PROJECT THREE

LEAD PAPER

TECHNICAL EDUCATION IN AN INDUSTRIALIZING SOCIETY

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The previous two projects have dealt with partnership between technical educational institutions and industry, commerce and other bodies. They have been concerned with national framework, division of responsibility, and co-operation and co-ordination in the education and training process for industry, especially at the technician level.

This paper is concerned with Project Three and considers technical education in an industrializing society. It is tempting to commence with a series of definitions; however, suffice to state that technical, which derives from the Greek work "techne" meaning arts, crafts and skills, is intended here to cover a very broad subject spectrum from science and engineering to commerce, design and economics. Secondly, "industrializing society" implies a developing situation from a base which can vary from the primitive to the relatively sophisticated. Thus it is an essentially synamic process and is usually accompanied by inadequate resources.

The paper covers the various significant elements of the topic theme in four groups although in many instances they are interdependent. It also inevitably touches on aspects dealt with in the other two projects. Finally, the subject matter is effectively brought together through a concentration on a systems approach to technical education and the importance of the planning function.

The objective is to promote free-ranging discussion in the hope that it will lead to new approaches, and appropriate action, to what are, by now, rather "old" problems.

INDUSTRY AND THE INDIVIDUAL

The needs of industry and individual choice

The needs of industry and individual choice in technical education usually provide a dichotomy for most countries and must depend upon the provision of the resources that are possible and the particular circumstances of the country concerned. From the industrial viewpoint this emphasizes the need for reliable manpower forecasting. Even though this is notoriously difficult, it is essential, since only by experience can it be improved. A good approach on

provision for technical education is to provide for the estimated manpower requirements as a minimum and to provide as much more as resources will allow. Some over-provision in this way is wise house-keeping since manpower forecasts usually underestimate and distribution across industries can be wrong. Within this more flexible approach individuals have a choice but it is limited by the number of places available in the various subject areas. This emphasizes the need for careful selection which includes suitability for the type of work as well as academic attainment. However it is often argued that social preference for the individual should be completely unrestrained. Many would agree that this is a desirable aim but it must depend upon the resources available to the particular country. Highly developed and economically successful countries can do this as demonstrated in the U.S.A. but in industrializing countries the situation is different. They tend to lie between two extremes - the schools either produce large numbers, creating a high demand for relatively few places in tertiary education, or they produce too few even to satisfy the minimum tertiary requirements for industry and commerce. Industrialization depends upon adequate financial provision, especially capital, and the availability of suitable manpower. Thus the provision of education is inevitably tied to economic progress and the major necessity is to endeavour to balance the two as far as possible. It would seem that developing countries tend to move from one to the other of the two extremes mentioned above since the more general education of the schools usually takes educational precedence. Much can be done however to introduce appropriate curricula and training in the schools on the technical side so that termination from the schools provides suitable qualifications for entering industry and commerce. All of these considerations emphasize the need to choose a flexible and integrated system of education at all levels, from school to university, which optimizes educational effectiveness and cost efficiency. Much can be done here if education is looked at as a whole rather than in isolated sectors of primary, secondary and tertiary.

Status, remuneration and job satisfaction

Having linked educational opportunity to the rate of industrialization this raises the question of status and job satisfaction. One of the major problems in the provision of technical education relates to the distribution of study levels, i.e. craft, technician and technologist or graduate. There is no doubt that the greatest need in industry is for technicians and yet this group enjoys the least status. Craft has been recognized for its innate skills since the early ages and graduates enjoy their university status and professional recognition. The function of technicians, however, is not generally recognized by the public at large (nor by some industrialists) and there has been a general lack of professional and academic recognition from the professional institutes. This has led to a lack of career structure and relatively poor remuneration. The need here is for a nationally recognized qualified service, e.g. a Technician Registration Board. This could be linked to special councils such as those now developing in the U.K. through the Technician Education and Business Education Councils (T.E.C. and B.E.C.). Furthermore, to refer back to the two extremes of individual demand and the availability of places in tertiary education: when demand exceeds availability there is a strong tendency (often backed by social pressure) to admit the most academically able irrespective of terminal study level. This produces individual frustration and dissatisfaction on two counts. First, the more academically able find themselves over-qualified for the job they eventually find themselves in. Secondly, the less academically able are not given an equal opportunity in jobs in which they would be satisfied. Naturally industry does not like this state of affairs either, and it also induces a tendency for educational institutions to up-grade their work prematurely. The painful but equitable solution here is

a quota system of entry in which ability is matched to the level of the terminal qualification. At the other extreme, where availability exceeds demand there is the dangerous tendency to produce "all generals and no non-commissioned officers".

The scale of industry and small industries

Turning now to the influence of the scale and size of industry and commerce. Large industries generally have good training programmes and support educational programmes for full-time, part-time and evening study. They are inclined, however, to under-utilize their educated and trained personnel, and this leads to frustration and dissatisfaction. Much depends on their growth rate, both in terms of size and the degree of developing sophistication. Fortunately large concerns in developing countries tend to grow and hence create more opportunities especially for the younger personnel. The situation is compounded by the fact that sufficient technicians, especially advanced technicians, are either not available or their value and capabilities have not been recognized. At the other end of the scale small firms generally develop through entrepreneurs, many of whom have themselves had little relevant education and training. In such firms the balance between success and failure can be very fine. Thus their tendency is not to appreciate the value of education and training and hence not to support it. It must also be admitted that educators often lack a real appreciation of the small firm and the ethics of making such a business successful. Even if the appreciation is there, or is forced upon them through the need to improve standards or for greater sophistication, their support is often limited by financial considerations. This means that some aid must come from government and other agencies. An encouraging sign in this respect is that some large companies, either through their need for the products of small firms or in the national interest (or both), are prepared to train more than their requirements to provide a source of supply to the small firms.

However, the overall industrial stability of a country depends to a large extent on the distribution of size and scale of companies, and it is here that the medium-sized firms play a significant role. Medium-sized firms are notoriously lacking in developing countries where the pattern tends to be a few large firms (often related to public utilities) and a plethora of small firms. This clearly also influences the education and training situation, and especially the very important training element. In these circumstances it is essential that technical educators be well experienced in their subject professions as well as good academic teachers. An essential aspect of their work must be to get out into industry and encourage participation in training and the provision of time off for academic study. Furthermore a large responsibility for the training function (or a good part of it) must rest with the educational institutions. This can be accomplished by the creation of Industrial Training Centres within the institution. The Hong Kong Polytechnic has such a centre which offers training at all levels in engineering drawing, workshop technology and engineering practice and manufacture. Such centres can also include a limited manufacturing unit and a variety of end-product training appropriate to the differing technologies. They provide a focal point for close co-operation with industry, especially in the development of sandwich courses which otherwise could not materialize due to lack of suitable training facilities in the industries themselves.

The development of the individual

Reverting to the "individual", reference has already been made to educational opportunity but what of the individual's development within the system? There is always a danger in technical education, because of the great emphasis placed on the needs of industry and commerce, that education and training programmes over-emphasize the vocational element - sometimes to the exclusion of all else! This tendency is compounded where the programmes lead to the sitting of external examinations, e.g. for professional institution recognition. Such programmes intrinsically also tend to emphasize the academic rather than the practical aspects. Thus it is essential that the objectives of technical education institutions should specifically include meeting the needs of the community and the individual student as well as those of industry and commerce. Indeed all of these, industry, commerce, community and the individual, are interdependent and must be taken into account in formulating the work of technical education institutions. The aim is not to produce automatons but people who can think for themselves and who are equipped to be good citizens and capable of enjoying the cultural aspects of life. These elements are not inconsistent with vocationally oriented programmes but are often excluded or given scant attention. Specialization, in itself, is certainly necessary - especially in an environment of increasing sophistication. However, it is probably true that most educational institutions tend to over-specialize particularly at the secondary and tertiary levels.

General studies

This leads on to the subject of general studies. Much emphasis is currently being placed on so-called liberal studies which, presumably, are intended to liberalize the student. In many instances this has been effected in an uncoordinated way with the result that its relevance, interest and value to the student, or to industry, commerce and the community, is highly questionable. The main objective of general studies must be to complement and contrast those relevant studies constituting the principle subject areas of the complete programme. In fact "complementary and contrasting studies" is probably the best general term to use. Such studies must achieve a balance to meet the needs of industry, commerce, the community and the individual, hence close consultation with all of these parties is necessary, especially as the studies will vary considerably according to specific main subject areas. To achieve this an appropriate institutional mechanism and organization is required. This matter is sufficiently important to demand a fair share of an institution's resources - it must not be skimped. One approach is the setting up of an interdisciplinary institute or centre to provide this service, using specially recruited permanent staff together with appropriate staff expertise right across the educational institution. Such a centre could also assume the responsibility of adult education (including leisure activity) and the briging together of students and members of the public in common study. This latter is particularly important in the lessening of elitism that often arises from those privileged to undertake tertiary education, however humble their origins. This centre approach could be extended to a region covering several institutions and employing strategically placed sub-centres - thereby effecting a substantial economy and a wide-ranging core of expertise. But the willingness of institutions to collaborate is notoriously lacking and some degree of outside persuasion may be necessary.

Re-education and continuing education

Having advocated the need for more general education - how is it all to be packed into a programme? This raises the question whether it is necessary to pack in as much as tends to be thought necessary. There is much that is never, or seldom, used in later life. Furthermore much of what is used can be out of date by the time it is actually used. This raises the problems of continuing education and re-education. The arguments here have been well documented and generally relate to spreading education and training over a longer period, even a life span, in an environment of rapidly advancing technology, techniques and social development (including increased leisure). The need can be assumed and the major problems relate to the provision of resources and organization. An obvious approach is for shorter initial periods of education and training with additional periods of continuing education or re-education later. This requires very careful planning because of the problem of packing programmes and because key people from industry cannot be released easily - especially for periods greater than a few weeks, or for several days a week for a few months. It therefore makes sense to link the whole educational process with part-time and evening work. In any case these latter are vital in developing countries. They provide opportunity for those not able to gain full-time education places and, even more significantly, for very able students whose family circumstances force them to take employment where time-off for study is not available. This in itself requires a sound organization of part-time and evening work covering a full range of study levels closely linked to the full-time programmes. It is therefore logical and economic to extend this organization to encompass the continuing education and re-education work which, in fact, the Hong Kong Polytechnic will be implementing. If the work is well done, as it must be, and meets the needs of industry, then a greater proportion of the cost must be borne by industry. This would be reflected in two ways, increased fees and an increased industrial staff establishment to facilitate the periods away. However, additional government support would also be required especially in times of economic recession. This is clearly an area for action by Industrial Training Councils and Boards where they exist.

It is important to emphasize here the need for good library facilities, both static and mobile. This not only applies to books and learning resources of all kinds but also to the provision of substantial study places. Adequate housing is a particularly severe problem in countries whose societies are industrializing and home conditions are often not conducive to study. It is also important to ensure that student contact hours are not so great that such facilities are insufficiently effective.

Scholarship policy and other opportunities

In the context of the last few paragraphs it is relevant to raise the question of scholarships and other opportunities. Present scholarship schemes are largely out-dated and need re-thinking. Often the financial reward is insufficient and much depends on the level of educational grant awarded by the government authorities. If the government award is small or by a loan system then more might be done to create greater scholarship opportunity. Incentive is important here, and one possibility is to introduce a scheme of senior students tutoring junior ones on the promise of an eventual scholarship. The experience would be invaluable to the students and the scheme economical to run. Unfortunately scholarships and other opportunities are often ill planned (if planned at all) and, all too often, not relevant to the needs of industry and commerce. They tend to concentrate on the academic rather than the practical and professional aspects. Much can be done within one's home country - indeed

it is essential to understand the home scene. However this must not be exclusive, since it is necessary to know "how the rest of the world does things" and to adapt these, where appropriate, to the specific situation at home. In educational institutions it is particularly important to provide such opportunities for staff of all kinds, to avoid the "ivory tower" syndrome. Adequate allowance for this should be made in institutional budgets (10% - 15% of the total professional staff cost is a general figure to aim at).

Finally reference must be made to the care needed in the selection procedure. Pure academic ability must not be the sole criterion, although it happens all too often. Equal weighting must be given to the "need and desire to know", the relevance of the experience to the individual and the personal qualities of the candidate.

THE SPECIAL NEEDS

Relevance to needs of the economy, environment and safety

I turn now to the more specialized needs in technical education arising from an industrializing society. Firstly it is necessary to consider some aspects of economy related to industrializing societies. It is certainly extremely important but very difficult to strike the correct balance between capital intensive and labour intensive activity. This is greatly influenced by the relation between internal consumption and exports. The general trend is to move from labour to capital intensiveness because of the tendency for cheap labour to become less cheap. Cheap labour, if employed successfully, leads to economic gain which in turn provides greater affuence and a higher standard of living. The resulting less cheap labour demands greater product standards and sophistication if market competitiveness is to be retained or improved. In general this process needs to be accompanied by some outside aid - finance, resources and manpower expertise, i.e. a transfer from those who have to those who have not. There is a limit to this however and the gap between the two is widening. The limitation concerns the nature of human beings and their actions. For example there are those who argue that the resources of the space programme would have been better used for the benefit of the "have nots". This neglects the fact that even if the space programme had not come about the equivalent resources would almost certainly not have been used in this way. This is no particular indictment - it is simple a realistic appraisal of human action as it happens in our world at the present time. Thus the corollary is that aid must be accompanied by a high degree of self-help, i.e. for self-generated technology. This requires an ability to optimize resources and manpower. These are some of the factors often contained in references to "appropriate" or "relevant" technology. They emphasize the economic limits within which industrializing societies have to develop and therefore clearly emphasize the difficulties of finding the resources to educate and train. However, the economic factors of this kind do not complete the needs. The consequences of these factors on standards and the environment, including safety aspects, must be included. These latter are areas where there is the greatest divergence between satisfying the needs and what is actually contained, or not contained, in educational and training programmes. They are much neglected even though many isolated elements concerning them may be taught. Increasing industrial sophistication demands better standards in design, manufacture, handling, materials control, testing, inspection and safety - the latter both to the employee and to the product consumer. Equally industrialization brings in its train a host of environmental problems such as excessive noise, air and water pollution, waste of all kinds (especially water and materials), odious smells and deteriorating urban environments. They present a severe threat to health and "the good life", as Plato saw it.

Interdisciplinary activity

All of these standards, environmental and safety aspects must be considered in the industrial development cycle, by companies large or small. Relevant education and training are essential - both for those directly concerned with the development and those on the receiving end, i.e. the public. The educational need here is to bring the separate elements together into cohesive broad areas of study through interdisciplinary institutes, schools or centres which function in close co-operation with industry, government agencies and public bodies. A possible institutional organization for such interdisciplinary units is shown in Diagram 10. This indicates a normal structure of divisions and departments on which is superimposed a secondary interdisciplinary unit structure. These units are largely autonomous with their own permanent staff. They include associated staff from relevant departments and are linked for their academic validation process through the Academic Board, Divisional Board or a department according to their size and the primary nature of their broad subject areas. They have strong advisory committees with considerable relevant membership from outside the institution. It will be seen that this approach provides a good ambience for providing the right kind of education and training meeting the standards, safety and environmental needs that influence good economic decision. Hopefully it will also encourage social benefit to be weighted realistically with cost.

Self-employment

A further area of growing need relates to the education and training for the self-employed. This largely refers to the distributive trades and concerns, usually very small businesses. Examples are shop-keeping, garages and agencies of various kinds. Deficiencies of education and training in these areas have been brought clearly into focus through the developing trade organizations, distributive boards and training councils. They pose a special set of problems requiring new approaches in management, marketing, sales, etc., combined with more specific subject areas relating to the particular trade. The field is wide open for development and presents considerable potential for the exploitation of "in-plant" courses, either separately or in groups. The practice of staff going out into the working environment to teach and instruct is attractive and usually effective and could be employed much more frequently than it is. It could be encouraged by linking it organizationally with the part-time and evening work institutional structure.

Special training needs of females

Finally there is the essential but difficult need to cater for education and training of the female sex. Much depends here on custom and tradition and the breaking down of social barriers. It also depends on the degree of shortfall of required manpower and, perhaps, on the prevalence of "women's lib". In general, institutions concerned with technical education do all they can to encourage female students, though the same cannot always be said for female staff. But they are usually forced to concentrate on specific subject areas known to be popular, e.g. commerce, accountancy, languages, social work, domestic science, etc. Tradition dies hard, as does prejudice, and the main avenue of advance here seems to lie with the schools and, perhaps, equality in opportunity, salary and conditions through national legislation.

DEVELOPING APPROPRIATE SUBJECT AREAS

Subject areas of growing importance - The Asian and Pacific scene

So far this paper has been more concerned with general principles. This section becomes more specific and is related to such questions as the subject areas of growing importance especially in the Asian and Pacific context. There is of course no single answer to this, and one of the objectives of the workshop is to consider and opine on it. The Asian and Pacific group of countries varies widely in area, population, geography, natural resources and state of development. Many countries are highly agricultural, and in them many small industries have emerged, or are emerging, some of which are growing rapidly. Others, like Hong Kong, have few or no natural resources, possess a very dense population and depend upon successful international business and industrial export for their survival. In these circumstances it is clearly impossible to present one set of appropriate subject areas. However, in order to provide a basis for group discussion, Diagram 13 provides a classification of areas of interest in Hong Kong. They are classified in terms of broad subject divisions and interdisciplinary activity and therefore exemplify the principles put forward in earlier parts of the paper. The asterisks attached to certain subject areas signify joint activity moving across divisional/departmental boundaries, and the number of these clearly demonstrates the need to avoid isolation of subjects within departmental compartments. Clearly, developing areas in the fields of agriculture, fisheries and forestry need to be added for the Asian and Pacific scene. They are, in fact, of significance in Hong Kong and the subject of current discussion.

Levels of study

Perhaps of more significance is the estimate of the distribution of levels of study of these developing subject areas together with those already established. A preliminary estimate for Hong Kong suggests about 15% for technologist/graduate level, 45% at higher technician level and 40% at ordinary technician level. This again emphasizes, but in numerical proportion, the importance of technician manpower in industrializing societies.

Appropriate technology

Reference to Diagram 13 also reveals a number of areas which have been highly developed in the industrially advanced countries, e.g. press tools, food technology, instrumentation and testing. Appropriate technology was mentioned earlier and an important aspect of this is the transfer of technology. A recent definition of this by the Hong Kong Polytechnic is:

> "Technology transfer means the dissemination of technological know-how and information (in terms of product design, production techniques, management systems, etc.) from advanced countries to developing countries, and from established large enterprises to small ones."

Clearly this definition places significant responsibility on the educational process and this in turn requires educational establishments to employ experts in relevant subject areas both from within and outside a country.

The leading and supporting roles of technical education

New subject areas or those involving transfer must obviously be planned on a realistic time-scale of national development. Not all countries, industrialized or otherwise, are good at planning. When educationalists ask industry what

subjects they require, they are, more often than not, told of today's requirements rather than tomorrow's. Yet failure to provide suitably qualified people in new relevant areas of development brings coals of fire on the heads of the educationists - they are not doing their job properly. Closer co-ordination will obviously improve this situation but the most effective measures are to ensure that education staff spend more time in industry and hence get for themselves a feel for future needs, and that the institutional structure and organization of education and training programmes is sufficiently flexible to rapidly accommodate changing needs. It is, therefore, evident that institutions must take the initiative in playing a leading role in technical education and, hence, in industrial advance. At the same time they must ensure that adequate support is given to existing and developing short-term acvitivies.

A SYSTEMS APPROACH TO THE TECHNICAL EDUCATION PROCESS

This paper has now ranged briefly over the items incorporated into Project Three of the workshop, and ended on a note of flexibility. This word flexibility has recurred in many of the points made and should be the key password in education; unfortunately, it is all too often the opposite. In order to demonstrate the potential advantage of flexibility and, at the same time, pull together a few of the elements contained in this paper it is appropriate to refer to a systems approach to the technical education process. Since this is an approach adopted by the Hong Kong Polytechnic in its recent development plan, use will be made of its findings. Thus, to proceed systematically a set of educational objectives is defined as follows:

(a) To provide an integrated and effective education and training at an economic cost to meet the needs of commerce, industry, the community and the individual.

(b) To ensure maximum flexibility in course programmes and ease of transfer between appropriate and different levels of study.

(c) To give emphasis to part-time and evening programmes.

(d) To develop appropriate methods of learning.

(e) To encourage an ability to communicate effectively and to think critically and creatively.

(f) To create attitudes of rational judgement and the ability to make use of and apply knowledge.

(g) To encourage relevant consultancy and applied research.

(h) To co-operate closely with industry, commerce and professional bodies.

These objectives are relatively general but when they are aimed at the developing technology situation they lead to quite different approaches. The primary purpose must be to prepare students to adopt attitudes conducive to an industrializing society.

The next step is to define the system best suited to satisfying the objectives. At the heart of this is the learning process. At the outset it must be recognized that a large proportion of students in further education in developing countries have a high ability potential which has not been realized because financial limitations have prevented the provision of full educational

opportunity. This makes a self-learning approach an attractive proposition and, together with the need for flexibility, transferability and amenability to change, provides the base for a systems approach to learning. This can be achieved by the use of credit units of study which can be combined in different ways to provide complete programmes of study. This needs to be supported by considerable use of educational technology (programmed texts, audio-visual aids, closed circuit television, and, possibly, the computer) so that most of the lecturer's time can be devoted to small groups or even individual tutorials. In this way self-learning is complemented by a strong tutorial mode.

The need for breadth of study can be achieved by creating institutes or centres in relevant comprehensive areas of study which cut across the conventional departmental boundaries as already outlined. Combined with the unitary method this provides a powerful structure to facilitate the development of new areas of study very quickly. Thus specialization can be added to breadth as the technological need arises - and the demand satisfied in the minimum of time.

This system is particularly relevant to the important part-time and evening work previously mentioned and ensures that standards are equal to those of full-time study (which is not always true with more conventional teaching methods). Finally, the approach provides maximum opportunity to inculcate an open-minded attitude to problems leading to innovative and creative solutions.

Having defined the method it is then necessary to proceed to the educational programme structure. A typical arrangement is shown in Diagram 15 incorporating the following features:

(i) Flexible entry points including credit for units of work already completed satisfactorily.

(ii) A system of diplomas/certificates, higher diplomas/certificates and Associateships/Degrees.

(iii) Ease of transfer across programmes according to ability and progress.

(iv) A relatively high degree of self-pacing through the self-learning process.

(v) Provision of industrial/professional training units within and outside of the institution.

(vi) Pre-entry programmes to make up deficiencies prior to entry at a particular level (often utilizing the summer session).

This approach is particularly advantageous if adopted by a number of participating institutions and, in part at least, by the schools. In the case of Hong Kong the Polytechnic and the Technical Institutes are in fact co-operating closely and have almost finalized a common policy. Furthermore it lends itself to complete validation by the Technical and Business Education Councils of the U.K. which in turn should carry with it professional recognition of the appropriate professional institutions. In this way local qualifications can carry international recognition whilst the programmes can be specifically designed to meet the needs, and follow the customs and practice, of a particular country.

Finally, Diagram 15 can be used to exemplify the proposed quota system of entry and exit from programmes according to student ability and the needs of industry and commerce. This is shown in Diagram 16 with hypothetical numbers at the entry and exit points. It clearly indicates the distribution of different levels of study.

THE IMPORTANCE OF PLANNING

Now it will be evident that throughout this paper constant reference has been made to the importance of planning - in education and training, in government and in industry and commerce. Indeed the use of the adjective "industrializing" in the title of Project Three denotes time - dependence which in turn demands a logical planning sequence. This is clearly in itself a subject area of considerable importance in technical education and will therefore command the final words in this paper.

Planning can be defined as the development of a concept concerned with the active implementation of the process of change within a defined framework. It is essentially interdisciplinary, involves optimization, and is very necessary from the small detail to the very large overall problem. Failure to plan adequately can cause the deaths of a 100 people from the dangers of a simple toy as easily as from a complex aircraft.

Basic methodology at all levels of planning is available although developed countries themselves have been much more successful at the detail than at the overall problem. Developing countries need to do both very well. Many techniques are available with high-sounding names such as normative forecasting, delphi techniques, decision tree theory, morphological research, scenarios, to name but a few of about 100 versions. They can lead to very complex planning systems but much is common sense applied in a logical fashion! The essential is to use small, knowledgeable teams which balance numerical with human factors.

Planning methodology can be described under the following sequential headings:

Objectives (requiring to be well defined);

Output (useful application);

Criteria of performance (accuracy of data credibility);

Techniques (integration of these to embrace the complete system);

Perturbation (significance and timeliness);

Success rate (includes feedback for future planning).

These can be applied to simple or very complex problems and when properly applied can do much to eliminate wasteful effort. They must, of course, be linked with good management capable of timely decision to provide the human as opposed to the mechanical evaluation.

Thus it is contended that a high degree of planning "know-how" is essential for developing countries. For a relatively small investment in acquiring and practising planning techniques for all levels of activity, much could be achieved in defining the "appropriateness" of technology for a

particular developing country. Furthermore it will do much to promote self generated technology.

Perhaps every technical education institution should make its next development task the creation of an interdisciplinary centre of planning.