repairing Marine Engineering	Motor Vehicle, Aircraft and Rail Equipment	Other Metal Goods	Electrical Engineering and Electronics	Total
Research and Dev. :								
(i) Laboratory Technicians	29.1	10.1	5.1	3.0	7.7	5.4	12.9	11.2
(ii) Others	3.5	2.7	3.9	0.8	4.1	4.3	1.0	2.5
Design and Drawing Offices :								
(i) Design Assistants and Draughtsmen	14.4	18.9	37.3	55.0	27.2	21.1	30.2	29.1
(ii) Others	1.0	0.8	4.6	5.3	7.7	1.8	1.3	3.6
Production :								
(i) Planning and Estimating	1.3	5.2	8.7	16.1	10.1	8.4	9.9	8.8
(ii) Organising Methods and Work Study	3.2	5.5	6.2	4.3	5.1	7.6	3.9	4.7
(iii) Plant Engineering	17.5	28.6	5.7	3.7	15.9	19.8	3.3	10.4
Site Installation and Operation, etc.	1.5	2.1	5.6	1.6	1.7	4.5	8.4	4.7
Testing, Inspection and Analysis	24.5	22.4	10.2	4.3	10.6	14.0	16.4	14.4
Sales, Contracts and Administration	2.8	2.7	7.3	1.9	6.2	6.8	10.4	7.1
Other Functions	1.2	1.0	5.4	4.0	3.7	6.3	2.3	3.2
Total	100	100	100	100	100	100	100	100

TABLE IV—CURRENT VACANCIES ANALYSED BY TYPE OF WORK

OCCUPATION	Chemical and Allied Industries (including Mineral Oil Refining)	Metal Manufacture	Engineering Goods (other than Electrical)	Shipbuilding and Repairing Marine Engineering	Motor Vehicle, Aircraft and Rail Equipment	Other Metal Goods	Electrical Engineering and Electronics	Total
Research and Dev. :								
(i) Laboratory Technicians	44.6	21.5	7.1	10.0	7.4	15.8	11.4	12.8
(ii) Others	2.8	3.4	5.7	1.6	6.5	10.9	1.0	3.3
Design and Drawing Offices :								
(i) Design Assistants and Draughtsmen	15.6	28.2	47.8	61.7	31.5	22.8	41.0	37.4
(ii) Others	1.8	—	2.5	5.8	10.3	3.0	0.5	3.3
Production :								
(i) Planning and Estimating	1.3	5.7	7.3	8.3	8.4	12.9	2.0	4.6
(ii) Organising Methods and Work Study	3.0	4.5	4.5	—	3.7	11.9	11.3	7.5
(iii) Plant Engineering	16.3	10.7	4.0	—	16.2	4.0	1.6	6.8
Site Installation and Operation, etc.	0.3	1.1	7.3	4.2	2.1	—	7.9	5.4
Testing, Inspection and Analysis	11.5	23.2	7.1	—	6.0	6.8	14.9	11.3
Sales, Contracts and Administration	2.5	1.7	3.3	1.7	2.6	10.9	5.6	4.3
Other Functions	0.3	—	3.4	6.7	5.3	1.0	2.8	3.3
Total	100	100	100	100	100	100	100	100

TABLE V—TECHNICIANS ANALYSED BY QUALIFICATION

INDUSTRY GROUP	H.N.D., H.N.C. or membership of a Professional Institution	O.N.D. or O.N.C.	City and Guilds of London Institute	G.C.E. Advanced Level	1 .2 Other Quali- fications	No Quali- fications
Chemical and Allied Industries (including Mineral Oil Refining)	17.9	12.4	2.5	12.0	18.0	37.2
Metal Manufacture	14.5	13.6	5.4	3.0	10.2	53.3
Engineering Goods (other than Electrical)	17.7	16.0	3.6	1.6	10.3	50.8
Shipbuilding and Repairing, and Marine Engineering	18.2	21.3	2.5	1.4	14.3	42.3
Motor Vehicles, Aircraft and Railway Equipment	10.0	9.8	3.3	2.6	3.5	70.8
Other Metal Goods	12.1	12.5	4.5	4.1	8.3	58.5
Electrical Engineering and Electronics	13.4	13.1	4.1	1.2	3.7	64.5
Total	13.9	13.0	3.6	3.0	7.2	59.3

TABLE VI—DISTRIBUTION OF TECHNICIANS ANALYSED BY QUALIFICATION AND TYPE OF WORK

OCCUPATION	Qualifications Held						Total	
	H.N.D., H.N.C. or membership of a Professional Institution	O.N.D. or O.N.C.	City and Guilds of London Institute Inter Final		G.C.E. Advanced Level	Other Quali- fications		No Quali- fications
Research and Dev. :								
(i) Laboratory Technicians	15.9	12.4	13.9	11.9	36.3	16.2	7.8	11.2
(ii) Others	3.8	1.8	2.8	2.7	4.9	4.6	2.4	2.8
Design and Drawing Offices :								
(i) Design Assistants and Draughtsmen	43.2	51.2	30.8	28.1	15.2	23.8	22.3	29.1
(ii) Others	3.4	3.2	3.1	2.3	4.1	3.6	3.8	3.6
Production :								
(i) Planning and Estimating	5.5	6.6	9.7	11.0	4.2	6.3	10.5	8.8
(ii) Organising Methods and Work Study	5.0	4.1	8.6	7.7	3.8	5.7	4.5	4.7
(iii) Plant Engineering Operation and Maintenance	4.9	4.0	9.0	9.6	5.4	9.4	13.5	10.4
Site Installation and Operation, etc.	3.0	2.5	4.2	4.7	1.3	3.8	5.9	4.7
Testing, Inspection and Analysis	5.5	7.5	10.6	13.4	16.0	17.6	17.7	14.4
Sales, Contracts and Administra- tion	8.4	5.7	4.5	4.0	7.5	5.8	7.4	7.1
Other Functions	1.4	1.0	2.8	4.6	1.3	3.2	4.2	3.2
Total	100	100	100	100	100	100	100	100

MR. M. F. McCOURT, General Manager, General Electric Company of Ireland Ltd., proposing a vote of thanks to the Lecturer, said :

Mr. Chairman, Reverend Fathers, Ladies and Gentlemen: I would like to compliment Mr. Latchford on his very excellent address. It was very enlightening to me, and reflected an intensive research into the subject matter, and a deep and realistic knowledge of the problems involved, and I feel there is a dire necessity for us to get together on the part of industry and education and to ensure that we can provide the technicians for Irish Industry. I propose confining my remarks to our own industry. I cannot speak with authority except from our own viewpoint. Our industry is light electrical engineering, and I can only give you a picture of the problems I have encountered over the years, and of the necessity which we have felt, and we know how necessary it is to have the technicians in our industries.

Our market in Ireland is a small consumer market—there is no need for me to tell you that. It brings about diversification of product in order to bring home a pay load. The diversification of operation brings a lot of problems in its stride. In our small industry there was no tool-room facilities in Ireland. When we started we had to build up our own small tool-rooms, press shops, fabrication shop, plating shop, paint shop, fitters' enamelling shop; all the processes of painting, light assembly, and coupled with that we have got element manufacture and some other process. We have lately taken up radio and television manufacture; I should call it more aptly, assembly.

This field will let you know that the "Jack-of-all-Trades" cannot master it. There is only one answer to the Jack-of-all-Trades, and that is he goes out of business very quickly. We must have the skilled operator, we must have the craftsman, the technician and the technologist, in our industries, or in a comparable industry.

The technician, to my mind, provides a service: he doesn't provide supervision on the shop floor. Supervision, I think, is the craftsman's prerogative, and the skilled operator's prerogative. I would hate to see a technician looking after a polishing shop or perhaps looking after some other skilled operation. Our technicians' requirements in our factory embrace quality control, production control, industrial design from a parents' viewpoint; design and development, tool-room and shop management, work study, radio and television technicians. Now on the radio and television side there is a greater volume of technicians per operator than there is in the remainder of our industry, because you are dealing with a different type of industry altogether where the electronics and other aspects enter into it.

When we endeavoured to build up a team of technicians it just wasn't possible. We are located forty miles from Dublin. When we started first we sent up some of our boys to Kevin Street Technical School. They attended full-time day and two or three nights during the week. Well, as Mr. Latchford so rightly said, it was a feat of human endurance for boys to travel up to Dublin, travel back late, or stay a night, and then

come back the next morning for work. We found that it wasn't possible to fulfil the training of a technician under those circumstances, and we sent our boys, by agreement with our parent company, over to England, but we gave them first of all two years' training in the factory. I think possibly two years was too much. When we sent them to England, they attended the technical school in England for either one or two years and in the night time in addition and they got their Ordinary National Certificate and Higher National Certificate, and we have found it to be extremely beneficial to us. Now the selection and training of technicians; to my mind, here I give my own personal viewpoint, I just give it from inside industry—I would like to see the boy of eighteen, seventeen and a half to eighteen, with his National Certificate get his Leaving Certificate, preferably with honours in Mathematics. I think in our industry it is a fundamental requirement. I think he should spend one year on the factory floor to see, going through different sections of the factory, first of all if he is suitable material, from our viewpoint, and from his viewpoint to see if he has chosen the correct career, because there is nothing so bad as to find that we have got a square peg in a round hole from both viewpoints.

After his year in the industry I would like to see him do three days in industry and two days at a technical college. I think that a Sandwich Course is more suited to the technologist than it is to the technician; again this is my personal viewpoint. I think it is essential that the technician must earn enough money to keep pace with his grown colleagues in life, the boys and girls with whom they were at school. He may be a technician during the week but he has got to be able to do the twist at the week-end if he is going to enjoy life. If I might give my opinion on what a technician might earn, I would say that he should start at eighteen years—seventeen and a half to eighteen years of age—when he has got his Leaving Certificate, approximately £6 10s. 0d. per week, going up to, say, ten guineas in his fourth or fifth year. I think it is essential that a boy has money to spend and in addition to that his expenses to be covered for attending his technical school, and I couple with that some form of merit rate that would tie in attendance at work and would tie in performance at a technical college.

Now, works experience. Most of our industries here are small. We employ approximately six hundred at Dunleer. Nevertheless, we cannot give an apprentice technician all we want to give him. We can give him the general routine work of the factory floor, but we cannot give him design and drawing office experience in the manner in which I would like, and I know it is necessary to have it. We cannot give him development, and laboratory work—I don't mean laboratory work from the research point of view, but more from the testing point of view. We cannot give him these things in the way we would like, and I feel we must fall upon our associate companies if we have them—if we haven't got associate companies we have supplier companies—people from whom we buy our raw materials—and I have found that these people are only too pleased to co-operate in giving people training. We have used them to satisfaction. A difficulty which I haven't mentioned previously is the attendance at

technical colleges from rural areas. It is easier for boys in the city—in Dublin, Limerick, or Cork. The technical facilities are there for a boy to avail of them, but in the country it is very difficult, and hence I would say that if a boy does three days in industry, two days at technical college, he can come up to Dublin, Cork or Limerick or wherever the city is, and spend his two days there, and come back into work fresh.

I think it is true to say that every technician is ambitious. In the Army—with due deference to Lieutenant John Costello in the British Army—they say that every recruit has a Field Marshal's baton in his knapsack. I think every technician should try to attain the top position in management, and a lot of them do. Therefore, I think it is important, that coupled with technical training, there should be training provided for human relationships within industry. I find that shop-floor supervisors can get us into more trouble by not treating a problem on the shop floor in the right way. I think it is advisable that this aspect should be considered.

Continuity of Management Personnel is important as well. There is no use training a technician if you cannot retain his services. There is nothing so frustrating as a technologist performing a technician's functions. Therefore, the scope of the technician should be defined to him, the scope of salaries should be defined to him. There is no point in training a technician unless you can attract him to remain in your industry. I would never like to see us losing a technician unless he was going to start up his own business, and if he did that I think we would all wish him very well. It is important that the technician should feel his responsibility, feel his worth in the industry. He should have job satisfaction, and, as I said earlier, a properly defined monetary reward, and know the promotional aspect attached to his particular job. He should feel confident that he has a career in the industry.

I think that with the volume of our exports increasing or our industrial exports increasing year by year that it is important that our shop-floor management and our technicians should know the quality of product it has got to compete against. We have tended to be, I am not speaking of our own industry, but industry in general, manufacturing for the home market. Well that day is finished, whether we join the E.E.C. or whether we don't join it is something that I cannot say. Whether we do or whether we don't join it, we have got to export more, and I think that we have got to train our technicians and shop-floor people as well as management to interpret design, quality and finish in the particular field of industry, and there is no better way I know of achieving this than entering the international trade fairs. I feel it is essential that younger management and technicians should be sent abroad by their companies to attend the European Trade Fairs and Trade Fairs in the United Kingdom. I agree wholeheartedly with Mr. Latchford's views, when he said that there should be a joint effort towards the financing of Educational and Technical Training, and our industry would be only too happy to support completely any project aimed at supporting Technical Education, and needless to say would be very glad to take advantage of it.

I have pleasure, Mr. Chairman, gentlemen, in being associated with Mr. Latchford's remarks. Thank you very much.

MR. D. P. McGEOWN, Assistant Secretary, Department of Education, seconding the vote of thanks to the Lecturer, said :

Mr. Chairman, Reverend Fathers, Ladies and Gentlemen : I wish, first of all, to congratulate Mr. Latchford on the excellent address he has given us here this evening. He has, as you have all realised by now, dealt with a very, very difficult and complex field of training and education. He has shown how difficult it is to interpret even the modern definitions of the technician and how difficult it is to actually identify his particular functions. The suggestion that the notion of a technician which emerges from these definitions which he quoted may not be entirely appropriate to many of our industries. He has also suggested that the four-runged structure which he gave us from the craftsman up to the technologist may not be applicable in all cases. He has also made a very important thing abundantly clear and that is, that there is need for investigation in this field, and has forestalled me to a certain extent in saying that already steps have been taken to do something about it. The Department of Industry and Commerce, the Department of Education, have been concerned at this problem for some time, and as a result of discussions some time ago at the suggestion of the Department of Industry and Commerce, a Committee was set up in the Department of Education. This Committee is widely representative of all the interests concerned, including workers' and employers' organisations. It has started its investigations some time ago—it hasn't got very far yet, but its function will be to examine the whole question of the availability of, the need for, and the education and training of technicians; a difficult job, but there are many problems connected with this. Mr. Latchford has pointed out a lot of difficulties and problems, and as he said himself he hasn't offered any solutions. Well it would be very difficult to get a solution to any problem until the data connected with the problem is fully available, and that position has not yet been reached, but when it is I feel that many of the difficulties which Mr. Latchford has mentioned in connection with the education and training of technicians will be smoothed out. There is, as he pointed out, a definite need for co-operation between the educational authorities on the one hand, and the Industrial Interests and Workers' Organisations on the other.

He has mentioned the necessity for co-operation in the field of educational training and also in the matter of financing any schemes which might be brought into operation. It is, I think, clear that that co-operation is absolutely essential. There is, I think, already a good deal of co-operation between industry and the educational authorities. We have so many examples. We have roughly three thousand apprentices in the Vocational Schools doing courses on a day release basis. These, of course, are voluntary, and this co-operation is, I am sure, to be extended very much in the near future. Already the Ceard Comhairle has laid a basis, a very firm basis, for co-operation between the representative educational authorities and the industrial interests. There is one point I would like to refer to, and that is the advantage we have here in having a good supply of the raw material almost ready at the moment to be moulded into technicians, whether the prospective trainee be recruited directly from our Secondary

Schools or whether they be recruited from the young workers who have already done a full craft apprenticeship course. If the modern definition of the technician is to be accepted it is clear that the entrants to technician courses would have to have a very good general education with a bias in the mathematical and scientific direction. He would need to have a very good knowledge of mathematics, and a pretty good knowledge of one or two scientific subjects.

Now there are close on eighty thousand pupils in our Secondary Schools and the half of these are boys, and many boys who take the Leaving Certificate succeed in getting honours in Mathematics and one or two Science subjects, and a good many of them do not go to University. Now these should make very good raw material for technician training. There are in the Vocational Schools some twenty-nine thousand pupils, and about one thousand pupils in what might be described as Technical Schools. From the Vocational Schools, of course, comes the raw material for apprenticeship training, and many of these might move on up to the technician grade, when suitable education and training would be provided for them. There is an increase also in the number of pupils receiving both secondary and vocational education, and when the Education Scholarships (Amended) Act, introduced by the Minister for Education in Dail Eireann last year, becomes fully implemented the money available for scholarships to vocational and secondary schools will be increased threefold, and for University Scholarships the money provided will be doubled. The availability of these scholarships should increase the number of able and determined pupils entering our vocational and secondary schools, and that should add considerably to the pool from which industry can draw its raw material for training of its personnel at higher levels. In connection with the availability of raw material, I should mention that the secondary school numbers taking mathematics at honours level is steadily increasing, and that the teaching of science has been encouraged greatly in recent years. Industry has already co-operated here—the industrial scientific fund which was initiated by Messrs. Arthur Guinness has benefitted the secondary schools very much. Many of them have received equipment grants which have helped them considerably. Now from August last year special grants have been made available for the furnishing and equipping, through the Department of Education, of new laboratories in addition to the existing grants which are available for replacements. These amount to forty-five thousand pounds roughly, or touching fifty thousand pounds per year. These additional grants should have the effect of encouraging School Managers to try and further the teaching of science in their schools.

There are, as Mr. Latchford mentioned, quite a number of technical whole-time technological courses already in existence, and many of these have a large technician content, and I am sure many of them could be made suitable for technicians. These courses are provided mainly in the Colleges of Technology at Kevin Street and Bolton Street, Dublin, St. Mary's College of Domestic Science, Dublin, and more limited facilities of a similar type exist in Rathmines School of Commerce, Dublin, and Crawford Institute, Cork, Municipal Institute, Limerick, and the Marine

Radio School, Limerick. Another thing I might mention is the matter of accommodation for technical teaching generally. The College at Bolton Street has been extended recently at a cost of about £400,000, and that a new College is to be provided for Kevin Street, at an estimated cost of £1,000,000.

Mr. Latchford has referred to the expense involved in providing schemes of training for the education of technicians, and has suggested that there should be co-operation between industry and the educational authorities here. Well, the educational authorities would welcome the co-operation of that kind very, very much. In connection with that the questions of policy and economic growth of investment and education are given very careful consideration in Western Europe and North America at the present time, and in this connection a conference of member countries of O.E.C.D. was held in Washington last October. The outcome of such investigations may be more money may become available for education on the grounds of sound economic investment in the near future.

Mr. Latchford has outlined various methods by means of which this matter of training and education might be approached and he has given us the merits and de-merits of each. The main choice seemed to be the College based course and the industrial based course with some kind of sandwich scheme. He has mentioned a very interesting example of the College based course at Cork where more technicians were trained than was absolutely necessary, and that these were absorbed in other industries in the area. It is also advocated that we should possibly train some more technicians than we really require. Perhaps that would be a very good idea, and it might encourage industries to employ more technicians if they are available.

Another problem to which Mr. Latchford directed your attention is the shortage of adequately qualified teachers for technician courses. Well this is a problem, I think common to all countries in Western Europe, and really I think it is probably less acute here than it is elsewhere. The schools have, of course, to compete with industry inside and outside the country for the available supply of science and technological graduates, with the industrial side, for many reasons, having the advantage. This is not actually altogether a matter of financial inducement. I have never yet met an undergraduate in the Faculties of Science who had made up his mind to enter the teaching profession. For some reason the graduates in Science and Technology seem to keep away very much from the teaching profession. Of course, an improvement may be brought about in future years by the increasing numbers now going to our Universities, and the additional scholarships to Secondary and Vocational Schools may also have some effect. The new Science block is to be provided for University College, Dublin, at the Belfield site. This will accommodate eleven hundred students, taking Science subjects—about half of these, of course, would proceed to Degrees in Science. So that perhaps all in all in the next ten or fifteen years the output of graduates should be considerably increased, with a consequential increase, we hope, in the number of such graduates entering the teaching profession. However, in the meantime industrial

enterprises might be able to help to overcome the shortage of teachers by encouraging their suitably qualified personnel to do some teaching in their spare time, or better still, by releasing them on a part-time basis to the technical schools. In the field of technical education industrial experience is a valuable asset to the teacher.

Before concluding, I should like to say that I believe that the Vocational Education Committees, the Chief Executive Officers, and their Staffs, have served industry well in the past and will continue to do so, and make even greater efforts in the future. I think I can safely say that given the minimum of notice Vocational Education Committees will do all in their power to provide the education courses that an existing or prospective industry may require.

I wish, once again, to congratulate Mr. Latchford on his excellent address and to thank the education board of the Vocational Education Committee for inviting me here.

Thank you.

MR. S. O CEALLAIGH, Principal, College of Commerce, Rathmines, speaking to the paper, said :

Mr. Chairman, Reverend Fathers, Ladies and Gentlemen : We have a well-recognised principle in education that when we give quite a solid dose of solid information to students that we give them ten minutes' relaxation after that before we get back to the really solid work again. Of course, after I have spoken you will be hearing Mr. Cuffe talking about technician training, so I think really that when I was thrown into this position it was because it was realised that you needed some relaxation, so you can look forward to ten minutes of that, or even of mental inertia if you feel like it.

Mr. Latchford has given us valuable information about technicians in the fields of Science and Engineering. He has given us some definitions of the technician. He has defined the technician's rôle in industry, and has indicated in a broad way the type of person who might be recruited to the technician grade, and the forms of education and training which are already available or for which facilities must be provided if the necessary supply of technicians for developing Irish Industry is to be guaranteed. Now may I compliment Mr. Latchford on the clarity of his exposition. He has prepared a document which for a long time to come, I think, will undoubtedly be of great value to the organisers of Irish Industry, to the Trade Unions, and to the Educational Authorities and Teachers whose responsibility it is to provide the pool of fully-trained technicians.

The technician, as indicated by Mr. Latchford, is a functionary working in the intermediate area between the technologist and the operator with some overlapping above and below—unavoidable in some cases—and indeed probably essential. The term technician has always been associated in peoples' minds with production and manufacturing and research processes, because, of course, such processes are accepted as being of a technical

nature. There is, however, in commerce and in trade, in distribution and in businesses specifically engaged in providing essential personal services needed by the community, a variety of intermediate positions between the operators of the day routine work and planners at management level.

For his own type of technological assistant Mr. Latchford is privileged and indeed accommodated by the fact that he has a word reasonably derived and generally accepted to describe this particular functionary, that is the word technician. Unfortunately there is no word specifically derived, no word commonly accepted to describe such a functionary in the fields of Commerce, Distribution and personal service. We have, in fact, a plethora of connotations, the executive, senior, higher, junior; the management trainee, whose functions are never defined; the office manager, purchasing officer, sales executive, transport manager, credit controller, computer programmer, work-study technician, stores controller, departmental manager, shop manager, radiographer, ward sister, physiotherapist, head chef, head waiter, dietician, pharmaceutical chemist, lay-out artist, copy writer, industrial designer, market researcher, economist, insurance broker, dress designer, choreographer, and first violinist. These are occupations between the rank and file of ordinary operatives and the upper echelons of planning, designing, technology and management. You will appreciate that I have not exhausted the list. You will appreciate also that although we, in the fields of Commerce, Distribution and Community Services have no single word to describe this intermediate functionary, nor do we worry over-much about the absence of such a word, he has, nevertheless, been in existence since time immemorial simply and solely because people needed him.

Now that there is some likelihood that Capital Punishment is on the way out, there will no longer be any necessity for the public executioner. The Commercial Technician might, therefore, be appropriately termed the executioner. Mr. Donal O'Dwyer, Principal of the College of Technology at Bolton Street, would probably feel much happier in describing him just as the hangman. The technician has been ever with us, as the man who blended the unfading colours for the Book of Kells, the early astronomer who watched and plotted the movements of the stars in the heavens; the inventors of the wheelbarrow, the spinning wheel, the plough, and the loom; the architect of the sphynx and the pyramids; the pioneer of the boat, the designer of the compass. All these, and many more, developments throughout the ages, were the results of innumerable hit and miss experiments, of the collective knowledge of practical daily experiences, of traditional know-how culminating eventually in some form of inspirational achievement. The modern technologist, as such, did not exist in those days. The distinguishing feature of the technologist is, and his essential value lies in, his ability to think in the abstract; to use his intellectual powers to extend the frontiers of knowledge; to use the power of his mind and of his trained intellect rather than experiences of the past to plan, design and execute for the benefit of man.

The development of these intellectual powers has been so rapid in the past couple of centuries, indeed so frighteningly rapid in the past couple of decades, that a startling gap has been opened between the craftsman

operator and the technological technician. A gap not so noticeable at present at least in Commerce and Community Services, except possibly in politics, where the links between rulers and citizens appear to be coming ever more tenuous. This gap in the field of technical production is one which, quite obviously, must be filled, and filled by men and women specially trained for this purpose. Our purpose here to-night is to try to ensure that there will be no lack of technicians for Irish Industry. We are not playing fair with our Irish people if we adopt the pessimistic defeatist attitude that because technicians are in short supply in other countries we therefore cannot be expected to provide sufficient for our own needs. If it is clear, as it seems to me to be, that we must train technicians to ensure the proper development of Irish Industry—a development which is essential in Ireland to raise the standards of living of our community—then surely it is incumbent on us to have the courage to face up to this challenge immediately and now, not some time in the years to come when we will have lost the initiative, and the opportunity is gone. Nor is this an immediate responsibility for the Government only. It weighs indeed much more heavily on employers and employers' organisations, on professional men and professional organisations, on the trade unions, singly and collectively, the Educational Authorities, secondary, vocational and university. Can we not get together to ensure the need is supplied.

In conclusion, some few words of warning. To me it seems that the modern technician is related, in people's minds, to two words—Science and Engineering—rather than to his real function in life. The great majority of technologists are engaged in applying their technological knowledge for the immediate benefit of human kind rather than in technological research. The main function of the technicians, therefore, is to assist the technologist in this work and to realise the value to the community of the intellectual and practical contribution being made by the technologist.

DR. R. C. CUFFE, Divisional Engineer, Electricity Supply Board, speaking to the paper, said :

Mr. Chairman, Reverend Fathers, Ladies and Gentlemen : I consider it a very great honour to have been asked here this evening by the Board of Studies of the City of Dublin Vocational Education Committee to participate in this meeting, because I think it is one of the most important meetings we have had for a very considerable time in Dublin.

This question of technicians, everyone is talking about it, but very, very few people have any clear ideas as to what a technician is, what his function is, and where he fits in. We have just come to realise, whether we like it or not, the day is past when the ideal way for all youngsters to get into engineering was to serve their time in the Broadstone or some railway works, manufacturers or local garage or that kind of approach. That is just gone. While, from the philosophical point of view, there might appear to be some advantages in having a man or a boy start at the bottom, in a classical mode if you like, to learn everything about everything in the

business, from brewing the tea, turning, fitting, welding, etc., upwards to production techniques, and somewhere along the way managing to fit in some basic Science, and then gradually getting enough basic Science to understand the techniques, and getting enough even to understand the new developments that were coming in the industry. Now, frankly, we would have to live as long as Methuselah if we were to cover that, and I am pretty certain that there would be very few people who would have enough natural aptitudes on all sides to be able to cover that ground.

Now, I am making this point very deliberately because, I think, there must be these sub-divisions which Mr. Latchford stresses at the start of his paper, and I think it is very important to realise it that there are these sub-divisions; they will exist and they will continue. Now, if they do exist, each should be an end in itself, not just a transition stage from one to the other. In that I feel that each category should enable a man working in it to get full satisfaction for his abilities, capabilities and what have you. Each category should have its own normal method of recruitment, education and training. Now, undoubtedly, there should be connecting ladders between one category and the other so that the exceptional man starting in one category and having the capabilities to get to another can get from one to the other, and the sooner he gets up that ladder the better, the happier he will be, and the more satisfied the people in the group working near him will be.

Now that should be for the exceptions—it shouldn't be the general method of recruitment, and in that regard we come now to the technicians' group in particular. I believe that the recruitment of technicians should not be in the main from promotion from the craft classes. I believe that the bulk of the recruitments should be from a recognised channel from, I think, Secondary Schools. I was very pleased to hear Mr. McCourt making the statement that he wanted people who had got Leaving Certificates in industry, because I think that in industry at the moment, much of Irish Industry that is, the general tendency is to recruit operatives and to promote the best of them. The schoolboy coming along with a full secondary education, there is no planned course that he can follow; he doesn't like going down to the lowest level of operative after getting a whole secondary education. There is no definite path for him to follow planned out in front of him, unless he happens to be a relative of the boss where he knows he will get in at the top later on. Now that is, I am afraid, inherent in a lot in Irish Industry, and we need much more appreciation of what a technician is and where he is, and how he can fit in so that we can arrange a proper approach to it. I like the approach suggested by Mr. Latchford, I like the approach suggested by Mr. McCourt. I think they are both very similar showing this type of thing.

Now there is the tendency also to mix the idea of a technician and a super-craftsman. People are inclined to think that men you employ in the tool-room with very high manual skills is a technician. He may be, but not all technicians are craftsmen in any way. The point that Mr. Latchford brought out is very important in that it is a simple definition rather than a long one, that a technician predominantly uses his intellectual skills,

whereas the craftsman and operative uses essentially the manual and machine skills. That doesn't mean that a highly skilled craftsman cannot also have a sufficiently broad understanding to understand the principles of the things under what he is doing and become a technician.

Now, that a man may have satisfaction in his work, he not alone wants pay, but he also wants a recognition of the worth of his work, and in that he must have certain status. If we were all idealised beings, and hadn't got the ordinary human failings of vanity, pride and that kind of thing, perhaps we wouldn't need this, but it is a general thing, I think, in all countries, that you do need recognition of your work, and in Ireland we have had no recognition for the technician. He is not generally known. It is not a thing that people will put their children into to become technicians, because they don't know anything about it. We need more publicity to show what a technician can do, and meetings where the idea of the technician is explained to people. I think it will fill a very great need that there is in this country with its developing industries.

About this technician, some of us on various Committees, Engineers' Association, Institute of Electrical Engineers (Irish Branch), and that kind of thing, have suggested that there should be a National Diploma of some sort. The name of it would give some difficulties, but certainly Mr. O'Kelly widened the technician theme when he classified head waiters as technicians. I think the title for them should be masters of the technique, because frankly in the other field I think it is very difficult to get a name that will suitably convey the idea of what we want for the technician. In certain fields the technician is there already, but he is at a lower level than what is meant by the full technician here. In some of the communications fields this thing has arisen. The technician comes below a person called a technical assistant who is really the technician we have in mind.

Coming to a couple of particular points in the paper, there is one point I would like to cross swords with Mr. Latchford about, and that is he mentioned that the demand for technologists in England was greater than the demand for technicians, that is only percentage-wise, unless I misunderstood the table. I have taken that looking at the table there is a far greater number of technicians and, as a result, if you take the seven per cent of technicians that were required in, say, the motor vehicle and railway industries, that represents some twelve hundred individual cases. The 14 per cent in the technologists is only about three hundred cases, so that while percentage-wise there is a bigger demand for Scientists and Engineers, in actual numbers the number is greater in technicians. I am only stressing that to bring out still further the importance of technicians in the numbers that are required, and where the demand is for them.

Now, on this question of carrying out a survey to assess what the demand is, some people have already tried to do this by issuing questionnaires and that kind of thing to industry, but frankly until they know what technicians are it is no use doing this. It is quite obvious from the results that have been obtained that most industries if they are asked how many technicians they have got they will up-rank everybody, so as to look good. Now I feel what we have got to do is to do a statistical survey the way

it is done in England. I find that looking at some of the statistics in industry this is not as big a job as we would think. To get a representative sample, if we take the firms employing a hundred or more, those firms employ practically half of the total employees in the transport and goods industries. They are responsible for approximately two-thirds of the national output of transportable goods. Now if we take one hundred of the firms employing a hundred or more that would give us a sample which would contain a third of the larger firms, and it would contain 20 per cent of the total employees which should give us a representative picture, probably erring on the favourable side as far as the worth of technicians and the application of technicians are concerned. I think if we took just these hundred firms, and if we could have some trained enumerators, perhaps three or four, who would know and agree between them what was a definition of technician and what wasn't. If those men went round to those firms, provided their co-operation had been got to start off with, it wouldn't take more than three months. We could get a very good idea of what the position is, but unless we get a limited number of trained enumerators to go round and do it, I don't see that there is any other way that we can get this accurate information. I put that up as a possible suggestion or way of getting this information, of the number of technicians that are in the country.

Now, there are certain places that are employing technicians, mention has been made of the E.S.B. There has been this growing need for it, and courses have been put on by the Vocational Education Authorities—a Crash Course first of all, and there are two other courses, one is in its second year, and one is just starting, for these technicians. There are also communications technicians in the E.S.B., and there is a whole scale planned out with monetary rewards for the obtaining of fixed certificates, and a regular progression through which the younger men come in on their side. There are various other places that are doing this also, but I am only just mentioning this as one of the places where technicians are seen to be an essential part of the picture, to help out and to release the technologist and let him do or fulfil himself better in jobs that are not just merely technician level.

There is one thing I would like to suggest that in this idea of getting more publicity for what the technician is so that we can get a better understanding of it in the country, I wonder if it would be possible to get this paper, which I think is an extremely good one, published in some journal like the I.M.I. Journal, or something like that, where manufacturers and industry generally could see and read the very clear form in which it is set out in this paper—what the technician is. I'll just leave that as a suggestion; I don't know if it is possible to have it arranged.

I have very great pleasure in speaking here to-night, and I congratulate Mr. Latchford, and the Vocational Education Authorities, on having a meeting of such interest.

THE CHAIRMAN, LIEUTENANT-GENERAL M. J. COSTELLO, General Manager, Comhlucht Siucré Éireann, Teo., in his address, said :

After the feast of information and suggestions on this very important question it is not for me to take up any more of your time. I consider it a very great honour to be on this platform to-night to listen to such an outstanding paper, and it is only necessary to visit a small number of factories abroad, factories with which people in Ireland will have to compete, to realise how urgent it is that we should do something about this problem. In reply to the over-kind remarks made at the beginning, I must speak with some diffidence on this, and I can only give you perhaps a worm's eye view of some of these problems and make a few suggestions.

It seems to me, first of all, that this problem arises to a great extent from the increasing complexity in manufacturing processes, increasing specialisation. The difficulty, for instance, of using the word technician at all. As indicated by Mr. O Ceallaigh's remarks, there are so many different techniques—there are several different techniques within each industry, and these are multiplying at an alarming rate, and it is in practice the case, that people trained in the traditional way to be fitters and carpenters, and electricians, are no longer as useful in industry as they were. On the one hand, there is an increasing need for broadest possible scientific training which the University can give, and on the other hand there is need for a degree of specialisation which does not exist in existing trades training, and cannot very well exist because these techniques are applicable to particular manufacturing processes and therefore the technician, I suggest, has to be "tailor made" to the actual factory that wants to employ him, and he has to be re-trained as new techniques come to be adopted in that factory, as new processes become known, discovered by their research workers, who are technologists, and as new equipment becomes available.

Now that is being done, it is being done very rapidly. It is the basis of the great expansion of industry in America. This baton in the knapsack that Mr. McCourt spoke about is more frequently, in America, in the knapsack of the technician than of anybody else. It is only necessary to look at some of the published figures, the background of the people who are reaching the top in American industry, to see that they are of this class. That class is diluted, no doubt, by a great many sons and relatives of the boss and the boss's wives, and so on. That is an increasing affliction of American industry from which it is freed at times of crisis, and individual industries free themselves when they meet their individual crisis too.

I should say that the work being done by the Vocational Education Authorities in the City of Dublin is not at all appreciated. I don't know that even the firm in which I am employed, and where we depend absolutely upon various schools and colleges in Dublin, fully realises how good the facilities are here within the great limitations, financial and otherwise, they have. One way of seeing that, and this is the only point in which I differ with Mr. McCourt, we too have sent some individuals abroad and, I think, in point of the quality of the teachers, the techniques of teaching, and the approach of teaching, we haven't come across any places elsewhere that

match up to the Colleges of Technology at Bolton Street and Kevin Street or the School of Commerce at Rathmines. I think that this is the only really comforting aspect of this thing; perhaps it arises from the fact that we seem, as a race, to be addicted to teaching, despite the shortage of teachers at the present time.

Now one approach, this is not by any means to suggest that it is the right approach, but it is only an illustration of one way of meeting this difficulty. We have great and urgent need of food technologists, and we have had great co-operation from the Technical Education Branch of the Department of Education, and the Vocational people, in organising such a course. That course can only be carried out in a place where there is plant costing hundreds of thousands of pounds, and it can only be carried on by people who are competent to teach. We have the plant, but we have not the competence to teach, and the problem is to bring the teachers and the plant together. It is just not financially or physically possible to put into any College of Technology all of the different items of plant and machinery that are necessary to make a competent Technologist as I see him. Now, I may have a quite distorted view with which Dr. Cuffe would not agree, but I mention this as an illustration of the difficulty of the problem.

This course is comprised of people who have the Leaving Certificate with Mathematics, and either Physics or Chemistry. There is no difficulty about getting them, and I have forgotten which speaker said—Mr. McGeown I think it was—that we are in a fortunate position in having these. I agree with that, and take a limited amount of comfort from it. The comfort is limited by this fact, that we have in the case of the tradesman reached an average rate of pay which is substantially higher than that of our competitors, and we want a class above them in point of pay, and we want a class with prospects of advancement. The unfortunate position is, that if a boy wants to become a fitter he will reach his maximum wage, or reach his top level wage, at an age when he has not yet assumed any family responsibilities, and when he has got used to spending this on the girl, going to pictures, and doing the twist and so on as suggested, and he begins to find himself accustomed to a certain standard of living, that is rapidly depressed when he has to begin to rent a house, buy a house, educate children, and so on. This is in sharp contrast to the kind of financial development that would take place with the technician, who would begin at perhaps seven pounds a week, or something like that as suggested—we start them at this seven pounds figure ourselves—but whose pay must, of necessity, get to the thousand pounds level if he is to be financially above the present effective rate of people like electricians, and so on. Now that is too big a difficulty to resolve to-night, but this whole question is very much tied up with the attitude towards craftsmen as such and the relative rates of pay.

The actual training, the way we are doing it anyway, a good deal of it is done in the factories, some of our people go to the technical schools to teach there, and we have made an attempt, with the able assistance of Mr. Morgan Sheehy and Mr. Flanagan, to bring some of the teachers to

some of the places where there is quite unique plant. Whether that can be developed or not I don't know—it is very hard on the teachers.

One of the questions which was raised in this most excellent paper was whether there should be an agricultural technician or not. In fact there—I suppose in one sense every highly skilled farmer is an agricultural technician, but there is specialisation in the agricultural field too, and perhaps the most frightening deficiency is there. It is extremely difficult, in fact impossible, to get in this country at the present time people who are capable of designing, or even modifying, agricultural machines. Those who have the fundamental engineering training haven't got the techniques; those who have the fitters' training haven't got the techniques either, and in practice we are sending to England for these people; there are a great many of them employed in the country. The fact is also we are sending a very large amount of money out of this country every year to bring over technicians of one kind or another to service machines, to instal machines and to do work which our own people would be better able to do if they were trained, because we don't get the best of these people from abroad. We have people of better intellectual capacity and equal organising capacity who would get on better with our own workers.

One very successful apprenticeship scheme apparently was the Air Corps apprenticeship scheme which was one of the major efforts of the early days of the Department of Education, and I'll mention one fact in connection with that bearing on the salary question. We had an advertisement in the English papers to try to attract some people back here from England recently, and on analysing the applications, and the salaries now being received by the applicants, we find that ex-Air Corps apprentices in England are getting salaries in England about three hundred a year higher than University Graduates in Engineering and Science. That is because they are people who are above the skilled crafts rate, and very often our Engineering and Science Graduates get put into back-raters in some of the jobs in England, partly, I think, because they are not able to get into the commercial side which has the biggest rewards in England—these are reserved for friends of the bosses very often, and because they haven't that unique skill or the specialised skill which enables them to get at once to key jobs. If you examine, for example, the people who are employed in Ford's in Dagenham you will find that the Crawford Tech. in Cork is providing the people that really keep the Ford works going, and they are not the people who keep it out on strike either, they are the people who get it going again in spite of the strikes. If they had more authority on the administrative side there would be fewer strikes there.

This survey is very necessary, but I suggest that the only way that the survey can be effectively done is by making a survey of techniques, and that if we speak of technicians we will have to use a second word like Diploma in Food Technology, Diploma in Technology of Agricultural Machinery, and so on and so forth, and there will be hundreds of these, and we shouldn't try to lump them all together, because a very different approach is required to the training in the different cases.

One of the great difficulties here is, perhaps, that arising from what is a good thing in another way, and that is that our industries are very

widely dispersed. If you are in Bradford or Leeds or Dusseldorf or any of the other centres of industry abroad you will find a concentration of industry like the motor industry in Detroit in America. It is very easy for the Vocational Education Authorities there to work in with the factories; to bring their pupils to the factories to do some practice in them; but here we have a large number of small industries widely scattered. I don't know how that difficulty is going to be overcome, because some specialisation of the technological colleges will obviously be required, because of the limited amount of money we have, and that, presumably, means that boys will have to travel from one part of the country to another to get this training and if that is to be effectively done it must be associated with the plant in some factories in that locality, and that leads to the greatest obstacle of all to our progress in this direction, and that is the reluctance of Irish industries to work together in this training. In France, for example, at the moment, where they are working feverishly to build up their economy where they have, in fact, had as great a miracle of recovery as they had in Germany. It was not merely an amalgamation of industries. We read about those in the newspapers, but there is a co-operation between industry in this very problem. Instead of hiring efficiency experts from abroad groups of industries come together with the people from the University and the technological colleges and they set up teams of people who go around from within this group of factories and they find that the amount of knowledge they can pass on from one to another is amazingly great. They are, at least, as efficient as the people who make commercial business of this, and it is not always from the very big industries that the most effective and brilliant ideas come; it is very often from the small ones. The small ones are sustained and the big ones are stimulated by this kind of work, and if there is to be a survey of technological needs, it would, I suggest, have to be on an industry by industry basis, and I sincerely hope, despite what the author of our very excellent paper to-night said, it is true that it is not the business of the educational authorities, but I sincerely hope that it would not be carried out without them, that there would not be at least in any such team strong representation of the people who have really made a study of this, they are the teachers in the technological schools.

The other thing, incidentally, that has arisen from this grouping of factories is a thing corresponding to a labour exchange, only that it doesn't deal in labour, it deals in machines. They list the various machines, techniques and skills that are available and they know from their visits to one another's factories who is best able to do a particular job, and they are able to apply for this exchange when they want to get a job done. They are able to find at the exchange where a particular type of lathe has idle time, and conversely any factory that has a machine running down, instead of laying people off as they do in England, they notify, through the labour exchange, instead of sending unemployed men to the exchange; they send advance notice that there is a machine on short time, or likely to be unemployed, and in that way a very great efficiency of production is achieved. Much of the high costs of Irish industry arise from idle time of machines which must necessarily mean semi-idle time for some of the operatives.

I have kept you very long anyway, although I said I wouldn't, and I am sure I am expressing the sentiments of everybody present in saying that we have heard an extraordinarily fine paper read on a very difficult, nevertheless very important problem, a vital problem, and one which must be tackled and tackled quickly, if we are to hold our own in the equal competition which, as Mr. McCourt said, we must face no matter what happens our application for membership of the E.E.C.

Thank you.

P.S.—Before calling on Mr. Gleeson to conclude the proceedings I should, perhaps, mention one other point that I made a note of in connection with this baton in the knapsack, and that is that in the training of technologists, I do think that the man who gets a Leaving Certificate or the Intermediate Certificate or any other qualification in a technical school who is willing to start in a factory with a sweeping brush in his hand should not be excluded from promotion, and at least one-third of our technologists, and some of the very best of them, come up in that way. The Vocational Schools perform an additional function, that they are able to give them the teaching in mathematics and English, and so on. These men have an experience which is unique. If we get a class of technologists who begin at an intermediate level, we are creating a new strata in the industrial organisation which is bound to lead to friction. The percentage of the fellows coming up from the most menial jobs are a necessary leavening in this very important new class.

MR. MARTIN M. GLEESON, Chief Executive Officer.

Mr. Chairman, Ladies and Gentlemen: My task is to propose a vote of thanks to General Costello, for honouring us by his presence here this evening.

Just last week I was at a meeting of the people connected with the technical institutes in England, and a paper was read there on technical education in Soviet Russia. Naturally a portion of that was devoted to technician training. I will give you just a brief resume of what is being done there for technician training at the present time.

The importance of it in the economy of the country is widely recognised. The following table will show the number of technical institutes—technicoms they call them in Russia—and the student population in the principal fields concerned. You have Industrial and Construction, Transport and Communication, Agriculture, Economics and Law, Medical, Physical, Culture and Sport, Nursery and Kindergarten training, Cinema and Art. The number of technicoms that are dealing with technician training is some 3,000, and the number of students attending these particular courses is 3,000,000. You have to measure that, of course, against the background of the population of the country, which is 216,000,000.

If I may briefly describe one of these particular training schools it will suffice to give you a broad picture of their general structure. Devoted to one very, very narrow field of electro vacuum technology, one of the technicomms in question has a total enrolment of some 2,000 students. Forty per cent of the 2,000 is women. A little more than half of the students were in attendance at full-time day course. Correspondence courses, too, were contemplated; they weren't in action, but they certainly were contemplated for keeping in contact with them during the off-season periods. Even that technology was divided up again into six very narrow specialised fields.

The recruitment to the Technicomm was, they hoped, to be recruited from the Secondary Schools or people that completed a secondary education, but 70 per cent of the enrolments in that Technicomm came from young people in the primary schools that had gone up to the seventh or eighth grades, which are the final grades of the primary schools in Russia. Thirty per cent of the time spent was devoted to general education, 40 per cent to special technology, and a further 30 per cent to laboratory and workshop practice. The fourth year of the extended course was spent in industry, and the final six months—it was a four-and-a-half year course—were devoted to the preparation and the defence of a thesis; a thesis bearing on some practical aspect of the subject studied. Students who had completed a secondary education spent three years there. Naturally much of the general education that was given there they omitted, and the one year in industry they spent in writing the thesis again on some particular aspect of the subject studied. I might mention that many of these theses have contributed very largely to the improvement in industrial techniques and output, and have been made the subject of financial awards.

When they have passed and got their diploma a variety of paths is open to them in industry. The holder of the diploma awarded by the Technicomm may go in at craft level into industry, or he may go in at technician level, but whatever level he goes in at promotion is pretty rapid. Some 5 per cent of them enter the Institute for Advanced Technology, after two or more years of industrial experience. If a student gets an excellent in his diploma he is promoted straightaway without any further training. This just brings out what Dr. Cuffe said that the path is there but the path is only there for a very few.

That is, I thought, something that you might like to hear, and I am sure you are able to put it in the perspective after listening to the feast of information we had on technician education here this evening.

General Costello, I came to propose a vote of thanks to you, but before I sit down may I rectify something that my colleague, in that very excellent way that he introduced you, said. He demoted you, and I as his superior officer give you back your rank and restore you to your glory.

