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DEVELOPMENT OF MANAGERIAL
AND TECHNOLOGICAL CAPABILITIES
IN GHANA ^{1/}

by

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S U M M A R Y

Ghana is a developing country fairly well endowed with natural resources which, if rationally exploited, could make the country relatively strong, economically.

Weak technological and managerial skills have, however, greatly contributed to the slow economic progress of the country in spite of a number of economic plans since the attainment of national independence in 1957.

A judicious use of the existing manpower and a conscious effort towards the development of technological and managerial capabilities will help the country develop faster.

To realize this, there is the need for a critical examination of the various bodies operating within the economy, with a view to defining and popularizing the functions of each and restructuring them, where necessary, to make them perform their duties more effectively. The exercise should ensure that the proper linkages are established among the various components of the economy with the Ministry of Economic Planning playing a nodal function.

The technological research and development institutions and management training centres should be streamlined, their activities co-ordinated and the necessary facilities granted to them to enable them to serve the needs of industry.

Arrangements should be made for the provision of an adequate number of skilled manpower of the right calibre based on an assessment of manpower requirements prepared from time to time by the Manpower Board, preferably on a micro-level. The educational system should be restructured so as to expose the population to the real-life problems of the country and, in the process, impart to a large section of the people a modicum of scientific and technological knowledge.

A national committee, including a wide spectrum of interests to prepare an integrated programme for the development of the capabilities in question is recommended.

DEVELOPMENT OF MANAGERIAL AND TECHNOLOGICAL
CAPABILITIES IN GHANA

INTRODUCTION

The introductory chapter of the "Guidelines for the Five-Year Development Plan 1975-80" for Ghana begins as follows: "The aim of planning in Ghana will be to build an independent economy, firmly structured on the resource potentials of her land and the culture of her peoples in the context of the stated Government principle of Self-Reliance. This principle is based on the conviction that meaningful development is possible if structured on our own values, material and human resources, rich cultural heritage and the beliefs of the people. It is also based on a realistic appraisal of past, current and likely future development in international relations The approach to planning that will be followed will aim at avoiding the twin dangers of "growth without development", and "development without growth". It will be an approach that will fully recognise and be sensitive to the basic structural problems in the Ghanaian economy. In particular, attention will be paid to the dualistic nature of the economy (the existence side by side of an enclave-type modern sector surrounded by a large traditional sector, the absence of significant linkages among productive sectors, immobility of factors of production (largely a result of imported technology, an inflexible educational system and outdated land tenure system) and the tendency for balance of payment crises to develop in periods of growth".^{2/}

The above quotation is pregnant with important statements which in a nutshell state where Ghana wants to go, how she wants to go there, and finally the main obstacles which must be cleared before she gets there, i.e. before the economic goal envisioned is achieved.

^{2/} Government of Ghana : Guidelines for the Five-Year Development Plan 1975-80; Accra, 1975, p.1

The "Guidelines" states that for the past decade the economy has not performed satisfactorily. While the population grew over the period at the rate of 2.7% per annum, the Gross Domestic Product (GDP) grew, on the average, at the rate of 2.5%.^{3/}

There have been four different governments since 1960, each with its own economic policy. The internal economic difficulties have been aggravated by external manipulation of commodity prices on international stock-exchanges, and most recently by the oil crisis and the world's inflationary trend.

This paper will attempt to illustrate the vital role which the development of indigenous management and technological capabilities could play in the realization of not only the current Five-Year Plan but also any future development plan.

The question posed are complex and the strategy proposed somewhat eclectic; it does not pretend to offer definitive solutions. It is hoped however that some of the ideas expressed may be of help in evolving a national programme for the development of management and technological capabilities.

Chapter I of the paper deals with two barriers, which tend to slow down the economic development of the country, namely technological and managerial barriers.

Some proposals have been made in Chapter II, as to how these barriers could be removed. In connection with their removal the drawing up of an integrated programme for the development of technological and managerial capabilities has been proposed. Some institutions to play a leading role in drawing up such a programme and in its execution (under the overall aegis of the Ministry of Economic Planning) then follows.

Chapters III and IV of the paper deal with specific recommendations and the mode of financing any programmes that might later be drawn up.

^{3/} Guidelines for the Five-Year Development Plan, op. cit. p. 7.

Assumptions

(i) It is assumed that there will be no appreciable change in government economic policy in the foreseeable future. Frequent changes in government have affected economic development in this country. Not only does the government of the day try to change radically the policies of its predecessor, the change often takes in its stream key personnel through whose dedication and expert knowledge success could have been achieved in certain areas.

(ii) Secondly, it is assumed that the current Five-Year Plan is the beginning of a series of plans telescoped into each other to span at least the period 1975-2000. This sort of planned continuity is essential because most of the measures to be taken to achieve success, particularly, the creation of indigenous capabilities are by their nature long-term.

(iii) Thirdly, it is assumed that structural defects in the system will be corrected frontally.

(iv) Finally, it is assumed that on the international scene nothing drastic would happen to obstruct the efforts Ghana is making towards her economic reconstruction. On the other hand, Ghana should aim at generating enough wealth to act as a buffer against any external pressures.

CHAPTER I - BARRIERS TO ECONOMIC GROWTH

Balanced economic growth is one of the main objectives of any government. Even as a colony, Ghana was anxious not only to improve upon the production of cocoa, she aspired towards industrialization. The Watson Report states: "At every turn we were pressed with the cry of industrialization".^{4/}

Ever since independence, efforts have been made by successive governments to give a broad base to the economy and to encourage economic growth. Success has not been as high as expected.

One may therefore like to examine some of the constraints that have hampered steady economic growth in Ghana. Most of these constraints, such as those of a historical, social, cultural or economic origin are well known. For the purposes of the present study only two will be highlighted. These are the technological and management constraints. This approach does not mean that the importance of the other constraints is being underrated. But technological and management constraints appear to have a more direct bearing on this exercise.

(a) Technological Barriers

The effective application of science and technology is the sine qua non of any modern satisfactory economic development. The difference between the economically advanced countries and the developing countries is that the former are all technologically advanced while many of the latter have scarcely reached the "take-off" stage of technological development. Most of these developing countries, like Ghana, have therefore not developed adequately the indigenous technological base on which to build. At the same time these countries want to improve upon their agricultural production and to industrialize using modern technological methods in production. Technology therefore has to be imported. Since there is often a shortage of highly skilled technical experts, the choice of appropriate technology often becomes a problem. At times, it may even be impossible to choose the appropriate technology since technical know-how for making the selection is lacking.

^{4/} Report of the Commission of Enquiry into disturbances in the Gold Coast 1948. Para.298, Colonial No.231.

Compared with a number of developing countries in Africa, Ghana is fairly well endowed with natural resources both material and human. It has a relatively developed educational system which can boast of three universities. It has a fairly good cadre of professionals and civil servants. It also has scientific research institutions, the majority of which are controlled by the Council for Scientific and Industrial Research (CSIR) which has been charged with the responsibility for national scientific research and experimental development. Ministries such as Agriculture, Health, Communications and Works and Housing have sizeable technical wings; and there is on the whole, a fair range of infrastructural facilities.

One should then ask why the research work of the research institutions and of the universities has not had the desired impact on the production fronts as it is the case in developed countries.

It may be that the scientific and technological community has not reached the critical mass necessary for overall efficiency. The whole of the Council for Scientific and Industrial Research with 9 research establishments has only about 250 research scientists of all grades. The technological and technical services are also inadequate. Practically, no industrial or research equipment is manufactured in Ghana. There is no well developed national scientific and technological information and documentation service. With foreign exchange constraints, it is often difficult to get the tools at the appropriate times for the industrial activities of the country. In sectors where the position is better, effective use of facilities is very much hindered by the lack of balance and linkage with other related components of the economy.

An important drawback is the inadequate availability of key technologists and skilled technicians. Repeated advertisements in local papers reveal that quantitatively and qualitatively Ghana has still a long way to go in satisfying her manpower demands. The universities are trying, but they have not been able to produce, for example, enough of suitable chemists, biologists, physicists, engineers, and medical scientists needed for development projects.

There are certain areas in which indigenous expertise is wholly lacking. Often, therefore, research institutions and industrial enterprises have to use part of their funds to train the type of staff that cannot be obtained. Planning for this manpower is often not well programmed and projects therefore suffer.

In the universities there is so much pressure on student places that nearly all the funds allocated to these institutions go into fundamental training and relatively very little, if any, into research and development work geared to the need of industry. The proportion of science students to non-science students is lopsided to the disadvantage of the industrial sector. This may be traceable to the lack of adequate teaching facilities in the pre-university institutions, and until recently to brighter career prospects in the non-science fields e.g. administration. It is also doubtful whether the available skilled manpower is fully and effectively used.

The demand for middle grade personnel is perhaps the most acute. Enough facilities for training technicians do not exist. Worse still, many do not consider technicians' work a permanent career because of the unfortunate relatively low prestige accorded technicians' training in the country vis-a-vis the training of graduates. It seems our educational system has still not got rid of its colonial trimmings. It has tended to be impervious for far too long to the essential encroachments of innovation.

For successful industrialization, however, the creation of a large class of middle grade skilled personnel and artisans is imperative. The present cry by building contractors in the country for artisans like carpenters, welders, masons, etc. is proof of the need for a crash training programme.

With the proper remuneration and the appropriate social status, many science students from the secondary schools who fail to gain admission into the universities could be attracted to the technical professions. This may result in what one may call the recycling

of the present high wastage of science students from our secondary schools.^{5/}

If Ghana is to become economically strong, technology must be well developed. The present manpower in the field of science and technology should be judiciously mobilised so as to obtain the capacity to select, import and adapt technology wisely and pragmatically, this process being combined with training of suitable personnel. The existing infrastructure for development as well as the country's science and technology policies must be critically reviewed and any anomalies corrected. An important consideration in this regard should be the development of an educational system which releases the creativity and inventiveness of a large portion of the population. Unless this is done, local efforts in research and development may take a long time to make any appreciable impact on production.

(b) Management Barriers

At the research institute level, a key issue is the quality of research management. It has been observed that research leaders even in industrial laboratories tend to be highly science-oriented and have a limited awareness of the economic factors affecting the industry that they ultimately serve, such as price-quality-market relationships. It is useful therefore to develop management systems whereby senior research personnel are obliged to go more or less thoroughly through the discipline of defining their objectives, justifying their requests for budget allocations, and accounting for their subsequent performances.

^{5/} Kwabong has pointed out that in 1968/69 out of 2,879 science students in Ghana's secondary schools, only 672 gained admission into the Lower Sixth science courses and in the following year only 653 went into the Upper Sixth science courses. Out of this number only 375 passed in two or more science subjects, and of these only 401 eventually got admission into the three universities. [A.A. Kwabong; Higher Education and National Development in the "Proceedings of the Ghana Academy of Arts and Sciences, Vol. XII; Accra, 1975, p.57].

Research staff must therefore be brought in closer contact with their industrial clients through joint management training courses or liaison officers attached to research units.^{6/} This is particularly necessary in Ghana, where local industries undertake practically no research; they therefore depend on research units financed by Government.^{7/}

Assuming that Ghana has even developed its own capability in science and technology, efficiency in production is not guaranteed until another key bottle-neck is removed, i.e. inefficient management. It is well known that proper application of modern management techniques is of crucial importance in modern industry. It has been realised now that high quality management is imperative for the effective implementation of science and technology policies. In this regard, the examples of Germany and Japan are often quoted, where the research and development investment was proportionally less than in many other market economy countries while their rate of development remained substantially higher in the same period. These examples have brought home to all the critical role played by high quality management. To be able to use natural resources of a country rationally, it is essential to improve continually the quality of management.

Ayensu is correct in stating (when commenting on the low productivity of Ghana's economy) that "most of Ghana's problems are caused by poor management and gross lack of discipline at many levels of the economy, especially at the public sectors of the economy".^{8/} Indiscipline is an outside manifestation of poor management.

^{6/} Unesco: Science and Technology in the Development of Africa - SC/CASTAFRICA/3, 1973, p.32.

^{7/} Trans-international firms normally depend on overseas laboratories for their research needs.

^{8/} E.S. Ayensu, "The Role of Science and Technology in the Economic Development of Ghana: A Nation Trying to Break Through in the Role of Science and Technology in Economic Development - Summaries of the contributed papers - The National Academy of Sciences Bicentennial Symposium "Science: A Resource for Mankind"; Washington DC, 1976, p.28.

Adu, commenting on why Ghana's economic plans have not been very successful echoes the same sentiment when he says "skills in management science and technology have not built up fast enough to cope with the implementation of planned programmes".^{9/} Boateng's observation is similar when he states "so far we have had little real success in national development, I think, largely because our planning has been too grandiose in scale and unrealistic in character".^{10/}

CHAPTER II

STRATEGY FOR DEVELOPMENT OF MANAGERIAL AND TECHNOLOGICAL CAPABILITIES

(a) Co-ordination of Activities

Having stressed the importance of the role of management and science and technology capabilities in the economic plan of a country, one can now examine how these may be developed and used to help the current economic plan, and succeeding ones, to work. As stated earlier, one of the constraints hampering economic growth is the "absence of significant linkages among productive sectors ... and an inflexible educational system". (See page 1).

Ghana has three universities and a number of national research institutes under the Council for Scientific and Industrial Research. Financial institutions like the banks, and insurance companies exist. Several corporations some of which like the Ghana Industrial Holding Corporation (GIHOC), the Regional Development Corporations, which produce both primary and industrial goods, have been created. There are others such as the Ghana Water and Sewerage Corporation, the Ghana Housing Corporation, the Tema Development Corporation, the Volta River Authority and the Electricity Corporation which produce services. There are also the commodity Corporations and Boards some of which are the Cocoa Marketing Board, the Timber Marketing Board, the State Farms Corporation, the Grains and Legumes Board, the Cattle Development Board, etc. Nearly all these bodies are public organisations whose operations are financed directly or indirectly by the State.

^{9/} A.L. Adu: "The Public Service [of Ghana] and the Administration of Public Affairs", in Proceedings of the Ghana Academy of Arts and Sciences, Vol. XI, Accra, 1974, p.48.

^{10/} E.A. Boateng: "Some Thoughts on the Definition of Targets and Strategies for National Development", in Proceedings of the Ghana Academy of Arts and Sciences, Vol. XI, op.cit. p.81.

The poor performance of most of these state-owned establishments has been a matter of concern to the government. One can safely say that the inefficiency of most of these bodies could be traced to lack of appropriate high quality management, the lack of appropriate technology and the absence of proper linkages.

(b) Mechanism for Co-ordination at National Level

At the national level, there seems to be a need for an effective mechanism for co-ordinating, monitoring and controlling the activities of these bodies.^{11/} The Ministry of Economic Planning appears at this stage ill-equipped to cope with this important work. It will be useful therefore if a mechanism were established to assist the Ministry in doing this co-ordinating, vetting and control service.

The mechanism should ensure that at the national level the appropriate linkages exist among the production fronts (like Agriculture and Industry) the research institutes and education. Through the manipulation of appropriate budgetary valves, the activities of these bodies could be regulated to keep pace with government's economic plans.

To achieve the goals set in the country's economic plan, an integrated total management is required. As the "Guidelines" to the Five-Year Plan has pointed out, relative low level and slow pace of development may be attributed to several factors one of the most important being "the absence of an integral approach to investment whereby complementary projects are simultaneously undertaken with the proper co-ordination and co-operation, organised with the other relevant ministries and institutions in the economy".^{12/} In other words, a mechanism must be developed through which, for example, the production agencies in industry and agriculture are linked with research and development and with agencies responsible for production of skilled technical and managerial manpower and with the financial and commercial agencies.

^{11/} The State Enterprises Secretariat has recently been set up to co-ordinate the activities of the state enterprises.

^{12/} Guidelines for the Five-Year Development Plan, 1975-80, op.cit. p.11.

In the present order of things the Ministry of Economic Planning is responsible for planning the economic development. Logically, it must therefore also assess continually the performance of the economy, and make the necessary adjustments. The Ministry could be strengthened to perform its central co-ordination duties by establishing a cadre of national technical experts 13/ who would advise on:

- (i) technical issues related to the planning of the economy of the country. An important function would be to advise on priorities in the fields of industry, agriculture, education and science and technology;
- (ii) ways and means of establishing the proper linkages between the various organs of the economy, including the strategy for producing the required manpower; and
- (iii) the control measures to be adopted to ensure a harmonious total involvement of all organs in the implementation of economic plans.

It would also:

- (iv) collect data from appropriate sources, e.g. Bureau of Statistics, industry, etc. to be used in economic planning; and
- (v) analyse and assess feed-back information and suggestions from the various sectors of the economy, (including the Planning and Analyses Group (PAG) of the CSIR) and to advise as to how these fit into the national plan.

Since this group will not be able to do everything by itself, it should be free to draw upon expertise available in other national institutions on specific issues or to sub-contract as necessary highly specialised work to competent national organisations or private local and/or foreign consultants, as appropriate.

13/ Where an expertise is not locally available it could be recruited from elsewhere, care being taken, however, that local counter-part personnel is attached to such an expert to under-study him.

(c) Central Project Control Body

Under the Ministry of Economic Planning should also be created a Project Control Unit headed by, perhaps, the Chief Government Economist. The main function of this body would be to ensure that development projects are executed according to the drawn-up plan. The Ministry of Finance may have an important role to play in such a Unit.

(d) Internal Management

The management of the economy as a whole starts at the planning level, but much cannot be achieved if the individual organs - ministries, departments, public corporations and industrial enterprises (both public and private) are not properly organised. The function of each organ should be properly spelt out and be made known as widely as possible. Each organ should then be restructured to ensure that its activities dovetail into those of other related organisations.

An example of this type of mechanism is the Planning and Analysis Group (PAG) being developed for the Council for Scientific and Industrial Research. The functions of the PAG include:-

- (i) the provision of analytical studies needed by the CSIR to carry out its broad advisory function [as stated in its Instrument of Incorporation;^{14/}]
- (ii) collaboration with the Ministry of Economic Planning with a view to identifying priority areas of national development where scientific and technological advice is needed.^{15/}

Properly manned and managed this machinery will dovetail into the planning mechanism of the Ministry of Economic Planning.

^{14/} See pages 14 & 15

^{15/} Council for Scientific and Industrial Research: Workshop on the Role of the Council for Scientific and Industrial Research in Determining Science Policy and Research Priorities, Accra, 1973, p.18.

In the streamlining of the management of the various component organs of the economy, special attention will have to be paid to manpower needs. One talks now about the professionalization of ministries. This implies the judicious use by each Ministry of the professional expertise it needs, for the performance of its functions. This expertise could come, on a planned basis, from both the Ministry itself and from outside it, e.g. from the universities, public corporations and private firms. This type of mobility will ensure a more rational use of manpower in the country.

This sort of arrangement is particularly necessary in the Ministries of Agriculture and Industry. It is only through a dynamic and pragmatic organization, planning and execution that projects under these ministries could be effective. For this purpose the ministries should help develop the relevant capabilities within and outside themselves. Employees should be given intensive initial training and the opportunity to have refresher or attachment courses regularly to improve upon their efficiency. Training courses which should expose key civil servants to production skills at the factory floor-level is essential if they are to take pragmatic decisions on matters affecting production units.

In this connection one needs to consider seriously Adu's proposals regarding what he calls the "re-tooling" of the public service as a means of improving efficiency through the increased use, in the service, of modern administrative and management techniques that have proved successful in industry. To this end he recommends the selection and training of bright young graduates with varying academic backgrounds (scientists, engineers, social scientists, etc.) on similar lines used for training products of the Ecole Nationale d'Administration of France, using "a revitalized" Ghana Institute of Management and Public Administration (GIMPA) for the purpose. He suggests a course of 2 to 3 years duration which should end with a stiff examination to ensure high standards.

The subjects to be studied should include applied economics, planning, including rural planning, and a modern language. He has not mentioned any language but one would think that with the creation

of the Economic Community of West African States (ECOWAS) the study of French should be encouraged in such a course. On employment the graduates of such a training college "would specialize over a period of time in particular sectors of the economy and system to avoid the generalist approach to management which has proved to be ineffective in this stage of the country's development".^{16/}

For such a course to be successful GINPA itself has to be strengthened and the contents of the proposed course well chosen through the participation of such organisations as the National Council for Higher Education, the Management Services Division of the office of the Supreme Military Council (SMC), the Public Services Commission, the Management Development and Productivity Centre, and individual specialists.

Conditions of service should be such that the services of good personnel could be obtained and retained. As Adu has also rightly pointed out, young men and women are not now motivated by the "king and country" spirit in choosing to enter the public services.
^{17/} Appropriate equipment should be procured for use in work places and arrangements made for the replenishment of spare parts.

(e) Institutions to be involved in Developing a National Programme for the Development of the Capabilities

As has been said it is an integrated development of the economy that is required. Science and technology, education and the production fronts would have to work very closely together. These same arms of the economy would have to work together in developing the technological and managerial capabilities.

For convenience, however, some of the bodies that can play a role in drawing up a national integrated programme for the development of these capabilities have been listed under three categories.

^{16/} A.L. Adu, op. cit. p.62 & 63

^{17/} ibid, p.61.

Category A : Those bodies concerned mainly with science and technology;

Category B : Those concerned mainly with management

Category C : Others

This categorization is arbitrary and the lists are not necessarily exhaustive.

Category A: The institutions that come under this category are:-

(1) The Council for Scientific and Industrial Research (CSIR)

The Council for Scientific and Industrial Research was established in its present form in 1968, but its beginnings date back to 1959, when its precursor, the National Research Council, was formed. It has the Animal Research Institute, the Crops Research Institute and the Soil Research Institute which are purely agricultural institutes. It also has the Forest Products Research Institute, the Building and Road Research Institute, the Institute of Aquatic Biology, the Food Research Institute and the Industrial Research Institute. There is also the Water Resources Research Unit. A Scientific Instrumentation Centre has been started as a common service unit. The Centre is a joint UNDP/Ghana Government project, with Unesco as the executing agency and the CSIR as the Government's co-ordinating agency.

The CSIR, by its Instrument of Incorporation, has among other functions to:-

- (i) advise the Government on scientific and technological advances likely to be of importance to national development and in particular to advise the Government or other agencies of Government on scientific and technological matters affecting the utilisation and conservation of the natural resources of Ghana and on how best scientific research may be co-ordinated and employed in the interests of such utilisation and conservation;
- (ii) encourage scientific and industrial research of importance to the development in the national interest of industry, technology, agriculture and medicine;

(iii) co-ordinate research in all its aspects in the country;
..... 18/

These functions make the CSIR the main source of technological information input into the production front, at least into the non trans-international sector of the economy. But the evidence suggests that the activities of the CSIR have not had the desired impact on production. Ayensu, commenting on the performance of some organizations in Ghana has this to say: "While several countries have relied on similar organizations for their economic development, the performance of CSIR has been disconcerting so far. The need for pursuing the kinds of research that could be linked to the economy of the country has never been realized."^{19/} He feels that the problems of the CSIR are due to its poor organizational structure and management of the institutes, "the constant neglect of the programme orientation and the fact that nobody seems to be in charge of CSIR accountability".^{20/} Other things on which Dr. Ayensu blames the problems of this organization are poor support given the institutes by government, the neglect of involving the private sectors of the economy in supporting worthwhile research in the institutes and the dearth of high calibre staff with inventive and innovative qualities".^{21/} The above statements show that not all the problems are of the making of the CSIR itself.

Luckily, the government is taking steps to examine and correct the faults listed by Dr. Ayensu and to diagnose any others that might be hampering the progress of the organization which, if made to function well, has an important role to play in the development of the country.

^{18/} Para.4 of N.L.C.D. 293 of 1968.

^{19/} E. Ayensu, op. cit. p.28

^{20/} *ibid.* In this regard he recommends that "the CSIR should participate actively in the introduction of intermediate technology especially in the areas that could help the small farmer and should encourage industries to engage in import substitution."

^{21/} *ibid.*

It is necessary to consider in this exercise the comprehensiveness and the balance of the research institutional network in the country so that the deficiencies could be corrected. Closely connected is the assessment of the design of the existing research institutes. Where necessary action should be taken regarding their streamlining. Here, as well as in other sectors, the balance among different types of personnel has to be established. As already mentioned, there is need for more skilled middle grade personnel.

To be singled out for comment is perhaps the current weak situation in which the Industrial Research Institute of the CSIR finds itself. This Institute will have to be organized to have the requisite impact not only on industry but also to play a leading role in the transfer of technology in Ghana. The functions of this Institute may have to be well redefined and concrete measures taken to boost it up using both national and international resources.

Similar treatment may have to be given to all the existing institutes of the CSIR to make them strong enough to enable the CSIR perform the duties assigned to it by its Instrument of Incorporation. A weak CSIR cannot inject dynamic inputs into the productive system.

Common to nearly all research establishments in the country is the lack of facilities to enable projects to reach the developmental stage and beyond. To be able to convince entrepreneurs to use research results, it is often necessary to go beyond even the pilot plant stage to the up-scaling stage. Without such demonstration facilities any research result may remain unused.

With the creation of the PAG it is hoped there could be continuous internal appraisal of the CSIR with a view to detecting any functional deficiencies and taking appropriate steps for their correction.

(2) The Universities

The various science and technological departments help directly or indirectly in the development of management and technological capabilities. There are now three universities in the country - the University of Ghana, Legon, the University of Science and Technology,

Kumasi and the University of Cape Coast. The Faculties of Agriculture of the three universities have research facilities which complement the agricultural research efforts of the Institutes of the CSIR.

(i) Technology Consultancy Centre (TCC)

The University of Science and Technology has a Technology Consultancy Centre which was established in 1972. Through this Centre the University makes available to industries, both private and public, the expertise of qualified professionals from all faculties and departments of the University. With improved staffing position and with more funds this Centre can provide needed consultancy service to industry. With more facilities the Centre should be able to give more "total consultancy service" (i.e. service covering all aspects of the production of goods from the planning stage through the factory floor-level to the marketing stage), to the local manufacturers. In this respect co-operation could be developed between the CSIR and the TCC.

The Department of Economics and Industrial Management has an important role to play in the provision of the "total consultancy service". It needs therefore to be strengthened to be able to perform this function efficiently in collaboration with the TCC.

The Centre proposes to establish so-called Intermediate Technology Transfer Units as sub-stations at Tema, Nakoradi, Suame in Kumasi, and at a suitable place in the north of Ghana.^{22/} Each Unit is to serve two Regions of the country nearest to it.

(ii) Land Administration and Research Centre (IARC)

This is a recently created centre within the University of Science and Technology, to undertake research into land administration including land tenure systems in Ghana. The results of research of this Centre will help agriculturists and banks financing agricultural production.

^{22/} J. . Powell: Technology Consultancy Centre - Five-Year Development Plan 1975-80. Kumasi, 1975, p.4.

(iii) Centre for Development Studies (University of Cape Coast)

This is a Department of Cape Coast University engaged in Development Studies. The Centre's activities particularly those bearing on problems of technology transfer are of importance to the development of the capabilities in question.

(3) Research and Technological Services Centre

It is a Centre jointly set up in August 1976 by the Ghana Manufacturers' Association (GMA) and the Government of Ghana, to:

- (i) assist manufacturers to identify their problems and offer guidance and assistance (including contacts with appropriate institutions) for solving their problems;
- (ii) assist manufacturers in preliminary project studies and investigations, market surveys, etc;
- (iii) provide information on manufacturing industries particularly on suppliers of machinery and equipment and raw materials, on consulting firms, export opportunities, ^{and} technological research results.

The Centre is still in its formative stages and has to be watched and guided so that it does not duplicate unnecessarily what the T.C.C. or CSIR are doing. Properly developed it could be a convenient contact point between industrial entrepreneurs on the one hand and government and technological researchers on the other.

(4) Cocoa Research Institute

The Cocoa Research Institute, which is the research arm of the Cocoa Marketing Board and the Ministry of Cocoa Affairs, deserves, in this regard, prime of position, being the Institute that maintains the one crop on which is pivoted Ghana's economy.

(5) Miscellaneous Technical Organisations

Other organisations that could be drawn into the joint venture would be those departments, ministries and corporations which have their own scientific research and experimental activities. To mind come, for example, the Fisheries Research Unit of the Ministry of Agriculture, the Department of Forestry, the Environmental Protection Council, the Geological Survey Department, the Centre for Research into Plant Medicine, (Maspong), the Centre for Radio-Isotope Application (Kwabanya) and the Ghana Standards Board. Service institutions related to meteorology, information and natural resources survey, have an important role to play. There is a need for critical examination of the last-mentioned category with a view to ensuring the comprehensiveness of such services in the country. Accurate natural resources survey is very vital for both research and industry. In this regard fairly sophisticated procedures, like remote sensing, may have to be used for which local personnel would have to be trained.

Category B - The following institutions come under this category:-

(1) The Management and Productivity Centre

The Institute was established in its present form in 1967^{23/} to introduce suitable practices and techniques to promote increased productivity, and to improve and develop the standard of management in all aspects.

To achieve the above aims the Institute organises graded training courses, seminars and conferences for personnel drawn from all sectors of industry. In other words, its work is to improve, through provision of refresher courses, the proficiency of personnel already employed. It provides consultancy services to industrial as well as governmental bodies.

(2) The School of Administration (University of Ghana)

The School was established as the College of Administration in 1960. It really, however, started a few years earlier as the Department of Commerce in the Kumasi College of Technology (now known as University of Science and Technology).

^{23/} It is the successor of the former National Productivity Centre established in 1964.

It was established as a full school in 1960 to train administrative and accounting personnel for the newly independent Ghana which needed skilled men to fill the vacancies created by the departure of expatriate colonial officers, the expanding economy and public administration. The moving of the School to Accra was to enable the students to be exposed to the business and administrative environment centred around Accra.

In 1962, the College became a school of the University of Ghana, governed by the statutes of the University. It however has its own Advisory Board with membership drawn up from business, industry and the public service, under the chairmanship of the Director of the school. The Board advises the school on its courses. The school now offers a three-year degree course - B.Sc. Administration - with the following optional areas: Accounting, Business Management, Hospital Administration and Public Administration. Two-year Diploma courses are offered in Accounting and Public Administration. The following graduate courses are now offered:-

A two-year course leading to the Master in Public Administration degree (MPA);

A two-year course leading to the Master in Business Administration degree (MBA); and

A year's graduate Diplomat course in Accounting.

Since it became part of the University of Ghana, 500 first degrees and 1,200 diplomas have been awarded to students of the school.^{24/}

The courses of the school concentrate on general business administration, public administration, accounts and hospital administration. Production management is not covered in detail.

^{24/} University of Ghana - School of Administration; Programmes in Administration 1976-78, Accra, p.5.

(3) The Ghana Institute of Management and Public Administration (GIMPA)

The Institute was established by Executive Instrument 117 of 30th June, 1961 as The Institute of Public Administration. For the first five years of its existence, it was a joint UN Special Fund/Ghana Government project.

The objectives of the Institute include the following:

- (a) to promote the study of public administration and management in Ghana;
- (b) to strive to develop in management a greater awareness of the changing values and needs of the community and the best means of effectively responding to those values and needs;
- (c) to educate senior executives in the best ways of maintaining the vitality and integrity of their organisations and thereby assisting the economic development of the country -
to assist Ghanaian enterprises to achieve through better management, increases in productivity and profits and more effective cost control.^{25/}

In 1969, it was redesignated by NIGD.381, the Ghana Institute of Management and Public Administration when offering a course in Advanced Management Course was made an additional function of the Institute. At present the Public Administration Studies Division of the Institute provides an academic year's training course for lower-middle level managers of the Public Services and also provides ad hoc tailor-made courses for senior personnel of the Public Services including Public Corporations.

The Advanced Management Studies Division provides management courses for the upper segment of middle management and functional courses for groups of managers drawn from all sectors of the economy. These courses last on the average for about 8 weeks. The Research and Consultancy Division provides consultancy services to outside bodies.

^{25/} GIMPA: Calendar 1976-77, p.12

The Institute, as far as industry is concerned, does not offer management courses as such but in essence, provides what may be called refresher courses to persons already employed by industry and government organisations.

It is necessary that these organisations in consultation and co-operation with industry should evolve a mechanism for the integration of their individual efforts in developing the capabilities under discussion. Without this integration Ghana's efforts in developing the capabilities will be slow.

It must be remembered however that to be able to solve problems of industry mutual trust has to be developed between the industrialist and the researcher, the economic planner, etc. Through discussions the consultant had the impression that some manufacturers are unwilling to reveal the details of the operations of their factories to government officials and other inspectors for fear that their trade secrets would be delivered into undesirable hands. With such mistrust, weaknesses in an industry could not be diagnosed and corrected. It appears this fear may also be nursed against financial institutions like the banks, the insurance companies and the Capital Investment Board which have an essential though indirect role to play in the development of the capabilities in question.^{26/}

Category C - Other institutions

Parallel with the activities of the institutions mentioned under categories A and B above, should be the supporting services rendered by the Central Bureau of Statistics. This Bureau needs to be properly staffed and equipped to collect and collate information using modern techniques. All things being equal the quality of information determines the realistic nature of any plan. Incomplete or doubtful information may lead to the choice of the wrong technology or management procedure.

^{26/} In the present order of things the banks and similar financing agencies are likely to play a more direct role in the development of the capabilities in question, since these bodies give much needed technical advice to their clients to ensure effective use of their loans.

In addition to the services of the Bureau of Statistics, an industrial and technological information network may have to be developed, so that needed information could be promptly supplied to industry. The CSIR may be encouraged to develop such an information centre and co-ordinate the relevant network.

Finally, the financial institutions, particularly the Bank of Ghana, the Investment Bank, the Agricultural Development Bank through their activities could greatly influence the development of the capabilities.

Under this category comes also the Manpower Board, whose accurate assessments are so vital for the development of manpower in the country. More will be said about this Board in the next paragraph. Not to be forgotten, for obvious reasons, is the Scholarships Secretariat.

(f) Manpower

Ghana has a Manpower Board whose main function is continually to assess the manpower situation of the country and to advise us to what should be done to produce the required number and calibre of personnel needed in all sectors of the economy. It has made a number of surveys.

This important service has to be provided with the tools to enable it to analyse its surveys quickly. It should be enabled, in collaboration with relevant agencies, to have micro-analysis of the manpower needs, at least in certain critical areas, using the appropriate statistical and computer analysis designs as necessary. The CSIR could stimulate such work..

Specialized personnel - scientists, engineers, technicians - are necessary for modernisation of production. Gone are the days when a person could be referred to just as an engineer. Engineers, for example, have specialized in different fields. This situation must be reflected in the analysis of the manpower position at any time. Inter-disciplinary production plants need different specialists.

Since the building up of special manpower is a long-term task, long-term forecasts would have to be made by the Manpower Board to enable the training organisations, e.g. universities and polytechnics to gear their programmes towards the achievement of the manpower target set.

(i) Manpower Requirements

The manpower studies carried out in the country have shown that there are many critical areas to be provided with skilled manpower if the economy is to grow. Skills most required are engineering (civil, mechanical, chemical, mining, etc.), architecture, geodetic sciences, geology, agriculture (specialists of all types), veterinary medicine, statistics, natural sciences and mathematicians and medicine. Listed also as shortage areas are accountants and managers.^{27/}

The list shows, however, that the critical shortages are mainly in the fields of science and technology, and in management. A crash programme will therefore have to be mounted to solve the manpower problem.

The universities have been making some effort, but they have not been able to cope with manpower demands in certain areas. From 1961 to 1970 the universities of Ghana produced only 20 chemists, 5 geologists and 214 agriculturists.^{28/} If the figure for agricultural graduates, for example, were to be broken down, serious shortages are likely to be noted e.g. in students majoring in the fields of animal breeding, plant physiology, virology, soil physics, and agricultural engineering.

It will be necessary that the Manpower Board, with the help of Consultants and other agencies, make a micro-level analysis of the manpower needs to enable the training institutions plan their training programmes more realistically. For reliable returns firms and the various bodies may have to be given courses in manpower projections in their various organisations. Based on the assessment of the manpower needs all steps should be taken to evolve a suitable national training scheme.

^{27/} Manpower Division: High Level and Skilled Manpower Survey in Ghana 1968 and Assessment of Manpower Situation (1971), Accra, 1971, pp.6 & 7.

^{28/} ibid. Appendix Table 11A

The "Draft report on the Ghana Comprehensive Manpower Survey 1973/74 and 1974/75" ^{29/} has given as reasons for the shortages, inadequacy of existing institutional, in-plant, in-service or apprenticeship training facilities, unattractive conditions of service, selection, recruitment and promotion procedures; the mis-match between the "World of education" and the "World of Work", the imperfect functioning of the employment market mechanism. The report also draws attention to the fact that there are at present no adequate facilities available in Ghana for training graduates in some specific fields of chemical, metallurgical, mining, and textile engineering, meteorology, industrial management and veterinary sciences, etc.

Judging from the long list of inadequate training facilities the report suggests strengthening, diversification and broadening of training facilities in the country.

Government now awards overseas scholarships to persons requiring training in fields in which training facilities are not available in Ghana. This policy is in order where, in the foreseeable future, only a few persons are needed to satisfy the country's needs. In certain areas, however, (e.g. industrial management training), the country, according to the manpower survey, will need a considerable number in the next few years.

Trained human resources form the greatest asset of any nation. "Bringing out their creativity and potential is the means, as well as, the end of development".^{30/} Since independence, there has been a great expansion in the educational system of Ghana. The system, however, still retains much of its colonial characteristics. There is the need for it to be restructured to the needs of the country's environment and development objectives. The new educational system should impart some scientific knowledge to a broad section of the population. Secondary schools, particularly in the rural areas, should be provided with facilities including good teachers for learning science and mathematics. It is only through such an operation that suitable science students could be

^{29/} Manpower Division of the Ministry of Economic Planning (unpublished).

^{30/} The 1979, United Nation Conference on Science and Technology for Development: A Range of Perspectives: U.N. Paper GE 76-910131, p.7.

provided for our universities and technical schools. Good science teaching may also arrest the present great drop-out rate of science students after the ordinary school certificate level. It is hoped that the new educational system to be launched by the government in 1980 will introduce many healthy innovations.

Existing technical training centres and schools need to be strengthened and more created in areas having none. Practical training at all levels, particularly at factory floor level should be encouraged. This training could be centrally planned and financed so that selected industries could participate in it.

(ii) The Creation and Strengthening of Training Institutions

It would be necessary to start creating or strengthening facilities for training people in the critical areas. As a start, selected fields based on priorities, could be chosen for development of manpower training. One such area is industrial management training. Graduates produced in the universities, to be able to give up their best in industry or in research, need some training in management. In this regard, the Department of Economics and Industrial Management needs special attention.

This is a Department within the Faculty of Social Sciences of the University of Science and Technology formally created by that University in 1973. Its aim is to orient technical graduates to industry by preparing them to develop later into managers and possibly entrepreneurs. Post-graduate trainees are awarded a diploma in industrial management after a year's successful course. The trainees have two terms of theory and a term's practical experience in a firm. Last year, 15 graduates registered for the course, (8 of them specialising in Food Technology). This Department is the only one giving a full basic course in industrial management in the country. If properly developed, it can cater for a felt need.

One would even suggest that the courses of the engineering students at Kumasi should be so structured that by the time of graduation each student should have been exposed to some courses in the basic elements of industrial management. This is very necessary because many of these young graduates are placed in relatively high

managerial positions early in their careers. It is learnt that the University is considering the introduction of the American credit system. Should this materialize there would be no difficulty in fitting industrial management courses into the system. It may be useful if the Ghana Institution of Engineers could be consulted in such an exercise.

What is necessary, however, is the strengthening of the Department. The teaching staff may have to be increased in numbers and specializations to cater adequately for teaching, research and consultancy services (the consultancy in collaboration with the TCC). At present the Department has an establishment of 10 of which 5 are at post and one on study leave. Accommodation is inadequate.

With the permission of the university authorities the strengthening of the Department could be submitted for UNDP technical aid - a project in which the appropriate UN agencies like UNIDO and UNWCO could participate.

(iii) Environment

Finally, in planning and development of technological and managerial capabilities it is essential to remember that although manpower is the most important item, the manpower produced could be rendered ineffective in the absence of a suitable environment. This environment, among other things, is made up of well-equipped work places, continually developing infrastructural facilities covering such areas as communications, health, technical information services, computer services, efficient banking and other financial services and natural resources survey services. Efforts should be made to ensure that school and research laboratories and industrial plants do not only have the basic equipment but that the demand for the supply of spare parts can be met at all times.

As an essential component of the environment may be mentioned the availability of enough entrepreneurs to absorb the trained personnel and research results. It is being increasingly realized, especially in some Asian countries, that in the absence of entrepreneurial skills there is the danger of over-production of technical personnel. Ghana may examine and adapt for use the study and training

centres for entrepreneurship created by India and the Philippines.

31/ Using courses based on modern behavioural sciences, attempt is made to arouse and develop in selected individuals entrepreneurial characteristics. Should the idea be acceptable, such a training course could be offered to selected individuals at the U.S.F. The TCC and the Department of Economics and Industrial Management could jointly organise it and use expertise from other organisations, e.g. GIMIA, the Psychology Department of the University of Ghana, I.I.T.I., and individuals from industry.

Indirect, but equally important, is the prevailing political atmosphere at any given time. A progressive and stable government is essential for the development and retention of these capabilities being aimed at.

Important also is the forging and development of healthy international relationship with other countries, particularly with the neighbouring countries, since some of the development programmes can best be executed in collaboration with other international organs at different levels.

CHAPTER III

RECOMMENDATIONS

Set up a national committee under the aegis of the Ministry of Economic Planning to study in details the situation and make recommendations for an integrated development of managerial and technological capabilities. Serving on this committee should be representatives from the fields of education, research, industry and relevant professional organisations.

Included in this exercise may be:-

- (a) The critical examination of the existing organisations, to see how their efforts could be integrated and co-ordinated.

31/ India has the SIET Institute in Hyderabad. The Philippines operates such a course at its Institute for small scale industry at Manila.

- (b) Proposals for strengthening of existing organisations to make their inputs into the economy more dynamic, e.g. the Industrial Research Institute and the Department of Economic and Industrial Management, U.S.T. Where there are lacunae, proposals should be made for filling them.

In the field of technology

- (c) Evolving a suitable system for technology transfer; since the country already has a Council for Scientific and Industrial Research, this system may consist of a mechanism for the effective integration and use of the services of existing scientific and technological establishments to ensure the proper selection, adaptation and application of technology suitable for the needs of Ghana.
- (d) Developing a network of national technological information services, having links with the outside world to ensure the free flow of technological and industrial information. This could be stimulated by the CSIR.
- (e) Examination of existing research and development institutions and, where need be, redesign, restructure, and streamline with a view to strengthening them.

In the field of Management

- (f) Improvement of the mechanism for financing, co-ordinating and monitoring of research and development activities.
- (g) Evolving a system for the better use of existing capabilities and manpower. (The CSIR's project on Survey of Skilled Manpower in Ghana, in collaboration with the Manpower Secretariat, with the compilation of available equipment and research facilities in the country is a step in the right direction).
- (h) Examining critically the existing infrastructural facilities, and improving weak components and providing new ones, where none exists.

- (i) Improving and increasing training facilities for the various categories of trainees. Adequate teaching facilities should be made available to all pre-university institutions. In this regard, the educational system should be under constant review so that a system appropriate to the needs of the country can be evolved.

In this exercise, it should not be lost of the fact that at present over 70% of Ghana's population is made up of rural people whose needs have to be catered for in all fields - industry, agriculture and social services. To cater for their needs in agriculture, for example, a viable agricultural extension service is imperative. This service is rather weak at the moment in the country.^{32/}

- (j) Making conditions attractive so that skilled personnel could be attracted and retained in all sectors of the economy.

^{32/} The CSIR and its precursor (the Ghana Academy of Sciences) have done creditably since 1964 to draw attention to the need of a good extension service in the transfer of technology to farmers. These efforts culminated in a joint Workshop organized by the CSIR and the U.S. National Academy of Sciences on the subject in 1971 which came out with recommendations. Up till now, however, nothing substantial has been done on the revitalization or reorganization of the agricultural extension service of the country.

³³ See CSIR : Report of the Joint U.S.A./Ghana Committee on Agricultural Extension and Research; Accra, 1971.

CHAPTER IV

FINANCING

The execution of projects based on the above recommendation would involve the provision of large sums of money beyond the means of the government, which has so far made funds available for creating the existing facilities and for maintaining them. Whether to boost up the Institutes of the CSIR or set up the technological information services or a technology transfer system, massive doses of funds in local currency as well as in foreign exchange will be required.

It is recommended that as many avenues as possible be sought for financing identified projects. Apart from the United Nations system (UNDP, UNIDO, UNESCO, FAO), bilateral aid could be sought from friendly countries, and international organisations.

Locally, industrialists and organisations should be encouraged to contribute towards the work of university departments or research institutes by sponsoring projects counted by the institutions.

The most important is to draw the greatest benefit from the various aids and grants that may be forthcoming, by co-ordinating their utilisation.

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*Only those not mentioned against any foot-note.

Abbreviations Used

1. CSIR - Council for Scientific and Industrial Research (Ghana)
2. GIHOC - Ghana Industrial Holding Corporation
3. GMA - Ghana Manufacturers' Association
4. LARC - Law Administration and Research Centre (Kumasi)
5. NLCD - National Liberation Council Decree
6. NRCD - National Redemption Council Decree
7. SMCD - Supreme Military Council Decree
8. PAG - Planning and Analysis Group (of the CSIR)
9. UST - University of Science and Technology (Kumasi)
10. UNDP - United Nations Development Programme
11. UNESCO - United Nations Educational Scientific and Cultural Organisation
12. UNIDO - United Nations Industrial Development Organisation.

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