2. The Role of Tertiary Institutions: *Keith Legg*

Introduction

There is a wide range of institutions in Commonwealth countries covering levels that overlap considerably with secondary education at one end to higher degree levels at the other. Some concentrate almost entirely on full-time study. Some work in close co-operation with the community,others (notably universities) tend towards isolationism. Resource provision, educational standards and student opportunity vary enormously. In addition, developing countries have tended to follow the developed ones (notably Britain) to varying degrees of detriment to their national and local needs.

This, together with increasingly severe economic constraints, emphasises the paramount need for "appropriate" planning to achieve the optimum balance between educational and cost effectiveness. This is particularly true for tertiary education as it is the most complex and by far the most expensive. It therefore demands a clear definition of functions, organisation and management. These must relate to the total socio-economic needs of specific communities and hence to a corresponding development of human resources.

The average person has a span of 40-45 years of working life and some 10-15 years of retirement. Looking back over this span we see considerable socio-economic change, largely due to the application of rapidly advancing technology. It is certain that this will continue over the next 40-year span facing the young people currently studying in tertiary education. Unfortunately social advance has not kept pace with technological development and hence future human resources must be developed with more emphasis on the former. In many developing countries current emphasis is placed on agricultural advance in contrast with the sophisticated industrialisation of developed countries. Both depend on advancing technology and it is certain that success in agricultural development will lead to increasing industrialisation.

Ideally everything points to a comprehensive system of continuing education and training, i.e. education during a life-span. However there are many constraints to achieving this particularly those arising from the need to change attitudes from the present traditional entrenched and largely unco-ordinated systems of education.

This paper discusses the development of human resources in the above context in relation to the role of tertiary institutions and their overlap with school and non-formal education. It is presented in a generalised form and is essentially synthesised from many examples in the Commonwealth countries.

The General Commonwealth Scenario

Technology, Industry and Agriculture

In the minds of many, technology has become synonymous with developed, highly industrialised countries and the possession of wealth and hence

a high standard of living. Agriculture on the other hand has become associated with non-industrialised countries and the lack of wealth and hence a low standard of living. However, advancing agriculture itself is substantially dependent upon technological advance. Thus the concept that technology necessarily relates to the rich and agriculture to the poor is false. Many of the technological factors relating to industrial development are identical with those relating to rural development. In fact today almost all things are technologically possible. The fundamental question is whether they are economic and socially desirable. Unfortunately the arts and science of economic assessment and of human behaviour have not advanced at the same pace as technology. This is a major problem for both developed and developing countries. Both must introduce technological change, albeit at different levels, but it is now generally recognised that developing countries must emphasise agricultural - and therefore rural - development in contrast to the emphasis on the greater industrial sophistication of the developed countries.

Unfortunately, the education systems in developing countries, based largely on the British system at a time of industrial revolution, have devalued agricultural education and are a root cause of high illiteracy rates in rural areas and the exodus to urban areas, especially of those lucky enough to gain some education. Thus, if the emphasis is to be placed on the socio-economic modernisation of agriculture, education must go out to the rural areas and link up with extension work and research in the field. It must provide an attractive vocation in agriculture and prepare well-rounded citizens as rural members of an integrated community. Obviously such steps must be accompanied by careful rural planning providing an all-inclusive rural community including nutrition, sanitation, social relations, culture etc. at least equal to the bright lights of the city.

However, industrialisation must not be neglected. Indeed manufacture, commerce and trade will automatically arise from advancing agricultural development. Prior to independence India was almost entirely agricultural, and industry and business contributed only 5 per cent to national income. The figure in 1980 is 33 per cent. Thus agricultural development is an integral part of the normal process of economic advance. Some countries, such as Singapore and Hong Kong, have no option but to industrialise due to lack of land and natural resources. Thus the balance between industry and agriculture must depend upon the realised and realisable resources of a specific country. Its education must be planned as a flexible system in strategic locations in conjunction with other government ministries to meet specific national and regional socio-economic needs.

The Consequences of Advancing Technology

In developing societies it is extremely important, although 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. Cheap labour, if employed successfully, leads to economic gain which in turn provides greater affluence and a higher standard of living. The consequence is greater demands in manufacturing standards, sophistication and agricultural yields and quality if market competitiveness is to be retained or improved. In general this process needs to be accompanied by some outside aid, e.g. finance, resources and manpower expertise. There is a limit to this however, and outside aid must be accompanied by a high degree of

self-help, e.g. for self-generated technology. This requires the ability to optimise available resources and manpower. These factors are the key to the development of "appropriate" or "relevant" technology. In addition there is a need for the transfer of technology. By this is meant the dissemination of existing technological "know-how" and information from developed to developing countries and from established large enterprises to small ones (whether these be industrial, commercial, farm, plantation, etc.)

However, increasing industrial sophistication demands better standards in design, manufacture, handling, materials control, testing, inspection and safety. This in turn demands better management and marketing, more exacting fiscal controls and the development of tertiary services such as banking, insurance, transport etc. Similar factors arise with advancing agriculture through more economic growth and land augmentation. Both industrial and agricultural development present 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 and rural environments.

All of these factors must be reflected in the education and training of human resources. However, many of the topics are often neglected or not very well taught in current educational programmes, and this emphasises the need for closer co-operation and co-ordination between education and the developing community.

Forecasting Human Resource Needs and Meeting Demand

An essential element of the educational needs of the community and of the individual is the ability to make reliable manpower forecasts. These are notoriously difficult to achieve. The basic education demand pressures are economic and social. In a developed economic situation the two can be virtually equal. In a developing situation they can be far apart. However it is essential to meet economic demand in order to provide resources to meet more social demand. Economic demand generally derives from manpower surveys of industrial/business/agricultural need. It can be usefully supported by making reference to comparative statistics in several countries, although these statistics are difficult to obtain. It is essential that they be related to both educational and training requirements and their distribution in terms of levels of study and subject areas. Social demand derives from student and parent aspiration. The limit of social demand will be the relevant age groups in the population. However not everyone has the ability nor the desire to reach the highest levels.

Obviously the extent to which economic and social education demands can be met depends upon the number and size of educational institutions that the economy can afford; thus provision is not necessarily synonymous with fully meeting the economic demand for education. In fact the assessment of availability of places in tertiary education to meet demands is an extremely complex issue.

There are two distinct requirements here. The first is to maintain the correct flow through the educational system to meet the balanced manpower needs of the community at the right time. The second is the provision of places to meet education backlog, up-dating, and re-education of those already employed. The first generally relates to full-time study whilst the second generally relates to part-time study. Furthermore, whilst the number of places available is clearly associated with educational opportunity, the community generally is more interested in graduated

output. The two can differ markedly due to attrition and this is particularly so for part-time study, especially evening only.

In most developing countries there is a wide gap between social and economic education demand. Where this is so, and all has been done that can be done in the provision of places within limited resources, then there is advantage in considering a multi-study-level open or distance learning system, which, if properly developed, could provide a good standard cost-effective education. Where the gap is small, or economic demand is greater than social demand, then further socio-economic advance is largely dependent upon greater productivity which, in general, requires education to go up-market in terms of level of study. However, care must be exercised in the way that productivity is increased. Over-zealous and random use of automation, for example, can produce an unemployable fringe with consequent undesirable social trends even with generous social welfare benefits. Productivity must be tempered with respect for human dignity.

Thus, the assessment of human resources presents an extremely complex problem for all countries and a planned approach is essential. Of great importance in this context is the need to develop a flexible and integrated system of education across all sectors, from school to university, which optimises educational effectiveness and cost efficiency. This demands education being looked at as a continuous process without barriers between the sectors.

Human Resource Requirement Trends

It is essential that the objectives of tertiary education within the environments described in the previous section should meet the needs of the community and of the individual. The aim is to produce people who can think for themselves, are equipped to be good citizens, and are capable of enjoying the cultural aspects of life. These aims are not inconsistent with a vocational approach but some are given insufficient attention. Specialisation in itself is certainly necessary - especially in an environment of increasing sophistication. However many tertiary educational establishments tend to over-specialise and this is also true in the secondary educational sector. In this context the example of management studies is relevant. In developing countries specialists often find themselves in management situations soon after graduation. In developed countries specialists continue to specialise, and, when successful, find themselves projected into management situations. In both cases, their education often ill-prepares them for what follows in their working lives.

There are good reasons, therefore, to approach most educational programmes from the standpoint of *breadth of study*. This automatically implies thinking across disciplines, a flexible programme structure and an institutional organisation that encourages breadth.

Breadth and Inter-Disciplinarity

The subject matter of study programmes can be broken down in such a way that study cores represent broad studies crossing the disciplines rather than specialist studies. Such cores, or parts of them, will be common to a number of different programmes and therefore economic whilst meeting the needs of the general community and the student. Of particular developmental importance is an emphasis on synthesising a number of relevant disciplines, e.g. the synthesis of technology, rural planning,

economics and social science into the broad subject area of agricultural studies.

The key to the provision of breadth and of inter-disciplinary study lies in the institutional structure. The conventional faculty/departmental structure tends to produce isolation, whilst a matrix type structure centred on basic disciplines tends to produce a sense of "not belonging" amongst both students and staff. The two structures can be likened to the function and project systems encountered in industry.

A good solution is to adopt an inter-linking system by superimposing a secondary-type structure of inter-disciplinary institutes, schools and centres upon the more conventional faculty/departmental structure.

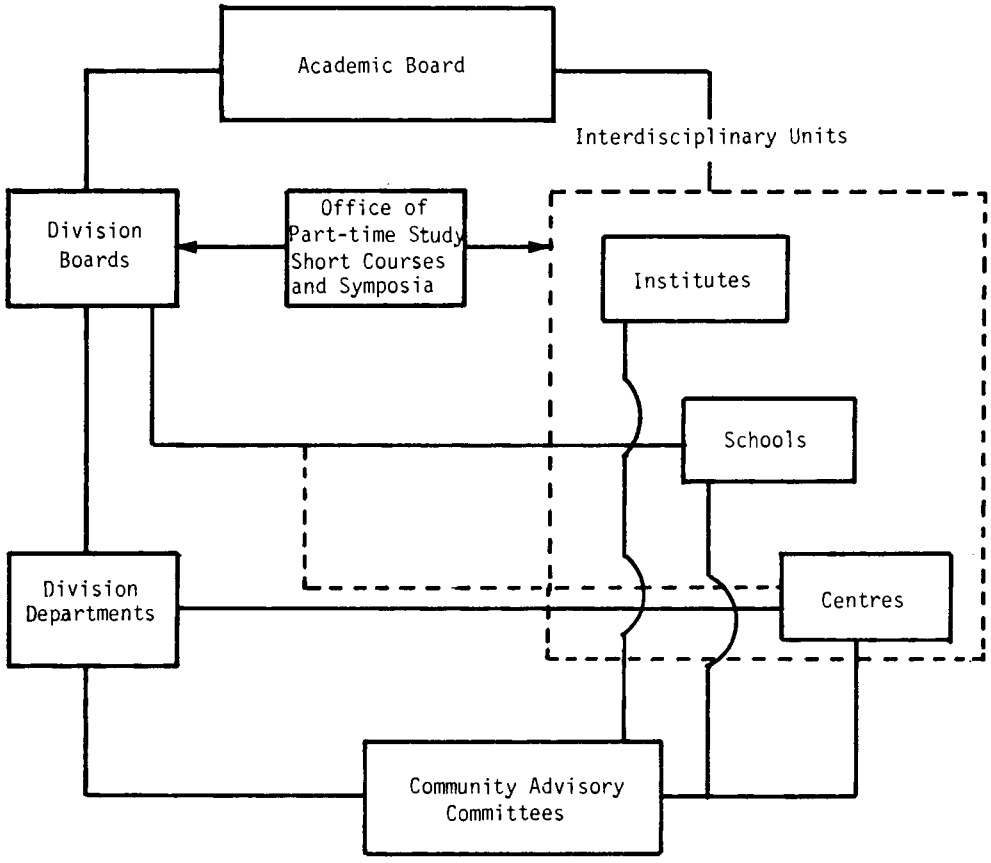

Figure 1: The Organisation of Interdisciplinary Units

Such a dual structure is outlined in Figure 1. Institutes, schools and centres are relatively autonomous activity groups which bring the more basic disciplines together through inter-disciplinary study activity. The activity groups must function in close co-operation with industry or agriculture, government agencies and community bodies and depend to a large extent on policies generated through strong advisory committees with considerable relevant membership from outside the educational institution.

Programmes of Study

Tailor-made study programmes are, in general, becoming much less efficient in meeting modern educational needs. They tend to be inflexible and often expensive unless group sizes are very large. Furthermore they lead to student and staff introspection.

A complete programme would normally comprise some or all of the following with a high degree of interaction: basic disciplines; application; general studies; project work; and practical, field and professional work. Basic disciplines and some application/vocational elements lend themselves most to common multi-programme use. These will usually be of large economic student-group size and demand very good instruction. Applicational elements involve the general application and synthesis of basic disciplines to particular subject themes.

The main objective of general studies must be to complement and contrast the principal subject areas of a complete programme. These should include communications studies emphasising the ability to communicate with different societal groups using all available media. All such studies should balance the needs of the community with those of the individual. Hence, close consultation with all relevant groups is necessary.

Project work is highly motivating and links theory with practice. It is important for the student to experience both individual and team projects; the latter particularly because in real life hardly anyone is not subject to the thoughts and actions of others. The depth of project work depends upon the study level of the programme. Obviously a technician would not be expected to produce the same kind of project thesis as that of a technologist. However, all should do projects and all can benefit especially if projects are related to useful research and development.

Practical work involves laboratory work, where applicable, and experience gained "on the job" or "off the job" or both. This can be provided either in a real or simulated environment. The development of such elements has led to many successful types of integrated sandwich programmes. However in the developing situation they are often poorly supported by the employer in the provision of good and relevant practical or professional training places. The process can be assisted by providing some of this training in a pseudo environment within the institution, for example, in an industrial centre or a practical accountancy unit. This integrated practical phase is one of the most important in any programme. It brings the student in touch with real life and has a marked maturing effect. Its organisation also brings staff into close contact with the community with a consequent benefit in teaching, research and consultancy and in institutional-community relations in general.

Finally it should be emphasised that the objectives of all elements and of the complete programme should be clearly defined and that curricula are best determined in objective form.

Access and Opportunity

The problem of educational opportunity is particularly acute where social demand is considerably greater than economic demand. The tendency is to admit the most academically qualified candidates irrespective of the terminal level of study. This produces frustration and dissatisfaction on two counts. First, the more academically able often find themselves in jobs less demanding than their ability level. Secondly, the less academically able are denied an equal opportunity to secure jobs in which they would be satisfied. Naturally employers dislike this state of affairs as much as the students. The painful but more equitable solution is a quota system of input and output in which ability is matched to the level of terminal qualification. It demands careful selection using good

interview techniques. It can be assisted by constraints on entry requirements. However, the system should make limited provision at all levels for alternative, but acceptable, entry qualifications. This includes mature students and pre-entry study programmes.

A highly competitive situation for full-time places emphasises the importance of part-time study. This provides a second chance for those failing to gain admission on full-time programmes and an opportunity for those who, through family circumstances, had to leave school early to take up employment. However, the organisation, standards and general

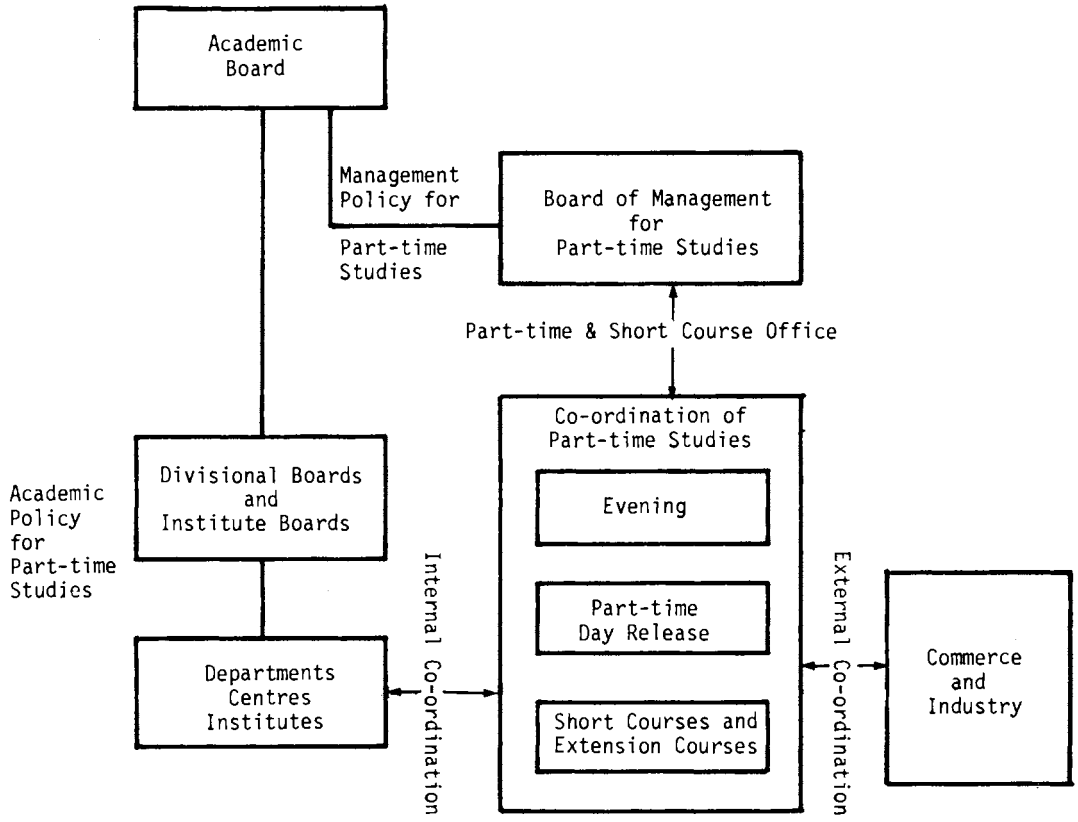

Figure 2: Hong Kong Polytechnic: Office of the Associate Director for Part-time and Short Course Work

level of teaching in evening work often leaves much to be desired. This can be overcome by setting up a high-level part-time co-ordinating unit to ensure that a substantial proportion of full-time teachers are employed on part-time work and that suitable administrative and supervisory support and in-service training for part-time teachers are provided. One example of this is the Hong Kong Polytechnic's Office of Part-time and Short Course structure (Figure 2). Its aim is to provide equal opportunity to part-time students at all levels of study and at the same standard as that provided to full-time students. It also co-ordinates short courses and conferences and is proving to be both educationally and cost effective. The success of such work is largely dependent on substantial participation by full-time teachers. Their time should be carefully planned and remuneration for extra work must be adequate. The latter is notoriously poor yet such work is a source of significant financial contribution from the employer and/or the working student rather than from the public purse.

As the gap between social and economic demand closes, changes occur. There is a swing from evening to part-time day or full-time study.

Employers become more generous in granting time off for day-time study. Entry requirements and ability are more evenly matched to the programmes offered and the content of these programmes alters. There is change in the pattern of levels required towards more higher-level work. There is a need for flexibility, transferability across levels of study, and rapid response to changing manpower requirements. The net result is perhaps demonstrated in many developed countries in the Commonwealth (and elsewhere). The resources available are just not adequate to meet demand within the traditional educational systems that have developed in a somewhat disorganised way. What is needed is a planned systems approach to the tertiary educational process. However, the tertiary sector is inter-related with the secondary sector and with non-formal education. The question arises as to whether it is wise to provide more and more places in secondary schools with the promise of university degrees for which suitable employment does not exist. A more appropriate solution would be to limit the secondary school places and provide alternative tertiary and non-formal education with a flexible mixed study mode progression according to student ability.

Research and Consultancy

The number of people capable of a real breakthrough in knowledge is small and even then history suggests that chance plays a significant part. Leaps forward, although dramatic in result, are rare, and advances are generally made in relatively small steps. The main requirement from human resources is therefore the ability to conduct useful project-oriented research and development on a team basis and the use of institutional staff expertise on consultancy. Such activity necessitates close co-operation with the eventual user, and the tertiary educational approach must be oriented accordingly although highly academic research must not be neglected in the process.

Unfortunately, higher degree programmes, whether by course or research often reflect the interests of the academics rather than the needs of the community. The result is often relatively small and uneconomic group sizes engaged in non-relevant higher degree studies. If, however, the predominant source of research and postgraduate study is the eventual user, then an economic and productive institutional approach is to concentrate on team research of practical application and to use the knowledge thus gained in the form of short courses. If the research is in fact useful then the short courses, based on a reasonable return of cost, will be well supported. In turn such courses will provide modules of study which, if combined in several disciplines, can lead to equally useful and cost-effective higher degree programmes. This approach can be enhanced if joint higher degrees are conducted integrally with industry as in the industrial PhDs developing in the United Kingdom.

There are considerable expertise and resources in tertiary institutions and they should not be confined solely to the teaching function. A good way of using this expertise to maximum advantage is to co-ordinate consultancy through a private self-financing non-profit-making organisation as instanced by the University of New South Wales in Australia and Loughborough University in the UK. Of course care must be taken to limit the time spent by staff on this activity and to avoid excessive competition with professional consultants.

The organisation of research and consultancy as described above provides an outlet for student participation at all study levels and for close contact with the user, i.e. the eventual employer. It also provides practical feedback to the academic staff with consequent benefit to the

teaching function and the orientation of human resources to the real needs of the community.

It is surprising that good research and consultancy co-operation between university and industry is still rare in highly developed industrial countries. This was brought out in a recent Workshop on University Consulting Services organised by the Organisation for Economic Co-operation and Development where the failure was attributed to a mental barrier and lack of confidence between educators and industrialists; lack of understanding of the economy and of industry at the school level; the choice of unsuitable joint research topics; lack of courses integrating theory and practice; university staff regarding applied research and development as inferior to pure research; and an information gap on what has already been achieved.

Reflecting these findings in the developing countries where their education systems have been modelled on the developed ones, the situation can only be regarded as ominous. This is especially true in agriculture where most experts are agreed that close co-operation between agricultural education, research and advisory or extension work is essential.

The way forward surely must be for the tertiary institutions and the private sector to make every effort to come together in a spirit of mutual understanding with the maximum support that government can give. In this respect it is significant that institutions offering multi-mode and integrated programmes appear to enjoy the greatest degree of co-operation with the community.

The Learning Process and Some Consequences

A Systems Approach to Learning

To cater for the real needs of the community through a systems approach it is necessary to define a set of institutional objectives. These objectives must aim at meeting the needs of a developing situation. A primary purpose must be to prepare students to adopt innovative and open-minded attitudes conducive to the socio-economic environment in which they work and play.

The next step is to define the system best suited to satisfying the objectives. At the heart of this is the learning process. The need for flexibility, transferability and amenity to change, make a self-learning systems approach an attractive proposition. Furthermore, there is often a student language problem. The approach can be achieved by the use of credit units of study which can be combined in different ways to form complete programmes of study. It needs to be supported by considerable use of educational technology (programmed texts, audio-visual aids, closed circuit television, and the computer) so that much of the lecturer's time can be devoted to small-group or even individual tutorials. In this way self-learning is complemented by a strong tutorial mode.

This system is particularly relevant and beneficial to part-time and evening work. It ensures that standards of part-time study are equal to those of full-time study (which is not always true with more conventional teaching methods). The system is particularly advantageous if it can be widened to a number of participating institutions and, in part at least, to schools. It also facilitates rapid educational response to changing community needs through the addition of suitable optional units of study.

There are many, often expensive, tools for the trade of educational technology. However, at least initially, accent should be placed on relatively simple and widely used software rather than highly sophisticated hardware. Many institutions have set up large centralised media centres which rapidly become isolated and very expensive emporia of low productivity.

Most teaching staff have to learn the techniques, and many have to be encouraged or coerced into trying them for themselves. Decentralisation is the key word. Obviously a central processing unit is required, but it should be relatively simple and contain only a few central staff and advisers. It is important to set up a number of small sub-centres near the academic units where staff can go to receive advice and produce programmes themselves. The result is a series of learning packages providing part or whole units of study. The greatest deterrent to progress is the staff time needed to prepare the packages. With a static staff establishment it is only possible to make significant progress by bringing in a temporary addition of staff. With an expanding staff establishment it is possible to bring in anticipated future staff, say a year early. The most economic way, however, is through a carefully planned and co-ordinated programme on an inter-institutional basis with each institution taking a share of the work. In general, student reaction to educational technology is good and understanding is usually higher than by more traditional learning methods.

The small group or individual student tutorial can be very time consuming on staff and hence expensive, and for this reason is often avoided with conventional teaching methods. However, when linked with self-learning the actual time required per small group can be relatively little. For example, a tutorial system of half an hour per fortnight in, say, four main subjects of a programme can be quite sufficient to provide adequate student-staff contact.

Indications are that the self-learning approach can be both educationally effective and economic. However, few institutions have fully succeeded as yet. This is probably because those who have tried have started from an entrenched and very traditional base and without a comprehensively planned systems approach.

Finally, the combination of a self-learning system with a part-time and short course unit (as suggested in this section on Access and Opportunity) provides the potential for the development of a multi-level open education, distance learning, approach.

Validation, Assessment and Awards

Having suitably designed the programmes and the method of learning it is necessary to ensure appropriate validation and assessment of the students' work and a suitable award to those students who are successful.

Validation can be entirely internal or external to an institution although it is usual to have a combination of the two. It is essential to have some degree of external validation since this ensures comparability of standards with other institutions (and countries). However, the best guarantee of standards is to place the responsibility firmly in the hands of the institution and its staff. A system of programmes, assessment and awards entirely external to the institution provides little scope for initiative, creative development and staff-student satisfaction. It divorces the teachers from essential participation in, and an objective approach to, the learning process. It also discourages the inclusion of

subject matter specific to the needs of the community local to the institution. Such local needs can vary considerably in a large country. Nevertheless some degree of external peer evaluation is essential. This could take the form of a validatory review every five years or so by a joint internal-external review body. Part of the external membership could, with advantage, come from different countries of the Commonwealth.

There is, of course, no reason why there should be no significant areas of common work (units and modules) across institutions. This would demand institutional, governmental, industrial, commercial and community participation and the outcome would provide common national contributions to the institution's own programme. These common national contributions, however, would not necessarily violate the principle of institutional responsibility for validation. It would nevertheless introduce a measure of constraint since some, if not all, institutional programmes would contain common national components. A possible structure to achieve these principles is indicated in Figure 3.

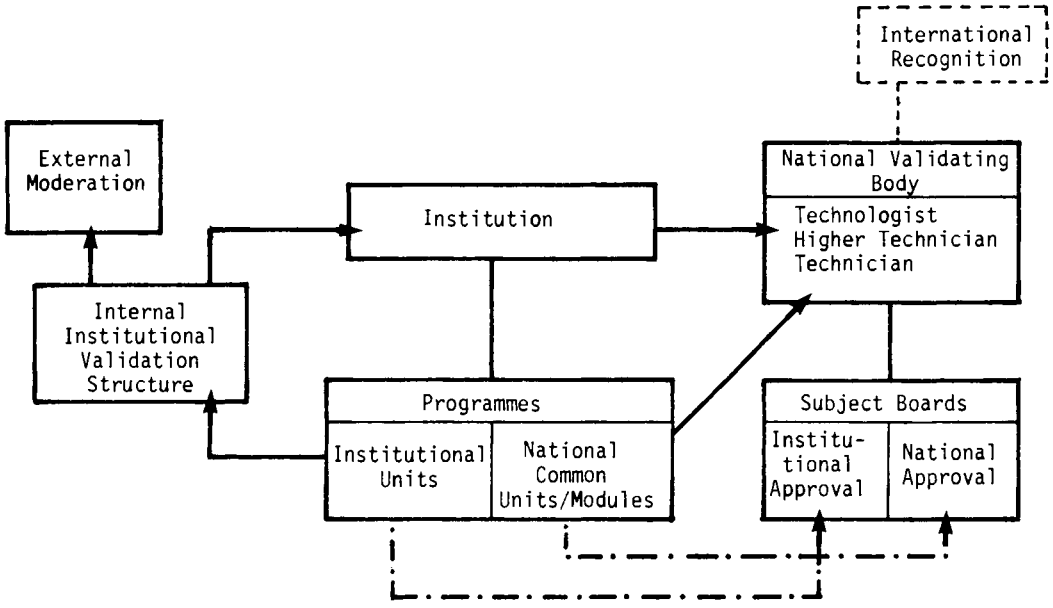

Figure 3: Combined Internal/External/National Validation Model

Assessment of units, modules and education technology packages may be by continuous assessment, combined continuous assessment and examination, examination only, and student self-evaluation. Assessment by examination only should be avoided as it tends to induce an uneven student work rate and emphasises memory retention rather than general ability. Furthermore, account should be taken of performance in laboratory work, essays, creative ability, etc. Continuous assessment demands a more even student workload but often creates unfavourable student reaction due to attitudes engendered from conventional primary and secondary education. Thus assessment is best based on a combination of continuous assessment and examination with some credit allowed for the results from student self-assessment. However in no circumstances should the number of examinations be excessive. Some students find examinations stressful, and in most employment situations few people are subject to the artificial examination environment created by conventional academic study methods.

The subject of terminal awards has caused problems in many Commonwealth countries. It is very important to use a nomenclature which reflects the level of study and the custom of a country. The overriding consideration is to ensure a nationwide uniformity and this can be achieved by giving terminal award powers to a statutory National Validating Body. By doing so there is the added advantage of avoiding different requirements for employment in government and non-government establishments, since government would have to use the statutory national awards.

The grading of programme performance is currently the subject of world-wide debate. Many students believe that grading on academic performance is a stigma which can remain with them for life. The employers believe that it is required in order to judge ability and the amount of remuneration to be offered. In addition, some form of grading is often required by professional bodies. However, it is questionable whether finely graded systems have much impact other than on the first few employment appointments. Thus a pass/fail system, with perhaps a "distinction" classification for outstanding overall performance, together with a subject record, should form a reasonable compromise. The emotive issue of grading often assumes far greater importance than it merits. What a student learns, how it is learned, and how the learning is applied, are far more important.

Tradition and the Professional Bodies

Certain educational and professional institutions in the United Kingdom have had, and to some extent continue to have, a profound effect on other Commonwealth countries. The reason lies in history. However human resource requirements differ considerably from country to country and what is appropriate in the UK is not necessarily appropriate elsewhere. The more developed countries of the Commonwealth clearly have much to offer to the less developed ones, and the best way this can be done is for the less developed ones to formulate and put into practice their own educational needs with the critical help and assessment of the more developed countries. Of particular significance is the reluctance of some professional institutions in developed countries to be flexible in the recognition of study programmes in the developing countries. Of course standards must be maintained but this does not necessarily mean that syllabuses and examinations must of necessity be imposed from outside. The case for complete exemption of an educational institution's own programmes and student assessments is much more logical. This should be based on an appraisal of the staff, resources, relevance of the programmes to the needs of human resources, and the overall academic standards and achievements of the institution. However this issue should not be confused with licence to practise professionally which should be a matter of an individual country's legislation.

It must be accepted that as countries develop they will become more competitive with their more developed counterparts. However this also provides the opportunity for the developed ones to export more know-how and goods to the developing ones. If, for example, a university or a polytechnic has a workshop full of UK machine tools it is certain that graduated students in their subsequent employment will look first to the UK to purchase that industry's requirements. Thus aid of all kinds is not a one-way process; it can have reciprocal benefits for the donors.

Teacher Training

Many teachers enter tertiary institutions immediately or soon after graduation and hence have no formal teacher training and very little

professional experience in the subjects they subsequently teach. Furthermore, many who do qualify in teacher training enter tertiary institutions immediately thereafter and therefore lack subject professional experience. This is not helped by the fact that many teacher training institutions are themselves somewhat introspective and do not have the advantage of a wide range of disciplines involving advanced levels of study, research and consultancy. One result of this unsatisfactory state of affairs in an environment of advancing technology has been the emergence of technical teacher training institutions. This has resulted in a marked improvement in the quality of technical teachers in tertiary education. However there are several ways in which teacher training can be improved. The most important is the need to incorporate substantially more "industrial" training into the programmes. To complement this, curricula should reflect more project-oriented work rather than traditional theory. There is also the need for some practice in the more innovative methods of learning and curriculum development. Most of the above is concerned with the quality of the teacher but the question of demand and supply is equally important. Most countries cannot get the equation right and hence go through cycles of under- and over-supply. Teachers tend to remain teachers because of the way in which they have been trained. There is a need for greater mobility through joint programmes in education and professional subjects, e.g. agriculture, engineering or business studies. Such teachers would then possess the ability to teach or to practise in industry or commerce according to demand, opportunity and inclination. The mobility benefit both to the teacher and to the community would be substantial. There are a few schemes but they are generally confined to joint degree programmes or to postgraduate topping up. There is no reason why such an approach could not apply to technician and craft levels. However, it would demand much greater co-operation and integration with tertiary institutions, teacher training establishments and industry than currently exists in most countries.

Staff Development

Staff development is the continuation of training of teachers in service. It is much neglected and generally substantially under-financed. It is concerned with up-dating and the extension of knowledge both academically and practically through work experience in industry, etc. It is also concerned with career involvement and therefore involves training in administration and management. Much can be done through properly organised in-service training by the educational institution itself. However the key to effective staff development is a systematic institutional process leading to the required competencies in the teacher derived from the objectives of the tertiary institution. This demands the development of procedures such as job analysis and staff appraisal on a continuous basis and the resources to achieve the required competencies.

Staff development should derive from national policy and be funded appropriately. However, a sound scholarship scheme can help in this respect. Unfortunately, these are often ill-planned and often not relevant to community needs. They tend to concentrate on academic rather than practical or professional experience and yet the latter is generally more useful to the teacher especially in promoting partnership between education and "industry".

Tertiary Institutional Organisation and Structure

There is a plethora of tertiary institutions in the Commonwealth countries Nomenclature differs widely and hence many institutions called by the

same name have entirely different functions. For example, a polytechnic in the UK covers higher technician work to higher degrees whereas in Malaysia a polytechnic is effectively a secondary school alternative. In fact there is no clear understanding of what really constitutes tertiary education. One way of looking at this problem is to consider the flow of students through the educational spectrum. For this it is necessary to use some notion of age and the number of years in each educational sector. Figure 4 postulates three types of institution: universities dealing with first and higher degrees; advanced colleges dealing with higher technician work (or equivalent) and first and higher degrees with emphasis on vocational study; and further education colleges dealing with craft and ordinary technician (or equivalent) work. In fact the latter two could cover the entire tertiary spectrum if universities in the Commonwealth had not followed the rigid "no sub-degree work" attitude set by the pattern of the UK universities. It is, therefore, unlikely that a two-tier pattern can emerge. However the main differences between the

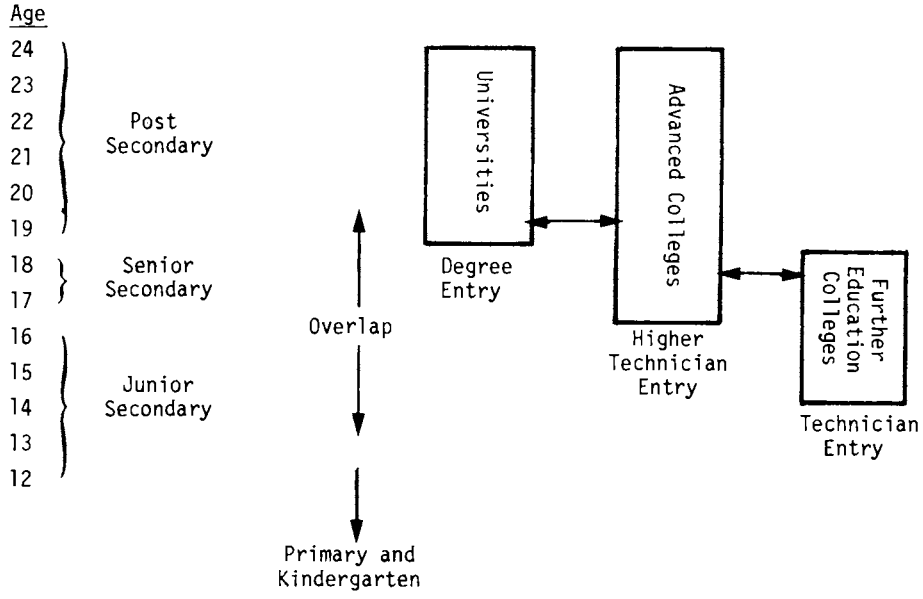

Figure 4: A Consistent Set of Tertiary Education Institutions

universities and the advanced colleges are the concentration of post-graduate and more fundamental research in the universities and the more vocational multi-study mode approach of the advanced colleges. This suggests that universities might assume an élitist role with the bulk of socio-economic human resource needs met by the advanced and further education colleges. A high degree of integration could be achieved by designating the further education colleges as associated units of the advanced colleges.

Few, if any, Commonwealth countries have developed the right degree of balance and co-ordination to achieve this essential, and potentially cost-effective, goal. To do so requires a high degree of national planning of secondary and tertiary educational institutional provision in close co-operation with regional requirements. This does not mean national or regional control of the institutions but rather a clear definition for each institution of the numbers, types, modes and levels of output based on socio-economic need and provision of the resources to meet them. Figure 5 indicates a possible scheme which also incorporates the validating function discussed above. It postulates a system of statutory national

and regional planning authorities. This would obviate the need for several specific bodies such as university grants committees although the experience of these committees would be invaluable in the setting up of a more widely based scheme.

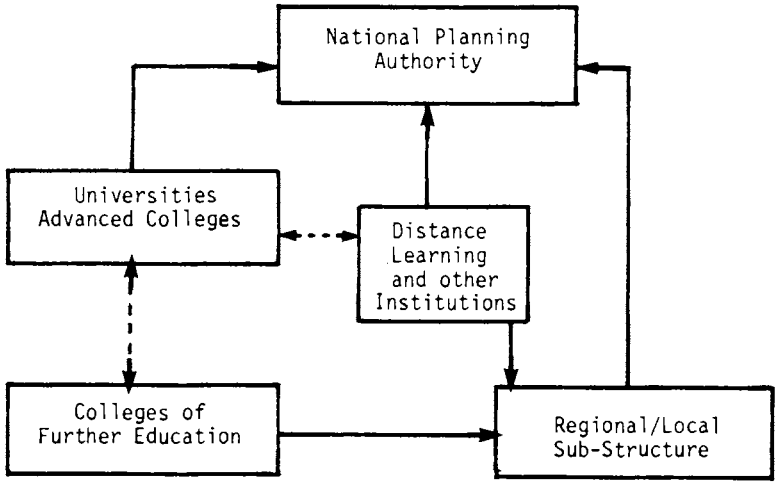

Figure 5: Outline National/Regional/Institutional Planning Authority

Whilst all institutions must take account of both national and regional requirements, it would appear logical that the output from the further education colleges would derive largely from regional needs. Additionally part-time work at all levels and in all types of institution have a strong regional connection because of travel distances between home or work-place and the institution (the exception being distance learning institutions).

For the developed countries the above approach is largely a matter of rationalisation and the reorganisation within severe traditional constraints, and most are engaged in this very difficult task. For the developing countries there is the opportunity to change direction through systematised planning. However, the constraints are different and, of course, resource provision is the dominant factor.

The Degree of Institutional Control

The primary consideration in the structure of relatively autonomous institutions is public and academic accountability. Unfortunately the roles of these two functions have become confused. Public accountability is normally effected through councils of governing bodies consisting of knowledgeable members of the public, some institutional representation and some government members (either national or local). Such councils generally set overall institutional policy and, through the control of finance, ensure that both students and public receive educational value for money. Academic accountability is normally effected through senates or academic boards and is essentially concerned with the devising, conduct, and standard of educational programmes and with research. It is the basis of "academic freedom" whatever that may mean.

In practice, within Commonwealth institutions the two roles can be dominated almost entirely by a governing body at one extreme or by a senate at the other. The former is the trend for locally controlled institutions and the latter for national institutions, especially universities. It is clearly wrong for the permanent institutional staff

to be "judge and jury" on all matters. Equally it is wrong for outside members of the institution to dictate. The situation requires a re-evaluation of the public and academic accountability roles and of the membership of the essential bodies responsible for carrying out these roles. Grey areas will exist, as in any organisation and structure, but these can usually be resolved through joint consultation.

The above most obviously relate to the appropriate institutional output to the community and hence of close co-operation and co-ordination with the latter. This is best achieved through strong and effective community-oriented external advisory committees to each academic unit. Indeed the existence and function of such committees might well be incorporated into institutional charters.

Other Factors of Organisation and Structure

With regard to teacher training and other specialised institutions it is suggested that the need for education breadth, self-learning, flexibility, manpower mobility, inter-disciplinary and cost effectiveness calls for the integration of such specialised institutions within the three-tier structure proposed in Figure 4. Most existing specialised institutions are small, costly and tend to become introspect and somewhat isolated from the community. Teacher training would seem to be ideally suited to be integrated with the advanced colleges since this would best meet the requirements stated in the section on teacher training. Other specialised subject areas might well be integrated with an appropriate institution from the three-tier system. However there will always be a limited need for a few specialised institutions linking education, research and practical application. They should however be kept to a minimum number and their benefits should justify their existence.

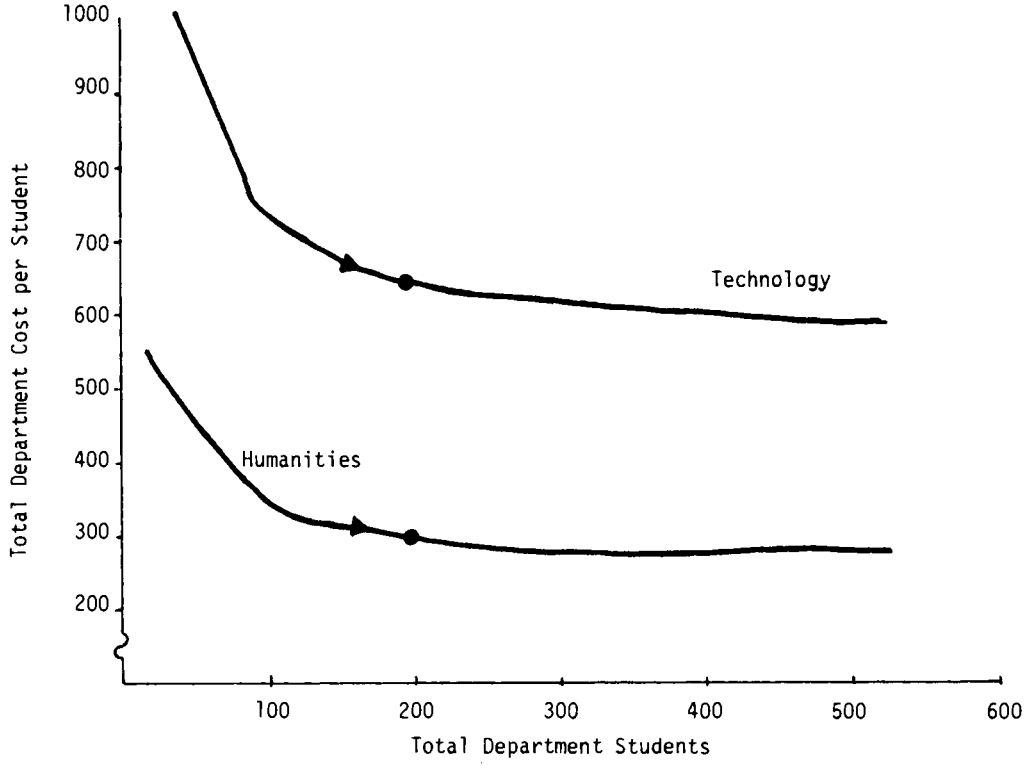

Figure 6: Variation of Departmental Cost Per Student With Group Size (1968/69 Cost Level)

This matter raises the question of size of an institution. The economic influence of group size is demonstrated in Figure 6 which shows total department cost per students against total departmental group size for

technology and the humanities. It indicates the considerable cost of small group size. Using this kind of data over a balanced institution suggests total student populations of about eight to ten thousand if full economic advantage is to be achieved. Beyond this the problem is one of achieving a suitable social structure and its breakdown into acceptable sub-structure.

Nevertheless geographical and regional considerations may dictate smaller units and this raises the question of multi-site institutions. Most experience to date suggests that such structures do not work. However, this has been largely due to the creation of a large institution by merging smaller ones. In such cases, it is necessary to break down many social, technical and administrative barriers. This is not to say that in the ultimate such mergers are not necessary, but it must be recognised that they need to be very carefully planned and take at least five to ten years to stabilise. On the other hand, there is no reason why large central institutions with a number of strategically located satellites could not be planned *ab initio* so as to provide social and economic advantages over a set of smaller, completely independent institutions. Such an approach is particularly important for developing countries where rural education is emphasised.

The Importance of Planning

Throughout this paper constant reference has been made to the importance of educational planning across the various educational sectors and in partnership with the relevant government departments and the community. 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 inter-disciplinary, involves organisation, and is necessary from the small detail to the large overall problem. When properly applied, planning methodology can do much to eliminate waste but it must lead to timely short-term decisions made with reference to a longer-term plan. Unfortunately inter- and intra-education institutional planning has been neglected. Indeed education itself has tended to neglect it as a subject area in its own right. This situation must be corrected if real progress is to be made towards meeting changing human resource needs. In particular, it is essential that the planning function balances the human factors with numerical evaluation factors if the optimum is to be achieved within limited resources. Finally it must be remembered that the educational output from planned new developments is some five years in the future.

Finance and Resource Provision

Since tertiary education is responsible for providing the dominant and most expensive proportion of a country's human resource needs, it is ideally necessary to assess economic and social benefit and cost. Such analysis should include benefit and cost to the individual student as well as to the community. Attempts to resolve this problem have so far yielded little that is meaningful and useful. There is a need for much more concentrated research effort in this area. Thus the method of provision and distribution of educational finance tends to be *ad hoc* and varies from crude simplicity to the application of quite sophisticated resource models. It is a process that leaves much to be desired even in the absence of reliable cost-benefit analysis.

The Overall Assessment and Distribution of Resources

The essential elements in the assessment and distribution of financial

resources for education are shown in Figure 7 together with a suggested preferred method of analysis. The assessment of human resource requirements *(Item A)* has already been discussed and clearly depends on manpower forecasts. This provides the basis for total educational cost, and, given a reliable cost-benefit analysis, it would be possible to assess the proportion of the Gross Domestic Product available for education and its distribution across the educational sectors *(Item B)*. This method would automatically take account of education's contribution to the growth in Gross Domestic Product. However the usual procedure is either to use overall normative models (e.g. cost per student) or to sum up vetted estimates from the institutions themselves through an appropriate authority chain. The former method is preferable as it provides a more equitable distribution, and account can always be taken of justified special cases. In any event the final total is generally greater than the government considers it can afford - although the government cannot really know this. Thus the usual outcome is a relatively arbitrarily determined proportion of the Gross Domestic Product which is then distributed in proportion to the normative assessments or institutional bids *(Item C)*.

It is clear from the above that there is a financial interface problem between the educational sectors (pre-primary, primary, secondary, and tertiary). The estimation of the proportions is very complex and depends upon the particular circumstances of a country and its state of development. Many developing countries are lucky if they can afford compulsory primary education whereas most developed countries already

Item	Element	Suggested Method
A	Assessment of the human resource requirements to meet the planned national socio-economic needs	Sound and reliable manpower forecasts
B	Assessment of the proportion of GDP available for educational financing and the distribution of this across the educational sectors	Socio-economic cost benefit analysis OR Normative models
C	Assessment of the equitable distribution of the tertiary sector funding across the tertiary institutions	Socio-economic cost benefit analysis OR Normative models
D	Assessment of the equitable distribution of the institutional funding across the institutional units	Normative models

Figure 7: The Progessive Assessment and Distribution of Educational Resources

provide free and compulsory education up to the age of 15 or 16. However, all countries have private or semi-private institutions in all sectors of education although their greatest impact is in the non-tertiary sector. Indeed in developing countries they often provide more educational places than the public sector. Thus the policy here must surely be that such institutions should satisfy at least a minimal educational standard and that wherever possible they should provide as many government subsidised places for those who cannot afford to pay as the economy will allow.

Bearing these factors in mind, it is apparent that the relative proportion of available resources spent on tertiary education is already generally excessive and yet is tending to increase. This situation is particularly severe in developing countries although applicable in some measure to all. Thus the onus is on tertiary education to become less costly, and hence on the economic use of resources in tertiary institutions themselves *(Item D* in Figure 7).

Institutional Resources

In general the total income of a tertiary institution arises from public funds (central and local government), benefactions, research and consultancy, and student tuition fees. Of these, the first and the last are usually the most significant. Benefactions are small and becoming more difficult to secure. Research and consultancy income is limited to profit margins on the institutional capacity to do such work and is not normally more than two to five per cent of total income. However, there is considerable scope for improvement here as suggested in the section on *Research and Consultancy*. Thus the major variable influencing the public fund contribution is the tuition fee income. This latter can vary from five to 85 per cent depending respectively on whether the institution is public or private. Tuition fee income usually derives from a personal contribution by the student (or the parents) and/or a subsidised contribution from public funds. The latter is normally part of a student grant and/or loan scheme and may be based on a means test of family income and cover both tuition and subsistence. It must be allowed for in assessing the total national education bill. Evidence from the Hong Kong Polytechnic suggests that salary on graduation has well exceeded inflation over the years quite apart from a considerable benefit in later career, and this may well be true of developing countries in general. If so, this suggests that a full or partial loan scheme for living subsistence is a fair proposition to the needy student. However, if it is accepted that those who can afford to pay should do so, then the tuition fee should be much nearer the economic cost per student. Obviously, the tuition grant to the financially disadvantaged student would have to be adjusted accordingly, but the net result of a high tuition fee and a living subsistence loan would be reduced demand from public funds.

By far the greatest recurrent expenditure is the provision of staff. This varies between 65-80 per cent for most institutions. Many models exist for the estimation of academic, supporting and central administrative staff. Academic staff is the most expensive, and adequate support and administrative staff should be provided so that teachers teach and research efficiently and effectively. Comparative data from different institutions and different regions of the world can be very effective in determining the staff complement for a particular subject area. However, changing needs can provide uneven staffing across the disciplines, and the use of some fixed-term contracts and part-time staff is wise and thrifty housekeeping. The employment of senior students to assist in the tutoring of junior students is a further possibility. Other substantial expenditures relate to equipment, institutional research, maintenance and minor works, general expenses, staff development and institutional services (library, computer centre, educational technology centre, etc.). All of these are amenable to some normative modelling although large items of equipment and unexpectedly large maintenance problems present difficulties.

Capital costs relate almost entirely to buildings and are equally amenable to normative modelling in terms of accommodation areas for different functions. It is essential to link space accommodation modelling with the recurrent resource models so that a matching balance of recurrent and capital is achieved. To be effective this requires funding provision on at least a three-year cycle with reference to an overall forward plan of five to ten years, annually up-dated.

Management Information Units

It is evident that considerable systems analysis and data handling are involved in the process of assessing and distributing resources within

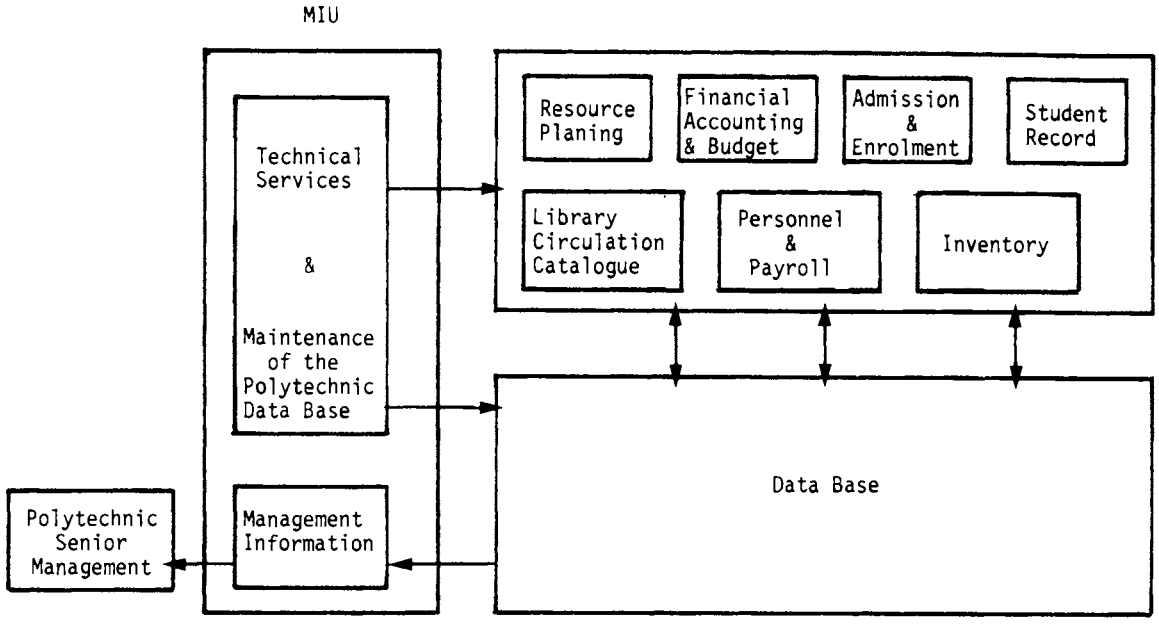

Figure 8: The Role of the Hong Kong Polytechnic Management Information Unit (MIU)

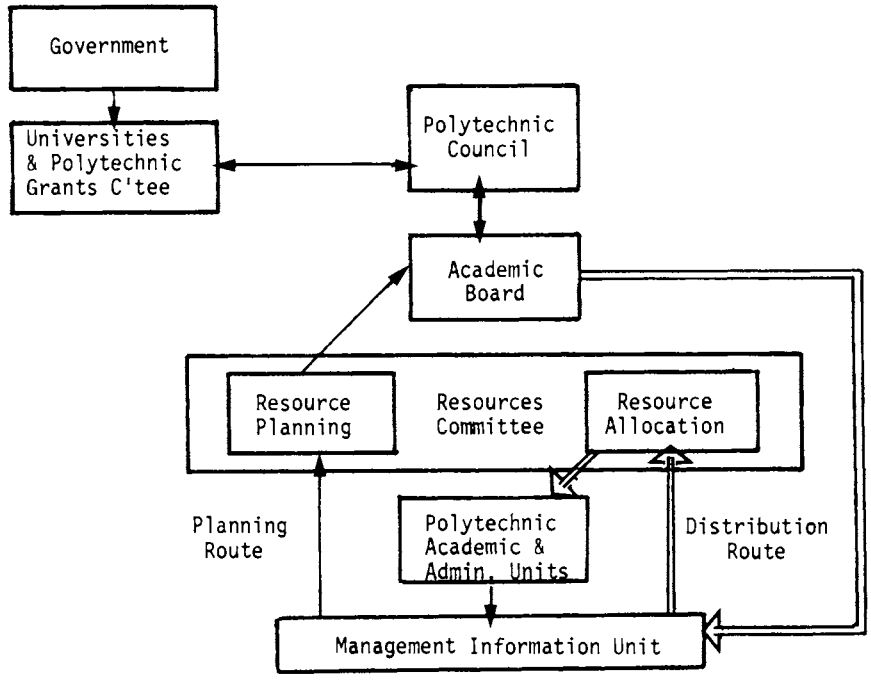

Figure 9: MIU's Function in Resource Planning & Distribution

institutions. However there are several other functions requiring a systems approach, e.g. academic student admissions, budgetary control, student employment and training. It is cost effective to accommodate all of these functions in a Management Information Unit.

A Management Information Unit is essentially computer based. It must be relatively small, contain systems analysts of a high calibre, and work in co-operation with academic and administrative groups. It develops and up-dates appropriate systems for these groups but the systems, once proven, are operated by the groups themselves. This in fact is the key to a successful Management Information Unit and its general acceptance by staff. Through this functional approach a relevant and continuously up-dated information data bank is built up within the Management

Information Unit from which good management decisions can be made. An example of the functions of one such unit is presented in Figure 8, and a more detailed picture of the resource estimation and distribution cycle in Figure 9. A study of these two figures demonstrates the principles stated above. The development has been extremely well accepted by staff and has made a substantial contribution to the planning, cost effectiveness and educational functioning of the institution.

It should be observed that whilst a Management Information Unit of this type usually derives from resource planning, distribution and monitoring, it is essential to pay particular attention to the other functional uses to which it can be put. This needs careful consideration of the total longer-term data of all kinds to be stored. Over the years sets of time history data will become available and these can be used for more refined modelling and, most importantly, for longitudinal studies of behavioural problems. If Management Information Units were effectively organised on a national, regional and institutional basis, they could be the means of providing the meaningful socio-economic cost-benefit analyses so essential to the assessment of educational provision.

The Need for Radical Change

The 'grass roots' view in the whole range of higher education seems to be the need for radical change. As an example of this I can do no better than to present the broad conclusions arrived at by the 1979 Conference of the Association of South Asian Institutes of Higher Learning (ASAIHL) which included a significant proportion of delegates from Commonwealth countries.

They perceived higher education as a broad spectrum of post-secondary institutions which included technical, vocational and non-formal education and which embraced sub-degree work and part-time study as well. They further advocated a reduction of the gap in salary between graduates and non-graduates. Higher education had to be planned according to manpower needs and related to available employment, and they warned against the unplanned diversification and proliferation of academic degrees. In a situation where countries are dominated by traditionally educated élites, the greatest need was to up-grade opportunities for the socially disadvantaged. The demand for social mobility particularly in rural areas was highlighted. This could be achieved by changes in geographical location and the academic content of tertiary institutions. However they favoured controlled selective admission to higher education since free access could result in the lowering of standards and the escalation of costs.

Thus the climate seems favourable for change. Because institutions are reluctant to initiate change, it requires wise and firm direction from governments based on clearly defined socio-economic needs and demands. Such direction should not however impose excessive control on the institutions - rather the reverse. There should in addition be real and close co-operation between tertiary educational establishments and the appropriate sectors of the community.

Much can be achieved through institutional self-help and the exchange of ideas and experience across Commonwealth countries including aid from the developed to the developing countries. This would seem to call for greater central co-ordination than currently exists involving links with existing organisations such as the Association of Commonwealth Universities. The Commonwealth Secretariat has an important role to play in this sphere and should be asked to prepare a suitable structure that would accommodate the changing needs of member countries.