1992

Advanced integrated curriculum for the training of marine engineers in Nigeria

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WORLD MARITIME UNIVERSITY

ADVANCED INTEGRATED CURRICULUM FOR THE TRAINING OF MARINE ENGINEERS IN NIGERIA

BY

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NIGERIA

A dissertation submitted to the World Maritime University in partial fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

IN

MARITIME EDUCATION AND TRAINING (MARINE ENGINEERING).

1992

I certify that all material in this dissertation which is not my own work has been identified and that no material is included for which a degree has been previously conferred upon me.

The contents of this dissertation reflect my personal views and are not necessarily endorsed by the University

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DEDICATION

This dissertation is dedicated to my nephew late Etim Effiong Abia. He served me honestly and faithfully, but passed away from this life during my studies abroad.

ACKNOWLEDGEMENT

I take this opportunity to thank my course professor, M. Kimura, Lt. Comdr. S. Ohnstad, Capt. J. Cross, Randall R. Fiebrandt for their encouragement, detailed and constructive comments on earlier drafts, which helped me greatly in preparing final version of the dissertation.

In addition, I thank Dr. I.E. Douglas and Capt. E.O. Agbakoba for the valuable input that I received from them during the period of writing this dissertation.

Finally, I thank my colleagues Uy Van Dang, Erdal Adnan, Parnupong Pattisink and Abebe Araya for the part play to bring what seems a hurricane task to the successful end.

To my wife and children, I am grateful for the patience, and the endurance for two year in pursuance of the programme. My wife Ikwo, was intimately involved with helping me to collect some of the information. Without which it could not have been possible. I am forever indebted to these people.

ABSTRACT

The existing marine engineering curriculum in Nigeria was designed and installed between 1977 - 78, but came into operation in 1979. It is more or less, a pattern of the United Kingdom's old system.

The programme focuses less on education but more training on shipboard operation.

The programme proved to be very useful, in that it produces skilled operators needed for ship operation. But fails to provide flexibility for someone wanting to change for new jobs ashore.

Curriculum can never be static. Not only is it unlikely that a single curriculum could ever be agreed upon, but one curriculum could not satisfactorily meet the legitimately varied educational goals. A multiplicity of paths to certificates and engineering degree would be best.

The changes in professional activities have a strong influence on objectives and contents of engineering training. The present curriculum is based on the **Standard of Training, Certification and Watchkeeping for Seafarers, (STCW), 1978.** There is a low level of trust everywhere in the convention. Its prescriptions is not only out of date with machinery but the ship design, multi-purpose programme, and automation system.

This dissertation, therefore, is necessitated by the needs to restructuring and upgrading the existing curriculum to the bachelor degree level. This is supposed to run in parallel with Certificates of Competence.

Education (NBTE), in the other hand. The paper, therefore, suggested means to either bridge or narrow the gaps.

I have used the **Standard of Training, Certification and Watchkeeping for Seafarers (STCW) 1978**, as a minimumn standard for License. This level should be exceeded to meet the requirements of Nigerian Acceditation Board for purpose of degree award.

For the new approach, I have recommended the curriculum to be divided into knowledge acquisition and skill training. The idea being to maintain a balance between the fundamentals and specialization.

I have listed out the existing facilities in the Maritime Academy and the training scheme. I have also enumerated the deficiencies connected with the scheme, for which reasons the cadets and the industry are getting the real of time and investment.

For solution, I have shown in my recommendation, how the proposed curriculum can be implemented, with little or no constraint. This proposal is to take account of the drastic and revolutionary changes in the maritime industry.

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LIST OF ACRONYMS

ACP	African, Caribbean and Pacific
BIMCO	Baltic International Maritime Council
DWT	Deadweight Tonnage
ECOWAS	Economics Community of West Africa States
FOB	Free on Board
FCC	Federal Craft Centre
GMDSS	Global Maritime Distress and Safety system
GCE	General Certificate of Education
IMO	International Maritime Organization
ISF	International Shipping Federation
IMLA	International Maritime Lecturers Association
MSA	Maritime Safety Administration
NNPC	Nigerian National Petroleum Corporation
NNSL	Nigerian National Shipping Line
NPA	Nigerian Ports Authority
VTS	Vessel Trafic System
FRONT-LOADED	A standard system of training in which the basic academic knowledge needed, is given in one continuous part prior to the skill training and experience.
SANDWICH-SYSTEM	The system of Maritime Education which is made up of alternate times of academic studies and skill training.

CHAPTER I

INTRODUCTION

1.1 HISTORICAL BACKGROUND

"From the dawn of history, maritime trade was carried on by merchants who conveyed their own commodities and sometimes those of others" (Rinman and Brodefors, p.10).

History shows that the geographical position of Nigeria made early contact with the European merchants possible. Nigeria comprises a number of areas formerly under separate administrations. Lagos, ceded in August, 1861 by King Dosumu, was placed under the governor of Sierra Leone in 1866. In 1874 it was detached, together with the Gold Coast (now Ghana) colony, and formed part of the latter until January 1 1986, when a separate "colony and protectorate of Lagos" was constituted".

Apparently, the United African Company had established a British interest in the Niger valley and in July, 1886 the company obtained a charter under the name of the Royal Niger Company. In January, 1900, the greater part of its territory was formed into the protectorate of Northern Nigeria.

Along the coast, the Oil Rivers protectorate had been declared in June 1885. This was enlarged and renamed the Niger Coast protectorate in 1893, and on 1 January 1900, by absorbing the remainder of the territories of the Royal Niger Company, it became the protectorate of Southern Nigeria. In February 1906 Lagos and Southern Nigeria was united into the "colony and protectorate of southern

Nigeria".

In January, 1914 the Northern and Southern protectorates were amalgamated to form the "colony and protectorate of Nigeria", under a governor-General. October 1, 1954 Nigeria became a federal state. In 1960, Nigeria became a sovereign and independent country.

1.2 GEO-POLITICAL INFORMATION

Nigeria is a Federal Republic with thirty constituent states as at August 1991. It is located on the west Africa, and falls whithin latitudes 4 and 14 and longitudes 3 E and 15 E. It covers a land area of 923, 768 sq.km. and is bordered to the west by the Republic of Benin, to the north by the Niger Republic and to the east by the Republic of Cameroon. Nigeria also shares a common border on the Lake Chad with the Republic of Chad to the north-east; while the Atlantic Ocean demarcates its southern coast line.

The Nigerian land mass is drained by many rivers and waterways incuding the two major ones, the River Niger, from which the name derives, and the River Benue. The two rivers form a confluence at Lokoja in the centre of the country from where the River Niger fans out into a delta before flowing into the Atlantic.

There are two main seasons in Nigeria; the rainy season which lasts from April to October, and the dry season, which runs from November to March. The vegetation of the country ranges from the Mangrove forest in the delta area of the southern Nigeria through tropical rain forests and the Sudan savannah in the extreme north. The temperature in the southern part of the country is somehow stable and does not normally exceed 32 degrees centigrade whereas in the north it goes from 13 centigrade to 40 centigrade.

Nigeria is a federal state. Origionally, Lagos was the federal capital, but this status has seen been removed to Abuja the new federal capital city. Lagos now remains commercial centre and seaport.

Nigeria comprises of 30 states. The states include Abia, Adamawa, Akwa Ibom, Anambra, Bauchi, Benue, Borno, Cross River, Delta, Edo, Enugu, Imo, Jigawa, Kaduna, Kano, Katsina, Kebbi, Kogi, Kwara, Lagos, Niger, Ogun, Ondo, Osun, Oyo, Plateau, Rivers, Sokoto, Taraba, Yobe and Abuja the federal capital territory.

1.3 SOCIAL-ECONOMIC INFORMATION

There are about 252 ethnic groups and languages in Nigeria. However, Ibo, Yoruba and Hausa are spoken, but English remains the official language of the country. Christianity and Islam are the two main religions, therefore, by the constitution the country is a secular state.

Nigeria has substantial natural resources. Properly exploited, Nigeria's fertiled land is capable of making the country self-sufficient in food. The country also has substantial quantities of minerals like petroleum, natural gas, coal, colombite, gold, limestone, manganese, tin and uranium.

Broadly, Nigeria is one the largest producers of petroleum in the World. Its production target for the first quarter of 1991 was 2.1 million barrels per day, while proven reserves at the end of 1990 were 17.1 billion barrels. Since then more oil has been discovered. The natural gas reserve are even more substantial.

The country is an agricultural country, agriculture sector of the economy employs nearly 65% of the working population. It accounts for 28% of the gross domestic product (GDP). Crude Oil sector accounts for about 30% of the GDP. However, the economy depends so much on revenue from the petroleum export, because it accounts for about 82% of the country foreign exchange requirements.

1.4 POPULATION

Nigeria's population provides a large human resource pool and it has invested substantially in education and training of its manpower. In view of its great economic potential, Nigeria is a developing country, whose economy depends largely on the export of petroleum for its foreign exchange earnings. However, with prudent management the future of Nigeria is guaranteed. It is now self-sufficient in food and its industrial base is large enough to meet domestic requirements and exports.

Population census has always been a thorny issue in Nigeria. But Babangida's administration has succeeded to produce a census that by and large is acceptable and seems reasonable to the vast majority of Nigerians. The population of Nigeria is 88,514,501. The break down against the 30 states are follows:

CENSUS FIGURES

STATE NAME	POPULATION PER STATE
- Abia	2,297,978
- Adamawa	2,124,049
- Akwa Ibom	2,359,736
- Anambra	2,769,902
- Bauchi	4,294,413
- Benue	2,780,398
- Borno	2,596,589
- Cross River	1,865,604
- Delta	2,570,181
- Edo	2,159,848
- Enugu	3,161,295
- Imo	2,485,499
- Jigawa	2,829,929
- Kaduna	3,969,252
- Kano	5,632,040
- Katsina	3,878,344

- Kebbi	2,062,226
- Kogi	2,099,046
- Kwara	1,566,469
- Lagos	5,685,781
- Niger	2,482,367
- Ogun	2,338,570
- Ondo	3,884,485
- Osun	2,203,016
- Oyo	3,488,789
- Plateau	3,283,704
- Rivers	3,983,857
- Sokoto	4,392,391
- Taraba	1,480,590
- Yobe	1,411,481
- Abuja	378,671

Country Total = 88,514,501.

SOURCE: West Africa March, 1992.

1.5 WATER\PORTS

The government has established eleven River Basin Authorities, for water resources development. The principal ports are, Lagos, Port Harcout, Tin Can Island, Onne, Warri, and Calabar. There is an extensive inland waterway.

1.6 INTERNATIONAL ORGANIZATIONS.

Nigeria is a member of the following organizations: Economic Community of West African States (ECOWAS), Organization of African Unity (OAU), Organization of Oil Producing Countries (OPEC), Commonwealth, United Nations Organization (UN), and the International Maritime Organization (IMO). Additionally, Nigeria is a party to fourteen IMO conventions. It holds an African Caribbean and Pacific (ACP) status in the European Economy Community.

Nigeria is blessed with an abundance of marine resources. It has many rivers, lakes, and lagoons. On the south, it has a coast line of about one thousand nautical miles. It has also an annaul trade volume worth more than two million metric tonnes.

It enjoys a status of a maritime state in the west African sub-region. But it is not a maritime state in a true sense of such a definition, like Norway, Japan, the United States of America and others. The fact is that the ruling colonial power, Great Britain was a great maritime state, within the true sense of such definition, and attempted to induce such maritime interests upon Nigeria.

1.7 MEANS OF TRANSPORTATION.

Naturally, seafaring is a learning while you work occupation. The main reason for this might be because the seafaring is one the oldest professions known to man. In Nigeria, coastal communities, along the bank of Oron, Cross River, Opobo Rivers, et al, used rafters, floating wood, bamboos, calabash and other forms of floaters, tied together for transportation. These floaters, were relied on ebb and flood tides.

Carved canoes (miniature boats) made out of single logs and powered by means by hand paddles were later introduced. By 1846, the canoes were highly developed and were used freely to convey passengers and goods from one coastal town to another. Fishing was prominent and was mainly the principal occupation for a good number of coastal communities as a result of improved of canoes.

1.8 THE EARLY TRAINING METHOD.

The training and education of seafarers was purely informal in approach. Broadly, man has always been able to use the oceans as a means of transportation. However, he was not a seafarer in the true sense of the word. Somehow, life at sea is different from the natural mode of living. Basically it takes several years of practical experience for one to adjust to a seaman's life.

Traditionally, an average Nigerian seafarer in those days, started a seagoing life in youth as an apprentice. The young man promised to serve the master obediently and faithfully, the master was also under obligation to teach him the art and tricks of the profession.

It is worth mentioning that international trade was under the control of the private companies. The only training schools in the country were organized by the private companies. The so-called training schools could just produce quarter masters, river-master, marine engineering assistants, et al.

1.9 COLONIAL INFLUENCE AND LEGACY.

In particular, the influence of Britain is felt in Nigerian shipping and maritime circles up to the present. Broadly, Nigerian maritime education training must be seen in that perspective. When Nigeria was a British colony, and of course even beyond that time when Nigeria was either self-governing or semi-independent, British shipping laws became Nigerian shipping laws.

There have been relatively few changes to basic evolution since then. At at present, wordings of Nigerian shipping Acts reflect the British system. One is not suggesting that something was wrong with all this. Nigeria simply followed what the former British colonies did. In between early and late 1950s, some remarkable progress was recorded in Nigerian international trade. This saw the establishment of a Ports Authority in 1950. It was not autonomous but was simply placed under the department of marine affairs.

1.10 THE NATIONAL IDENTITY

As a result of bouyant economy in the maritime sector, the following departments were created: Government Coastal Agency, Nigerian National Shipping Line (NNSL) and Nigerian Navy Notably, immediately after independence in 1960, the Maritime Safety Division and the Nigerian Merchant Shipping Acts came into effect in 1962. (Otobo, WMU, 1985).

The problem, however, was that Nigeria was different from Britain in many ways, but most importantly, Nigeria did not have the maritime consciousness which underpinned the British maritime policy and MET. As Nigeria developed its own national identity and economy more and more, maritime considerations became less an issue. However, it also shows a that long-term Nigerian maritime policy was not in the forefront of national thinking.

1.11 NATURE OF CURRICULUM.

The pattern for a integrated curriculum for the training of the marine engineers, which this paper proposes, differs from the dual-purpose or bivalent programme. What is being proposed in this paper is a curriculum which will bring together both instructions designed to make a potential marine engineer succeed in his profession as well as give him an Academic degree. It is also suggested that consideration be given to the creation of professional degree programmes for students inclined towards practice. Such a programme, without thesis requirement, might offer a master degree of Engineering (M.E), or might be cast as a B.SC-M.E. dual degree programme.

As for a bivalent system the Nigerian economy, its work ethics and culture can not support the dual- purpose MET system. When we talk about a change in technology, we should also keep in mind that this will bring a disruption in social settings. We often hear people ask such a question as "How has Japan sustained technological change without social and organization disruption? In this consideration, Nigeria should learn from Japan and Western approach. For instance, new technology or development is normally based on a long term view of the needs of the nation or organization and relies heavily on appropriate learning systems. Japanese problem solving ability is supported by the industriousness of its people, the standard of education, and a relatively stable labour management.

1.12 BACKGROUND PROBLEM.

The Maritime Education and Training is perhaps the least studied and understood sector of education in Nigeria. The reason might be because few of those who administrate or write about Maritime education have been through Maritime education, or it could be because the market is comparatively small.

Principally, another factor could be because of all sectors of education, maritime education is subject to constant change in response to the pressures of new technologies. This common element of change, together with other strands, unites widely different developments between Maritime education and other sectors of education.

The history of Maritime Education and Training in Nigeria can not be complete without special reference to MET in the United Kingdom. Before the first established government owned MET programme in Nigeria, MET was organized by private companies, and it was badly done. This system produced mediocre types of seafarers, even though the system was approved by the law.

In the words of Akinsoji (34), candidates for "examinations for the certificate of competency" have always had to study on their own and as a result "the performances were never commendable." He stated that in most cases examiners have had to relax to a " ridiculous level" (Akinsoji, p. 34).

1.13 ACADEMIC CONTENT

The existing curriculum lacks the necessary academic and professional contents which is suitable for the training of today and tomorrow. It is not broad-based, the change which is being proposed in this paper should result in cadets focusing on broad rather than concepts, paying more attention to social, economical and political context of marine engineering practice, as well as written and oral communication skills.

In the words of Gerald, "The engineering curriculum should be taught in the context of the real world to enable engineers policy process" the way we legislate technology today is based on law, and not on technology. Engineers (ibid) need to play a more responsible role in leading the society and explaining the technology to the society (Engin. Edu.vol.11,1988).

1.14 HYPOTHESIS.

In this case, the hypothesis is to give a short answer to the problem, to see whether the study is valid or not. Therefore the hypothesis of this study will be framed as follows:-

A. There is no relevant difference between the existing marine engineering curriculum in Nigeria and the requirements of the Standard of Training, Certification and Watch-keeping for Seafarers (STCW) 1978, International Convention for the Safety of Life at sea (SOLAS 1974/78).

B. There is a relevant difference between the existing marine engineering curriculum and the requirements of the Standard of Training, Certification and Watch-keeping for the Seafarers (STCW , 1978), International Convention for the Safety of Life at Sea (SOLAS, 1974/78).

1.15 SIGNIFICANCE OF THE STUDY.

This study is interested in a new approach to the training of marine engineers in Nigeria. The paper Proposes that training starts off on a clean slate. The curriculum of the existing marine engineering programme, both at the Maritime Academy and at the River State University of Science and Technology Port Harcout, have no introductory courses that cover decision making, design, methodology, time management, study skills, laboratory report writing, philosophy and ethics an engineer may need during his years of study and life time practice.

As we observe closely, training too has come a long way from "chalk and talk". Simulators are capable of accelerating experience in a way that was never before. They can provide much more than training in radars, to the operation of main machinery and pump room controls, cargo control handling and much more. These areas, though expensive, provide good ingredients for the training of the new breed of marine engineers.

Godson argues, " the status of subjects tends to be measured by the extent by which they moved away from the utilitarian or pedagogical traditions and have become academic" (Godson, 1983).

This becomes relevant in the sense that the existing curriculum appears to be running a race against time. The progress of marine automation and the application of other technological advancements are likely to be delayed in the Nigerian Maritime industry by a lack of well trained and educated personnel. It remains doubtful whether the number of new breed marine engineers will be sufficient to match the needs of future ships. This could only be a reality if a face lift is given to the existing curriculum.

Looking at the dramatic turn of event and development in the maritime industry, Bryan made the following observation:

> the development of the microprocessors in the electronic engineering and its impact upon all facets of mechanical and electrical engineering are proving to be a watershed; and on that watershed is a signpost which indicates that the professional marine engineer needs to add a further competence to the many faceted talents which are required to design, build, and maintain the very varied structures which operate on, over or under the sea, (Tran. Imar. E (TM), vol. 97,

pl, 1985).

When we take a critical look at such areas as machinery control monitoring, alarm and safety system, optimization of machinery efficiency and others. It is this wide spectrum of ship-board use that expedite the wider introduction of microprocessor and personal computer (PC). This development calls for upgrading and updating the existing curriculum.
Figure 1.1 shows areas where micro-based system are being used in the modern shipboard system and management.

Good engineering combines the quality of common sense, good economic, and elegant simplicity. Adequate improvements in the latter two qualities are often found by stepping outside the boundaries of conventional Marine engineering practices, which have evolved through optimization rather than innovation.

Many developments in engineering came as a result of using ideas born in parallel disciplines. For instance, marine and aircraft automation depend so much on electronics engineering. Taking advantage of such new techniques may involve re-tooling and re-education of large sectors of marine industries. It is only by such adjustment and adaptation that the marine industry can survive in Nigeria.

1.16 THE SCOPE

The limit in dissertation will be a certificate of competency in the Maritime Academy of Nigeria and the bachelor of technology degree in the University of Port-Harcout Nigeria. When the need arises, references will be made to The International Convention on the Standards of Training, Certification, and Watchkeeping for Seafarers, (STCW) 1978, International Convention for Safety of Life at sea, (SOLA).

This paper is not intended to be a report like those of experts or committees. Rather it is an academic exercise. Education writing today is in an age when criticism has overpowered creation. Awed by watchful eyes of my colleagues in the academic profession, and learned professors, I will as often as practicable, try to take refuge in professional magazines, text books, specialized dissertations, and others which can easily defend me from attack.

1.17 METHODOLOGY.

Instruments and data collection for this study will be descriptive, obtained from reference books, marine engineering journals, newsletter, newspapers, professional engineering bodies.

Data collection was also largely by means of a structural interview plan. Items on the schedule sought answers to the research questions. A random sample of some seafarers was selected for pretesting of the schedule, and the split-half reliability co-efficient of 0.72 was obtained. Some of the items were administered to the seafarers.

Near a 100 % response rate was achieved. In addition, one set of each of the unstructured interview schedules was administered to some officials in the Ministries of Education and Transport, lecturers in the Maritime Academy of Nigeria and the River State University Port Harcout, were all inclusive in the interview. A cross section of the students and cadets in the two Institutions were also interviewed.

In view of the above, changes in the marine industry, since the last few years, have been extensive. My proposal, therefore, is to take account of the drastic and revolutionary changes.

FIG. 1.1 INTEGRATED SHIP SYSTEM

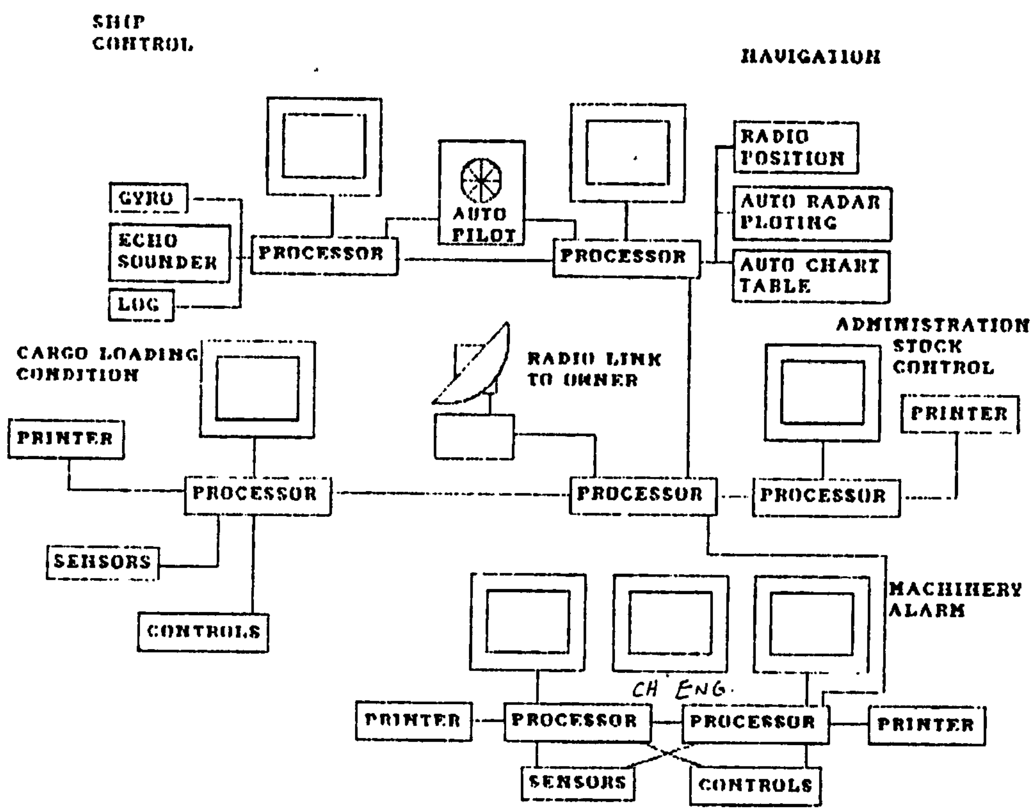


Fig. 1.1 Integrated Ship System.

Source: B. Hildrew. Institute of Marine Engineers.

CHAPTER II

EDUCATION AND TRAINING

2.I INTRODUCTION.

Tanner maintains that, " the study of the curriculum history can identify past problems that have interfered with the curriculum reform, which may provide lessons to help contemporary curriculum workers". Curriculum specialist can, she suggests, overcome immediate difficulties by searching for similar problems in the past (Tanner 1982 p.406-07).

In 1951, Nigeria was divided into three regions namely, Western, Eastern and Northern, and education became a regional function, administered by a regional Board of Education and Ministry of Education headed by a minister.

The curriculum was an integrated one aiming at socialization and character building. At the lower level, it was traditional. Fufunwa identified seven common educational objectives around which the traditional curriculum was organized:

- to develop the child talent and physical skill.
- to develop character.
- to inculcate respect for elders and those in position of authority
- to develop intellectual skills.
- to acquire specific training and to develop a

healthy attitude towards honest labour.

- to develop a sense of belonging and to participate actively in family and community affairs.

- to understand, appreciate and promote the cultural heritage of the community at large.

(Fufunwa, 1974).

In general, the existing education system provides six years of primary education, three years of junior secondary, three years of senior secondary and four years of University or tertiary system, simply cast as a 6-3-3-4 system.

2.2 TECHNICAL EDUCATION AND THE NEW SYSTEM.

The current structure of the technical education permits the existence of gaps within the various levels of this system. These gaps are clearly seen in both the old system and the present 6-3-3-4 system.

This unorderly structure makes transition from one level to another difficult. In a well designed system, it should be possible for a person to enter the system at the bottom and come out at the top, if his ability permits. Someone should be able to move freely within the entire educational system, sideways or upwards as he may choose. The author has suggested a way out of this.

2.3 NATIONAL POLICY ON TECHNICAL EDUCATION.

In 1983, the National Policy on education defined technical education as "that aspect of education which leads to acquisition of practical and applied skills, as well as basic scientific knowledge". In his definition, Olojo, (7) defines technical education as "that education designed to prepare individuals for entrance into and progress within technical educations. It requires an understanding of the fundamental laws and basic principles of mathematics, sciences and technology supported by appropriate courses". (Olojo, 1987, PP.9).

2.4 OBJECTIVES OF TECHNICAL EDUCATION.

The objectives of technical education as stipulated in the National Policy on Education (Ibid.), are as follows:

- to provide people who can apply scientific knowledge to the improvement of environmental problems for the use and convenience of man.

- to provide trained manpower in applied science, technology and commerce.

- to enable our young men and women to have intelligent of the increasing complexity of technology.

2.5. STRUCTURE OF TECHNICAL EDUCATION IN NIGERIA.

- University.

- Polytechnics.

- Colleges of education (Technical).

- Technical colleges (Maritime education inclusive)
- Vocational (After primary) and
- Pre-vocational.

2.6 NATIONAL PHILOSOPHY OF EDUCATION.

In view of what has been said, it is necessary to have a quick look at the basic philosophies of Nigerian education so that we can place technical education on its rightful place. These are:

- free and democratic society,
- a just and egalitarian society,
- a united, strong and self-reliant nation,
- a great and dynamic economy,
- a land of bright and full opportunities for all its citizen.

From the theoretical point of view, it is hard to fault the principle, is as they have been put down. But what one sees in practice is that the country still has a lot of ground to cover in actualizing these ideals. And since technological progress hinges on technical education, any obstruction in the way of technical education has to be removed.

Prior to 1986, the educational system was six years of primary, five years of secondary and four years of tertiary, which in short produced a pyramid structure, with a large number of drop outs. This system was elitist, and consequently inadequate. Worse still, each level of technical education was almost a terminus. This is shown in figure 2.1

2.7 PROFESSIONAL CERTIFICATES.

It is observed that vocational schools provide training for technicians, and the products come out with a Federal Craft Certificate (FCC), the federal college of education provides training up to National Certificate in Education (N.C.E). At present, graduates of this institution are required to spend two academic sessions for a bachelor degree.

Competency certificate, Higher National Certificate H.N.D, among others, appear not to be wanted in Ngerian Universities. What, however, is really absurd is that good HND holders are admitted straight for higher degrees overseas.

If Nigeria sincerely wants to develop technologically, she has to think over these things. No institution should be allowed to be an island unto itself. No matter how difficult the route, every academic institution must be linked in a continuous chain.

Technical education, no doubt, equips one to fit into the labour market and many of such are so reabsorbed. But provision still has to be made for that percentage of products of the technical institutions, no matter how small, who will have the aptitude and willingness to pursue further education, without let or hindrance. Apart from any thing else, this will give psychological rèlief or satisfaction both to those who will want to advance and those who will be content to stay on the job.

It is useful to distinguish a vocational education from a general education on one hand and vocational training on the other. My preference is for a broad concept of vocational education, which recognises that vocational education has a "dual mandate" to develop the individual both in the interests of self and of employment. If we tip the balance too far in the interest of self, then we cross the boundary into general education; if we tip it too far towards employment then we cross the boundary into vocational training.

I know there is an inherent conflict between these two elements. Its implementation always requires a compromise. The way in which this conflict is resolved may well be a question of political phylosophy of national or local culture, the infuence of culture is surprisingly strong in general education in Nigeria than in vocational. The way in which this will be resolved is hard to predict.

"Vocational" is often taken by an average Nigerian to mean "work related", this is fine provided the work is not always equated with immediate task, but all too often this is exactly what happens. The author has lived and worked in the Unted States of America, and has found Vocational education in the USA as vehicle for the entrepreneurial spirit. The main goal of the entrepreneurship in maritime education is to provide a broader look at at the career options and to identify way to reach these options.

Equally, failure to distinguish between vocational education and vocational training has led many educationists in Nigeria to use the adjective "narrow" when anything vocational is considerd. This tendency results in Government negative attitudes towards Vocational Education and Training.

I regard as intellectual arrogance that all vocational education is "narrow". Take for example, electrical circuitry. Design of electrical circuit normally requires a higher level of interllectual skills than its installation. The same person who does the installation, however, may be responsible for fault-finding if the circuit is not functioning correctly; this activity may require the application of considerable knowledge and interllectual skills which are moving close to those of design, especially if the circuit is a complex one. This higher intellectual skill is likely to be developed, and the knowledge (often based on principles not of obvious immediate application) gained, through "education" rather than through "training".

The point raised above is necessary, according to Jemie, (Guardian, one national newspaper, September 1984) "Any educational system that will be effective must take into account the psychology of the people. It either tailors itself to the peoples' psychology as its exists, or works hard to transform or modify that psychology to coincide with the system".

Since rapid industrialization is our professed goal, it makes no sense to down grade the manpower with practical skills. Figure 2.2 illustrates a new system, which is also not still better.

2.8 EXISTING GAPS

Many perceive the gap between the developed and the developing world in terms of wealth, but the knowledge gap is great and is increasing just rapidly. The concept of the knowledge gap is important because it should be less difficult and costly to transfer knowledge than to transfer wealth, and the knowledge so transferred may be a generator of wealth. Such a means of overcoming the "north-south" divide alone would justify paying greater attention to the study of vocational education.

In spite of the new system, gaps can still be identified. The working relationships among tertiary institutions is still not harmonious. The Universities sit on the progress of aspirants for a University education, and prefer to have nothing to do with each other. The other institutions are also an assemblage of unrelated parts.

2.9 PROPOSAL FOR IMPROVEMENT.

In any event, it is necessary to start somewhere. The main constraint in technical education is change. One must understand the changes which are taking place and the rasons behind them before one can undertake any helpful study relating to content or the way in which discipline are best learn in different cultures. Because consistent failure to invest in Technical\Vocational education will bring disastrous consequences to our economy.

At this point, it is worth mentioning to note the remark made by the former Secretary of State George Schultz, in a key note address to the National Academy of Engineering, December 19987:

"It is as though we have a race between the Engineer and the politician, the creators of the new knowledge and the statemen for the idea of a nation, and the concept of national sovereignty, is affected. It is long past time that the politician caught up with reality. But, if the lag between the political concept and the technological reality creates problems, the opportunities which such vast change now offers should provide us with optimism and inspiration to turn these times to our advantage"

The blueprint on technical education (1978-79) clearly puts it. "there should be an opportunity for the admission of craftsmen to technician courses, and technician to university or professional courses". No level of education should be an island, this is the heart of the matter.

The Bagauda Seminar (1980) highlighted this problem and suggested a restructuring of technical institutions, as mounting an excellent public image drive for technicians and technical education. To illustrate the interrelationship that is being proposed, a composite representation is shown figure 3.

A person should be able to progress from vocational school through technical college, and advance from craft school to Maritime Academy , polytechnics and higher degrees, if chooses. The system should not be designed to prevent this. HND holders should have no difficulty in going straight for higher degrees like his B.sc. holder counterpart.

2.10 MARINE ENGINEERING TRAINING IN NIGERIA.

Literatures on the training of marine engineers in Nigeria are hard to come by. Neither the Nigerian Shipping Act of 1962, nor the legal instrument setting up the Maritime Academy of Nigeria of 1978, showed how such training should be organized.

As disputed by Umejuru, in the parts of Nigerian shipping acts which deal with the competency certificate of chief engineer/master, and crews, no mention was made to maritime education and training, nor was there any provision in the Act except names of overseas countries where certificates of competency may be obtained", (Umejuru, 1988).

This dissertation refers to marine engineering training as 1) the supply of educated and skilled engineers to Nigerian shipping 2) the supply of educated and skilled engineers to non Nigerian shipping, 3) supply of educated and skilled engineers to Nigerian and non-Nigerian offshore oil industry, 4) the supply of educated and skilled engineers to marine related regulatory agencies at the national and international level, and 5) the supply of educated and skilled engineers in the consulting, advising and training areas at the national and international levels.

All the areas mentioned above require marine engineers that are educated and trained within the frame work of the International Maritime Organization, (IMO), as contained in the Standard of Training, Certification and Watchkeeping for Seafarers(STCW). However, the STCW level should be exceeded for the interest of future jobs mobility and for the purpose of meeting the requirements of Nigerian National Accreditation Board for the degree award.

Evidence points to the fact that there is considerable growth in the regulatory sectors every where, and Nigerian seafarers are generally welcomed abroad. In the true sense of the words, if persons are properly trained in these sectors, they can always be absorbed by the industry and its related areas.

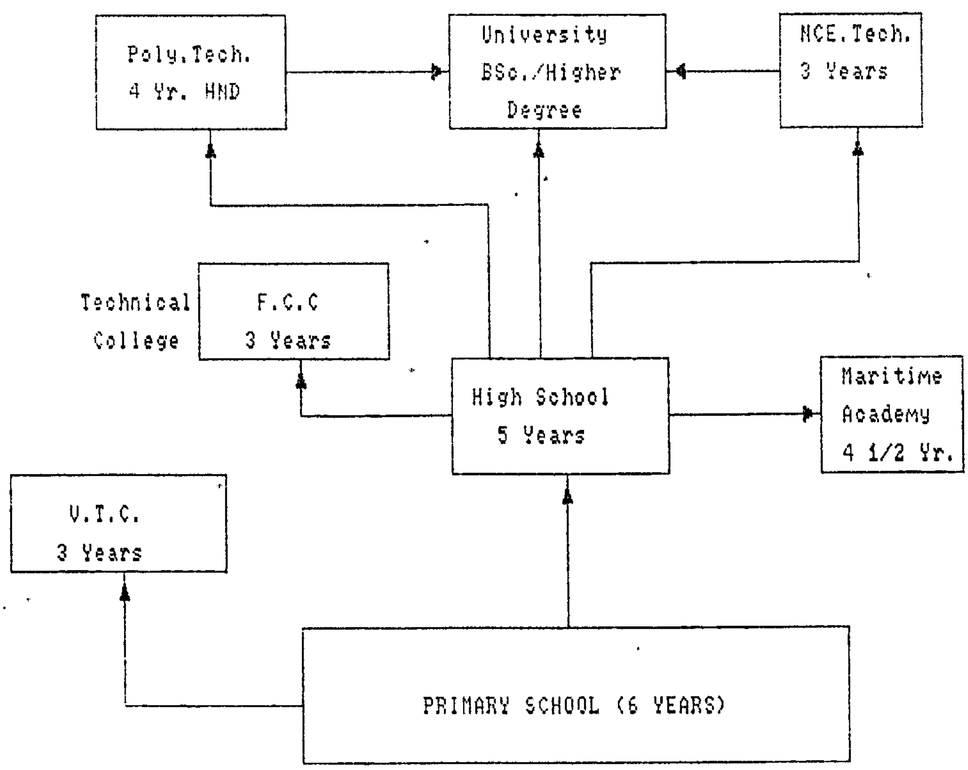
2.11 MARITIME INSTITUTIONS IN NIGERIA.

The Nigerian Federal Government provides for limited Maritime training, such as the Maritime Academy at Oron. The River State University of Science and Technology, Port Harcourt is run by that State government.

The training of marine engineering cadets takes place at the Maritime Academy at Oron. The institution prepares the trainees for the certificate of competency, and none for the academic degree. Facilities, human and material resources are grossly inadequate. Contrary to the prevailing conditions at Oron, the University of Port Harcout trains academic engineers, with little operational exposure.

This is a situation where IMO mandatory courses are not properly handled. As a result the University cannot prepare students for licensing examinations (1)

The latter, though State controlled, is provided with excellent facilities, and enjoys a high academic prestige like its counterpart all over the country.



Key: 1 HND - Higher National Diploma
2 FCC - Federal Craft Centre
3 VTC - Vocational Training Centre
4 NCE - National Certificate in Education

Fig 2.1 OLD EDUCATION SYSTEM (6-5-4)

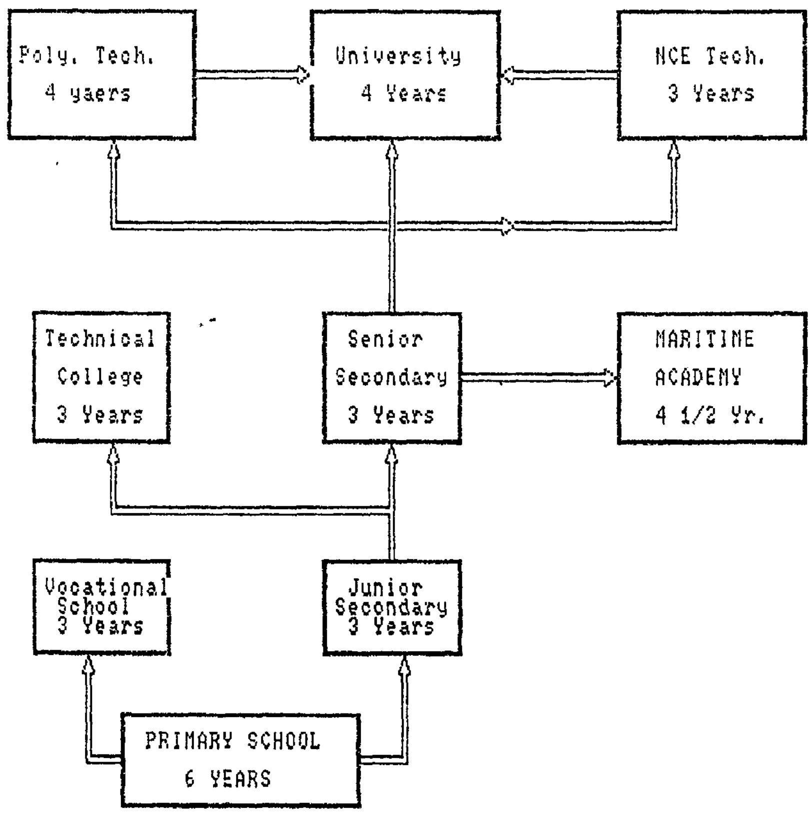
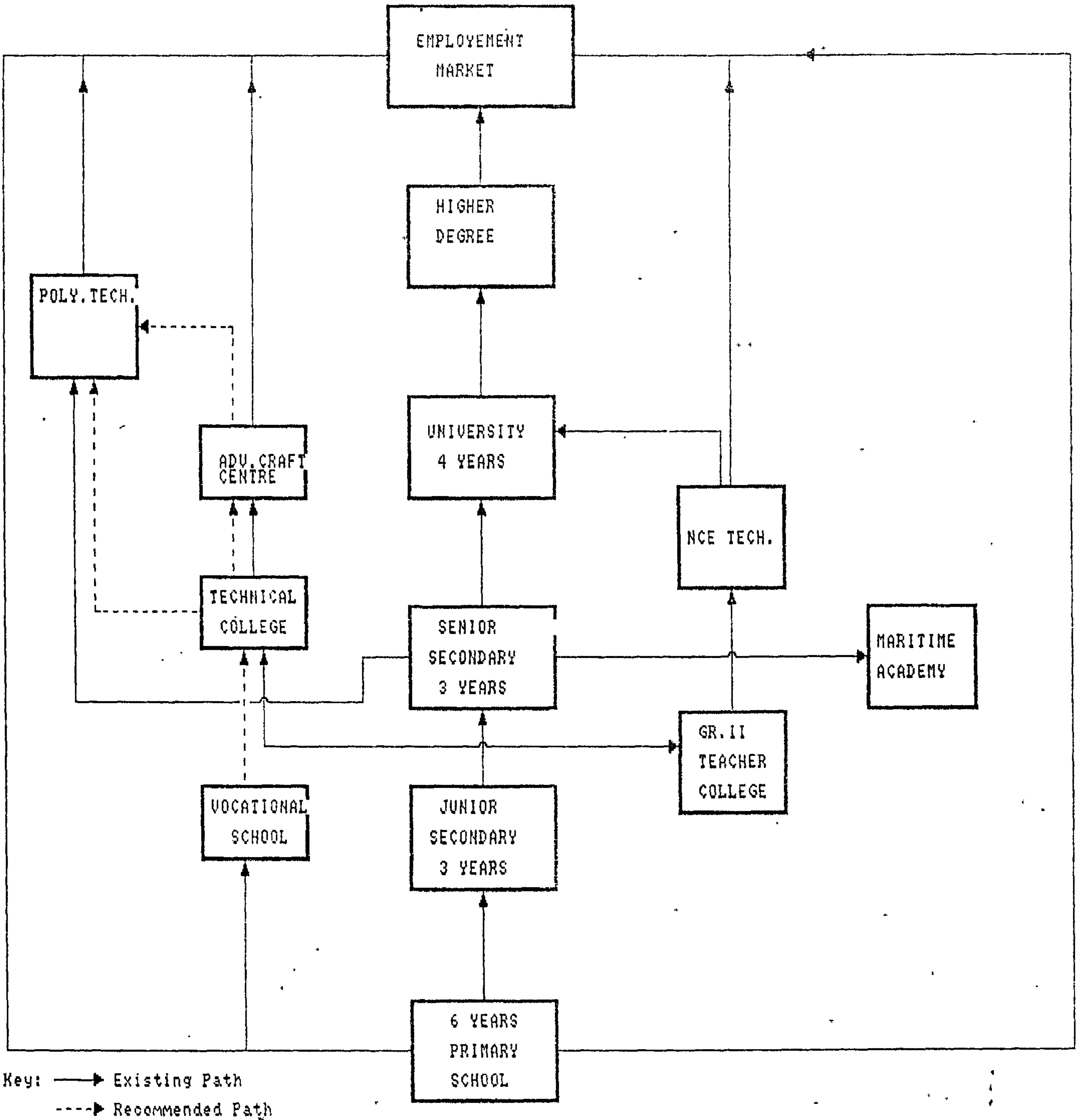


Fig. 2.2 THE NEW SYSTEM (6-3-3-4)



Source: Nigerian Journal of Tech. Edu. Vol.4 1987

Fig. 2.3 IMPROVED NEW SYSTEM

CHAPTER III

MANPOWER REQUIREMENTS

3.1 INTRODUCTION

Shipping is an international trade. A glance at the organization and management of the industry itself will prove this right. The financial interests and management of a ship do not have to be, and often are not located, in the same country. The crews who operate the ship may come from different countries. On this point, Edward Agbakoba, (1-2) successfully argued that, "ship management does not have to be located, in the same country" (Agbakoba, 1991).

The crews who operate the ship may come from different countries, the flag under which the ship sails is no longer reflecting the nationality of the owners ("Ibid., p.2). It is on the above background, that any study, or projection of Nigeria's manpower requirements in the near future, should take into consideration, the present state of the labour market for seafarers generally and globally.

3.2 SHORTAGE OF OFFICERS.

More than half the World's ship managers say there is an acute shortage of officers. A report by Lloyds Ship Manager published in "The Sea Newspaper" (1), of March 1992, showed that some 85 percent of maritime management believe that the shipping industry is facing a serious skill shortage, particularly of engineer officers.

The worst shortages were reported in North America. However, the problem extends throughout the industry, both in the developed and the developing countries.

3.3 STATISTICAL EVIDENCE

In October 1989, a joint study by the International Shipping Federation (ISF) and the Baltic International Maritime Council (BIMCO), was undertaken. The results were released in 1990. The statistical reports of the research indicated that 400,000 were officers, while some 840,000 were ratings, available throughout the world. These figures were against an estimated 450,000 officers, and over 600,000 ratings, required to man the world's commercial fleets.

The figures clearly revealed that in 1990 there was a shortage of some 50,000 officers and a surplus of over 200,000 ratings. The source pointed out that the anticipated upturn in the global economy, would produce a 33 percent increase in the number of ships, by the year 2,000. This again, would lead to an increase in demand of some 90,000 officers.

The shortage of maritime manpower, which the study indicated would persist over the next decade. The situation is already felt. While the study perhaps naturally concentrated on the number of seafarers, it is the new appreciation of the need for improved quality that is making the numbers even harder to get. Appendix 1a and 1b, show the world-wide demand and supply of seafarers by region.

The situation in seafaring in Europe, North America and Japan has two main causes. Firstly, the economic pressures on the shipowners to recruit labour from the cheapest source, and second, the reluctance of their nationals to take up seafaring as a career. Land based marine related jobs are becoming more lucrative. Seafaring is no longer attractive as a profession, to the nationals of rich countries of North America, Europe and Japan. Simply, because living standards ashore have risen. Conversely, the working conditions and improved leisure facilities have also increased substantially.

3.4 PERIOD OF SEAFARING.

The BIMCO and ISF study which I have earlier referred to, shows the following wastage rate among the seafarers world wide. The percentage represents the total who leave the profession from all causes (retirement, death, injury, et al). The percentage due to death and injury is very insignificant and the figures mainly represent those who leave by choice. Table 3.1 shows the short span of sea service region by region.

Region	Age	Officer	Ratings
North America, Europe, Japan	41-45	52%	53%
	46-50	78%	79%
Indian sub-continent	41-45	58%	35%
	46-50	89%	61%
Africa	41-45	92%	54%
	46-50	100%	81%
World-wide	41-45	47%	42%
	46-50	74%	70%

Table 3.1 . : Age distribution due to retirement
SOURCE: BIMCO/ISF, 1990.

Considering the figures for Africa, it shows that by the time the officers are 45 years old, 92% have taken alternative jobs ashore. And by 50, a good number have left seafaring. Empirically speaking, an average Nigerian at 40, must have taken ashore job. If he stays beyond that age he must have not been lucky to secure a new job. The trend is the same all over the world.

The question now is, where do we get manpower to staff our maritime industry ?. What quality of engineers do we have in mind to operate Nigerian's modern ship ?. Answers to these questions are clear. Maritime technology is not just an "item" that can be bought over night to develop commercial applications. Before it can be taken onboard, appropriate expertise must be in place to operate it.

Today's merchant fleet in Nigeria, should not be like some organizations, that can be "topped" up by the inexperienced. with little knowledge of law, safety, stability, stresses, automation, and commercial operations.

One does not doubt that a "sea-man" brand trained officer of the armed forces could operate fully automated merchant ship, without too much of a culture shock. But there is much more to it than , particularly in the senior officer roles on board. But one has to ask how seriously the ship will be operated, or if the intention is merely to fill the ship with sufficient warm bodies, with a qualification of some sort.

3.5 PRIORITY AREAS.

The maritime organizations in Nigeria covered in this analysis can be classified as follows:

- Nigerian National Shipping Line (NNSL)
- Nigerian Off-Shore Industry
- Maritime Safety Administration (MSA)
- Nigerian National Petroleum Corporation (NNPC)
- Nigerian Ports Authority
- the supply of engineer officers to marine-related regulatory agencies at the national and at the international levels.
- the supply of engineer officers to the private sector.
- the supply of key engineer officers to the design and ship construction.
- the supply of engineers to the training institutions.

The supply of engineering personnel to the marine sectors enumerated, in the foregoing list, shall continue to be a mirage in the next decade, unless positive action is taken, within a foreseeable future.

3.6 NIGERIAN OFFSHORE INDUSTRY.

History teaches how quickly unforeseen events can change the direction of society. But it is certain that any expanding economy needs energy from one source or another. In the near future, in the modern world, neither coal, water pressure, nuclear power, nor sunlight are likely to replace the central role of gas and oil. In providing immediate, clean, comparatively inexpensive sources of energy. Especially as fuels for special demands, for commercial transportation and military machines.

In view of all efforts at diversification, Nigeria depends increasingly on its earnings from oil. In 1990 oil constituted 96.1% of total exports (94.6% in 1989). Surprisingly, the Gulf War had a large impact on the government,s economic expectations. For instance, in mid 1990, before the Gulf crisis, the price of Nigerian crude oil was $16 per barrel, by October this had risen to $32. This windfall resulted in development of a new export termininal for petroleum products at Bonny, River State, as part of a major oil rehabilitation plan. The terminal is expected to reduce bottlenecks.

3.7 EXPENSIVE COMPONENT.

By far the biggest cost component of offshore oil production, in Nigeria is transportation. My personal experience with the Mobil Oil Production, at the Qua Iboe Offshore operation, Eket - Nigeria, led me to this conclusion. This cost does not refer to the supply of boat and helicopter aspects of getting supplies and personnel to the field facilities. But to the daunting prospect of how to get trained indigenous personnel to move output the product to the world market from the remote locations.

The choice between pipelining and tankering depends on individual circumstances, of each field development, such as production site location. For instance, at Qua Iboe Offshore location, there is no gas pipeline and no insurmountable technical barriers to tanker transportation. In a situation like this, tankers are almost certainly the transport answer. Securing manpower to fulfil this area, remains a distant dream.

3.8 OFFSHORE GEOPHYSICAL VESSELS.

Two major systems have been developed for the offshore exploration. namely, Marine Geophysical vessels, for reconnaissance exploration, and drilling rigs for a range of offshore water depths and sea conditions. These vessels require marine engineers, with a high degree of intellect and exceptional ability, to operate the sophistigated equipment installed onboard.

In the words of Edgard Driver and H. Sholnick: "geophysical research vessels are the pathfinders in offshore exploration" (1-7). Their role is to gather the data needed to guide the drill to the most favorable sites. Illustrative of the state of the art is figure 3.1 The diagram of the vessel shows the complement of geophysical, geological and geochemical equipment on board, which include the seismic, gravimeter, magnetometer, underwater seep detector, bottom cover, and computer systems. More than fifty senior marine engineers will be required in this single sèctor before the end of this decade.

Assessing political, economical, and oil prospects in Nigeria Micheal Ridd made the following comments in Lloyd's List of May 14, 1992 :

as a result of fiscal reforms, linked to the implementation of an integrated oil and gas strategy, experts are confident of substantial growth well into the 21st century. Major oil field developments are proceeding rapidly, with such prestigious companies as Mobil, Chevron, Agip and Shell committing huge volumes of capital, well in excess of $10bn, between now and the end of the decade. Production capacity is again increasing after a year of decline. Nigeria is producing some 2.1m barrels of crude oil per day, production capacity is projected to rise further towards a projected figure of 2.5m barrels per day by the mid 1990s.

The start-up date for the first Liquidfied Natural Gas (LNG) project is late 1996, with an estimated construction cost of $3.7bn. Before then, the oil industry would have expanded. Proven oil reserves, which currently stands at 17bn barrels, are expected to rise to 20bn barrels by 1995, when daily production should have risen to 2.8m barrels compared with 2.1m barrels in 1991.

As I did mention in the previous paragraphs that the space avaliable for the nation's carriers did not expand with our growing trend of the volume of trade. Petroleum export from early 1970s to 1990s is shown in table 3.2

CRUDE PETROLEUM OIL SHIPPED AT ALL NIGERIAN OIL TERMINALS

1970/71 - 1987

Year	Crude Oil Shipped (in tonnes)	Index Number (1970-71 as base)
1970-71	50,169,763	100.0
1771-72	77,946,573	155.4
1972-73	92,430,673	184.2
1973-74	94,717,879	188.8
1974-75	102,375,308	204.1
1975-76	97,037,938	193.4
1976-77	100,313,452	199.4
1977-78	93,648,251	186.7
1978-79	102,371,874	204.1
1979-80	105,032,673	209.4
1980*	68,227,943	126.0
1981	61,153,673	121.9
1982	51,824,276	103.3
1983	59,892,104	119.4

1984	61,703,669	123.0
1985	71,084,559	141.7
1986	65,874,867	131.3
1987	57,193,091	114.0

Table 3.2

Source: Nigerian Ports Authority Statistics Section Lagos.

From the above evidence, it will be seen that as much gas and oil remain to be found under our ocean, as already has been found under dry land. The human factor of training and safety, must be explored.

3.9 NIGERIAN NATIONAL SHIPPING LINE.

The Nigerian National Shipping Line (NNSL), was officially established in 1959. It all started with two ships, later five, and presently, it has thirteen as at March, 1992. The whole fleet are conventional and break bulk types. The initial concern of the NNSL was to give liner services to the Nigerian shippers. The under tonnage of the National fleet has resulted in Nigeria's inability to implement the United Nations Conference Trade and Development (UNCTAD) code of 40: 40: 20 policy.

In the United Kingdom - West African Lines Joint Service (UKWAL), Nigerian cargo accounts for 84 percent of the overall trade. Yet the bulk of the cargo goes to the U-K flag ships. This went to the extent that three U-K companies viz, Elder Demster, Palm and Guinea Gulf were found guilty of abusing their dominant positions in West African trade. They were fined FFr105m ($18.4m)by the

European commission, (Lloyds List April, 1992).

As pointed out earlier, Nigeria is a great generator of business for liner shipping companies operating in West Africa, even the so called Francophone countries. Nigeria traditionally accounts for about 60 percent of the cargoes carried. Nigeria is country with a big volume of trade, but with insufficient tonnage with her national carrier.

Nigeria is known to be the greatest generator of the seaborne trade in West and Central African sub-Sahara region. In a nutshell, Nigerian international trade in the region accounts for about 60 percent, if not more. Tables 3.3 and 3.4 show Nigeria foreign trade with U-K and the whole world respectively.

The trade between Nigeria and U-K, (according to the British Department of Trade returns):

Commerce: total trade in million Naira Nm for 4 years; oil accounts for 97% of exports in 1988.

	1984	1985	1986	1987
Import (c.i.f)	7,200	8,300	6,700	15694
Exports and Re-exports (f.o.b)	8,700	12,600	6,800	29578

Total trade between Nigeria and U-K, (according to British Department of Trade returns, in £1,000 sterling):

	1987	1988	1989	1990
Imports to U-K:	159,386	128,123	129,406	297,436

Exports and re-export from UK:	481,568	330,476	388,777	499,838

TABLE 3.3

SOURCE: British Department of Trade.

NIGERIAN AND NON-NIGERIAN INTERNATIONAL TRADE IN METRIC TONNES

	1988	1989	1990
Nigerian cargo	174.3	165.6	175.6
Non-Nigerian cargo	87.5	108.9	85.6
Overall	261.8	264.5	261.2
Nigeria % overall	67%	62.6	67%

TABLE 3.4

SOURCE: UNCTAD Year Book, 1991.

Judging by the available records of Nigerian seaborne trade, it is convincing, that double the existing number of ships, in national the fleet, will be acquired. Therefore, needs for the training of more than 50 engineers for this sector, is going to be eminent.

3.10 NIGERIAN NATIONAL PETROLEUM CORPORATION

Oil was found in Nigeria 1958. The Nigerian National Petroleum Corporation (NNPC) was established in 1957. The company has four cardinal areas to cover under its activities, viz; exploration, refining, production, processing; the Department of marine transportation was also added to it. Unfortunately, the corporation has no tankers.

Crude oil is at present shipped out almost excusively by foreign oil companies at the rate of 1.5m barrels per day, at the cost of about $1 a barrel in freight. Official attempts are now under way to stem this flow of foreign exchange. One of the ways to get this done is for the government to implement a 1987 law which obliges the Nigerian Maritime Authority (NMA) to involve indigenous carriers in the transport of 50% of the crude oil.

The only two tankers of 240,000 GRT. and 400,000 DWT, the company owns are being used as storage facilities. Evidence is very strong, that the corporation will soon go into transportation. This single area again, will call for specialized training for engineer officers.

3.11 NIGERIAN PORTS AUTHORITY (NPA)

Nigerian Ports Authority (NPA) was established in early 1960s, so far it controls about 8 container ports. Container trafic levels at the ports controlled by the Nigerian Ports Authority increased significantly in 1991.

According to Lloyd's List, Friday May 15 1992,"the container traffic throughput at the NPA facilities totalled 2.42m tonnes in 1991, up 34.4% over the 1990 level of 1.8m tonnes, an increase of 31%, while containerise exports rose 43% from 401,000 tonnes to 575,000 tonnes"

NPA ports handle 223,135 tue in i991, compared with 173,559 tue for the previous 12 months. The Lagos container terminal accounted for more than half the country's box movements. Part of the increase in the NPA container volumes is accounted for by the inclusion of the Lagos ro-ro port for the time.

In many ways, the take over of the ro-ro operation at the Tin Can Island was the main development in Nigerian Ports industry. NPA management is looking to tackle its manpower problems by zoning the Ports under its control and employing the services of the foreign partners to assist in the maintenance of plant and equipment in these ports. This is a typical situation where services of well trained could have been utilised. See table 3.5 for the Container traffic in the ports within the NPA controlled.

	1990			1991		
PORT	Import	Export	Total	Import	Export	Total
Lagos	53,803	33,523	87,326	62078	52920	114998
Tin Can Island	28,846	21,638	50,484	17,829	13,574	31,403
Lagos ro-ro port. -	-	-	-	17,339	15,808	33,146
Kirikri	2,389	2,945	5,334	2,672	4,386	7,058
Port-Harcourt	4,406	4,045	8,451	5,722	5,090	10,812

Port-Harcourt (B)	4,458	4,581	9039	5,355	4,894	10,249
Onne Fed. Terminal	4,525	4,592	9,117	4,197	4,654	8,851
Calabar	670	154	824	451	296	747
Warri	1,174	1,810	2,984	3,904	1,967	5,871
TOTAL	100,271	73,288	173,559	119,547	103588	223135

Table 3.5 Throughout of Container Traffic (teu) at Nigertian Ports Authority (NPA). Import and Export 1990-
Source: Nigerian Ports Authority Lagos.

3.12 THE PRIVATE SECTOR

The Indigenization decree number 4 of 1972 reserves certain rights in shipping policy for Nigerians. This was reinforced by the Nigerian National Maritime Authority decree number 10.

The Nigerian National Maritime Authority has so far granted National carrier status to the following indigenous companies: African Ocean Lines, Bulkship Nigeria Limited, Niger Brass Shipping company and Nigerian Green Lines. The National Maritime Authority may grant national carrier status to the company if:

- Nigerian individuals or enterprises are fully owned by Nigerian individuals who have at least 60 percent of its equity shares and the company is registered in Nigeria.

- the vessel is owned by the company operating on the deep sea
and on the Nigerian coastal or inland waterways;

- the head office of the company is located in Nigeria and its management and control is directed from its Nigerian head office;

- the company owns at least one ocean going vessel of not less than 5,000 net registered tonnage;

- the terms and conditions of the employment of the seafarers engaged by the company are in conformity with Nigerian Laws and accepted by the international rules and standards;

- the vessels of the company are registered in the Nigerian Register of Ships and the vessels satisfy all conditions stipulated in the Nigerian Merchant Shipping Acts of 1962 as amended; and

- 100 percent of the crews and at least 75 percent of the shipboard officers including captain and chief officers and wherever possible chief engineers, are Nigerians.

Putting together, man power demand in the private sector may equally pose a serious threat, to implementation of the lofty and noble ideas of the indigenization policy.

3.13 TRAINING INSTITUTIONS.

The teaching subjects, such as automation, electronics, Electrical machines, computer engineering, engine and bridge simulation training et al, requires lecturers with outstanding ability and qualification and additionally, seagoing experience.

The question now is, who will be the trainers, and how will they complement their academic degrees with industrial experience and professional qualifications. To addres this question, lectures must regularly update their knowledge through research and contacts with industries. Since this sector is worst hit by the shortage, special fund should be created to take care of the situation.

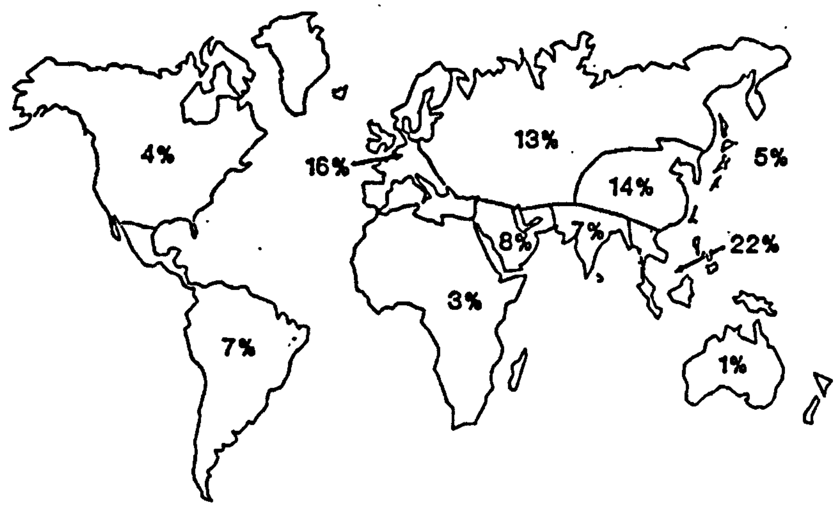
3.14 CONCLUSION.

Inspite of the apparent national need for trained Marine engineers, the goverment and many companies have failed to provide much encouragement. Both sectors need to recognize and react to the challenge by working with the Maritime Academy and professional societies toward solutions. The initiative probaly must be taken by the latter two groups. The federal is the largest single employer of technical personnel. Despite protestations in support of technological excellence, however, the government has yet to take the lead in promoting continuing education and training among its own engineers or those of its major contractors. Both attitudes of the federal government and that of the professional Union can probaly be best described as being neglect.

Area like dock yards which are the life blood of the shipping industry have a teething problems of manpower shortage. Niger Dock, which started operation in 1986 had a turnover in 1990 of Naira20m ($2.12m). It is to be upgraded into a ship building yard capable of constructing vessels up to 1,000 dwt before the end of 1992. According to its project director, Namdi Ozobia, Nigerdock has already constructed a passenger ferry, but its main operations involve the repair of vessels owned by the NNSL, the Nigerian Ports Authority (NPA) and Mobil.

The Ship construction sector is seasonably oriented or dependent on economic factors, beyond direct control of the industry. Conversely, marine engineering orientation requires a certain basic, well-trained labour force which is available to serve Nigerians and, if required, international demands. However, it takes time to train a "front loaded" marine engineer, so that if economy improves they can be found just any where.

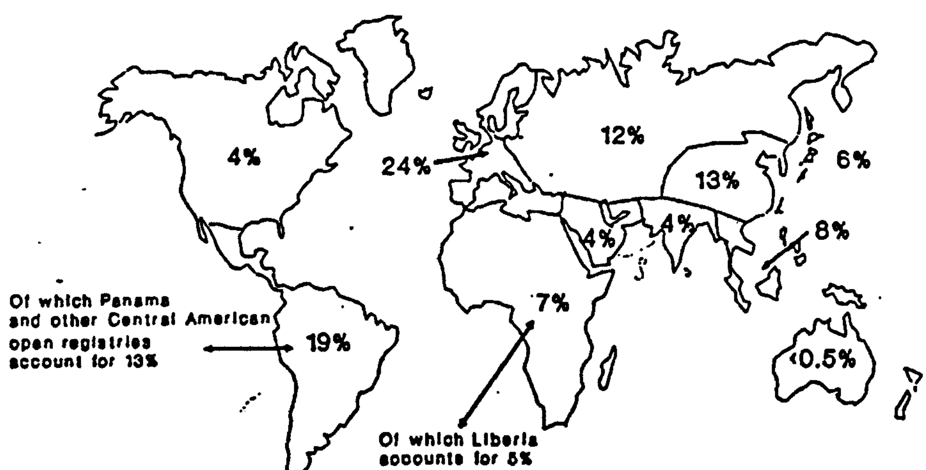
Regulatory and Safety Administrations are yet to get sufficient manpower for their activities. To speak frankly, a country which has maritime interests is manifested by a marine industrial base by the nine sectors outlined above, consequently, it requires fairly centralized marine training to ensure a stable, well trained personnel base to meet its own and its international commitments and obligations.



Total world seafaring supply • 1.2 million in 1990

Fig. 3.1 Supply of seafarers.

source: ICS/BIMCO



Total world demand for seafarers in 1990 is estimated at 1.06 million

Fig. 3.2 Demand of Seafarers.

(Courtesy of Bimco/ISC).

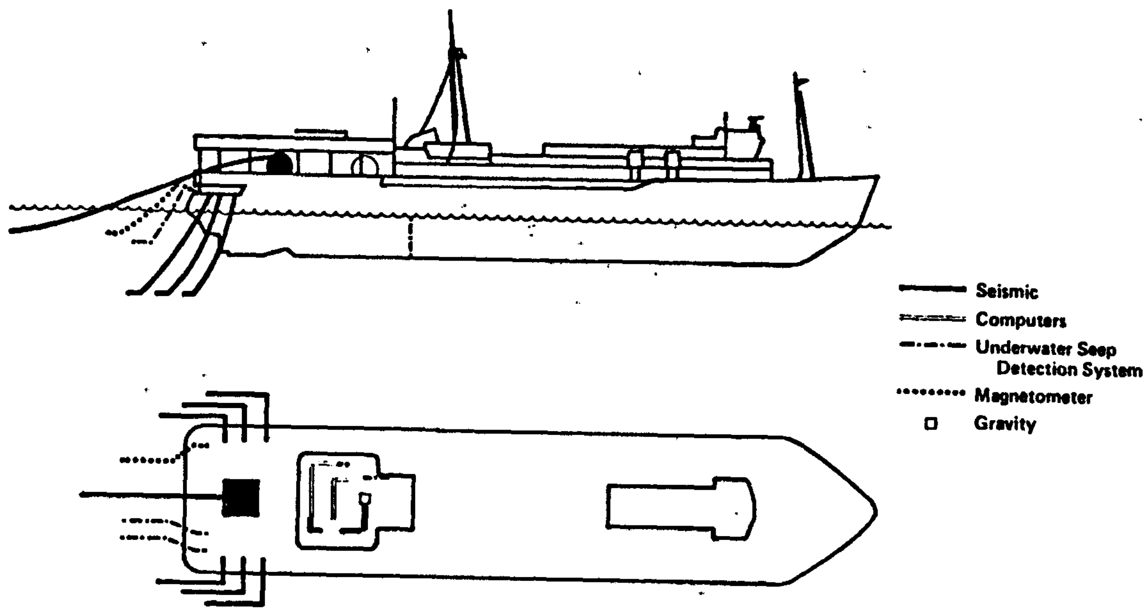


Fig. 3.3 Geophysical Research Vessels.
Source: Gerard Mangrove. _Future of Gas and Oil._

CHAPTER IV

MARINE ENGINEERING EDUCATION AND TRAINING.

4.1 INTRODUCTION.

As pointed out in chapter two, technical education came into thinking of Nigerian government between late fifties and sixties. By 1900, colonial government existed almost exclusively to guarantee the repatriation of profits from commercial venture to England. Maritime education including the curriculum was left in the hands of the missionary societies.

The "Tuskegee philosophy", (237) developed by Booker Washington (ibid), was exported to Nigeria. A curriculum was to be designed for vocational training. The curriculum was designed to foster a differentiated educational system, that is one to train African leaders, the other for masses. This curriculum model was based on the premise that African would forever doom to backwardness of rural servitude, while a privilege few would be trained to administrate and conduct the business of the colonist. Therefore, nothing was done about MET, nor Marine engineering in particular.

4.2 HISTORICAL BACKGROUND: 1978-1988

Maritime Academy of Nigeria Oron, Akwa Ibom State, was established in October 6 1979. But Babangida's Administration in April 22 1988, promulgated the Maritime Academy Degree as contained in the Federal Government gazette number 27 of 1978, volume 75. This instrument then changed the name of the institution from the Nautical College to the Maritime Academy of Nigeria Oron.

4.3 LOCATION OF THE MARITIME ACADEMY

The Maritime Academy of Nigeria is sited in ancient town of Oron. Oron is a boarder town between Nigeria and Western Cameroon. It is of one the two busiest fish market town after Port Harcourt in Nigeria. Oron can be reached by air, road and water, it is also a gate way to the ancient town of Calabar the capital of Cross River State of Nigeria.

4.4 ORGANIZATION STRUCTURE

The Academy is under the federal Ministry of Transport. From the inception, the affairs and policies affecting the destiny of the premier institution were directed by the ministry. It was in 1988 that the so-called autonomy was granted to the institution, since then it took nearly two years before the governing council was appointed. The policy making and management now rest with the governing Council of the Academy.

The day to day administration of the institution is done by the full-time rector, who is assisted by the vice rector. The Registrar and the Bursar are also key officers of the Academy, students' supervision and orderliness is assured by the Regimental unit of the Academy. See fig. 4.1. The Organization Chart.

MISSION - To train young men as officers in the Nigerian Merchant Marine and as leaders in the Maritime industry.

4.5 THE OBJECTIVES OF THE ACADEMY

- To admit and train the various levels of personnel required for running and operating ship of the Merchant navy;

- To train technical manpower for Ports Marine Engineering, Workshop, piloting and navigation, Marine Insurance, Hydrography and related services;

- To provide such other forms of instruction as the Academy may from time to time decide to undertake.

4.6 THE POWERS OF THE ACADEMY

- "To provide courses of Instruction and training;

- In marine technology, including marine Engineering, Navigation, Applied Marine Sciences, Shipping Business and the management thereof and any other courses as may be approved by the council from time to time;

- In maritime sciences related to the needs and development of Nigeria in areas associated with Maritime Affairs; and

- In applied research in Maritime Technology and related activities.

- To arrange conferences and seminars;

- To encourage and promote in-service training and study groups;

- To hold examinations and grant or award diplomas and other distinctions to persons who have pursued course of study approved by the council and have satisfied such other requirements as the council may lay down;
- To demand and receive from any student or from other person attending the Academy for the purpose of instruction for such fees as the council may, with the prior approval of the Minister, from time to time, determine,
- To hold public lectures and undertake printing, publishing and bookselling;
- To make gift for any charitable purpose;
- To undertake any other activity appropriate a Maritime Academy of the highest standard".

4.7 EXISTING MARINE ENGINEERING CURRICULUM

Maritime Academy of Nigeria provides four and half years academic programme leading to the class two certificate of competency (foreign going). From the Maritime Academy's brochure, the curriculum is sub-divided into 5 parts and spread over four and half years. This means that each part constitutes one academic year duration (i.e approx. 9 months), followed by 2 months industrial Training Programme. Every Academy year is further broken into 3 modular terms.

The Education and Training period of 4 1/2 years comprises of four phases:

Phase 1a -The first two years, comprises four semester of

basic academic and professional studies.

Phase 1b- 6 months of industrial training in marine or

mechanical workshops and dockyards.

PHASE 2 - 18 months sea training.

PHASE 3 - 20 weeks mandatory and preparatory courses, before proceeding for the certificate of competency examination. This arrangement is shown in fig.4.2

The curriculum for the basic studies at the Maritime Academy Nigeria covers courses required for the certification of marine engineers in accordance with the International Convention on the Standards of Training and Certification and Watchkeeping for Seafarers (STCW 1978).

4.8 CORE SUBJECTS AREA

The composition of the engineering core subjects are as follows:

- Control engineering;
- Electronic
- Electrotechnology
- Engineering drawing
- Fluid Mechanics
- Internal Combustion engines
- Naval Architecture
- Steam engines
- Strength of material
- Theory of machines
- Thermodynamics

The curriculum structure for the academic study and practical training for the above course is subdivided into five parts and spread over 4 1/2 years. As pointed out earlier, each part is for one academic year duration, followed by a 2-month Summer Industrial Training Programme. One academic year is further broken up into three modular terms.

The subjects to be studied for each part of the programme are given below, followed by a detailed outline of the modular courses for parts I, II, and III.

Course subjects	Total Hours	NO. of Terms 1	2	3	4	5	6	7	8	9
Mathematics	28	6	6	6	6	-	-	-	-	-
Physics	12	-	4	4	4	-	-	-	-	-
Chemistry	9	5	4	-	-	-	-		-	-
Communications	6	-	4	2	-	-	-	-		-
Liberal Studies	6	4	-	-	2	-	-	-		-
Naval Science	3	3	-	-		-		-	-	-
Fluid Mechanics	6	-	-	-	-	-	-	-	-	-
Theory Machines	12	-	-	-		-	6	7	-	-
Steght.of Mats.	12	-	-	-	-	-	-	6	6	-
Thermodynamics	12	-	-	-	-	5	-	6	-	-
Elect.Technology	12	-	-		-		6	-	6	-
Engin. Knowledge	18	-	-	6	-	6	6	-	-	-
Humanities	12	-	-	-	-	-	-	-	4	8
Control Engineering	6	-	-	-	-	-	-	-	6	-
Theo.& Constr.	18 - -	-	-	6	4	-	4	4	-	-
Knoweldge	6 - - -	4	-		-	-	2		-	-
Engin.Drawing/Design	30	4	4	4	4	4	4	2	2	2
Boat Work	12	4	4	4	-	-	-	-	-	-
Workshop Practice	36	4	4	4	4	4	4	4	4	4
Project/Elective	10	-	-	-	-	-	-	-	4	10

Total practical (vocational) Training for Engineers:

(i) In the Academy Workshop from term 1 to 9 - 360

(ii) On National Flag vessel un the summer between term 3 and 4

In the Industrial Workshop during summer
between term 6 and 7 - 320.

COURSE STRUCTURE IN THE SCHOOL OF MARINE ENGINEERING

Term I (OCT.-DEC.) Subject Descript.	L	P	T	Total	Term 2 (JAN.-MAR) Subject Descript.	L	P	T	Total
Maths.I	4	-	2	6	Maths.II	4	-	2	6
Chemistry	3	2	-	5	Phys. I	3	1	-	4
Lib.Stud.	4	-	-	4	Comm.	4	-	-	4
Boat Work	-	4	-	4	Boat Work	-	4	-	4
W/S Pract.	-	4	-	4	W/S Pract.	-	1	3	- 4
Naval Sci	-	4		4	Engr.Draw.	4	-	-	4
Term Hrs/wk. 30				27	Total Term Hrs/wk.				26

FIRST SUMMER VACATION (JULY TO SEPTEMBER)

Cadets will be required to make a short voyage of 2 months duration on National Flag Ships. During this period they receive practical training on various aspects of Running and Maintenance of Marine Machinery.

TERM THREE Subject Descript.	L	P	T	Total	TERM FOUR Subjects Descript.	L	P	T	Total
Mathematics	4	-	2	6	Mathematics	4	-	2	6
Physics	3	1	-	4	Physics	3	1		4
Communs.	2	-	-	2	Liberal Studies	2	-	-	2

MarineEngin.	6	-	-	6	Fluid Mechanics	4	-	2	6
Engin.Draw.	-	4	-	4	National Knowled.	4	-	-	4
Boatwork	-	4	-	4	Engin.Drawing	1/2	3	1/2	4
W/S Pract.	1/2	31/2		4	Workshop Pract.	1/2	3	1/2	4
Term hrs/Wk				30	Total TERM Hrs/Wk				30

TERM FIVE TERM SIX

Subject Descript.	Hours/Week L	P	T	Total	Subject Descript.	Hours/Week L	P	T	Total
Mathematics	3	-	1	4	Theory of Mach.	4	1	1	6
Thermodyna.	4	1	1	6	Srength of Mats.	4	1/2	1/2	6
Marine Engin.	5	1	-	6	Electro. Tech.	4	1	1	6
Ship Theory	3	1	2	6	Theory of mach.	4	1	1	6
Construction	3	-	1	4	Construcion	3	-	1	4
Engin.Draw.	1/2	31/2		4	Engin.Drawing	1/2	3	1/2	4
Workshop pract.	4	-		4	Workshop Pract.	-	4	-	4

TERM SEVEN (October to Dec.) TERM EIGHT (Jan. to March)

Subjects Description	Hours/Week L	P	T	Total		Hours/Week L	P	T	Total
Theory of Mach.	4	1	1	6	Electro.Tech.	4	1	1	6
Strength of Materials	4	-	2	6	Engin. Econ.	4	-	-	4
Thermodynamics	4	1	1	6	Control Engin.	4	1	1	6
Marine Engin.	5	1	-	6	Ship Theo. & Construction	3	-	1	4

Engin. Design	1	1	-	2	Engin. Design	1	1	-	2
Workshop Pract.	1/2	3 1/2	-	4	Workshop Pract.	1/2	31/2		4
					Design Project	-	-	-	4
Total Term Hours/Week				30	Total Term Hours/Wk.				30

TERM NINE

(April to June)

Course Subjects Description	Hours/Week L	P	T	Total
Maritime business	4	-	-	4
4 Personnel Management	4	-	-	4
Ship Theory	3-	1	-	4
Nautical Knowledge	1	1	2	4
Engineering Design 1	1	2	4	6
Workshop Practice	1/2	3 1/2	4	4
Design Project/Elective	2	-	1	3

Total Term Hours/Week 29

KEY: L - Lecture Hour

p - practical

T - Tutorial

4.9 MANDATORY COURSES

This is the final stage of the programme and is always given in the Arab Transport Maritime Academy Egypt. The approved subjects within Mandatory courses are:

FA 01	First Aid:	20 total hours
FF 020	Fire Fighting:	30 total hours
PS 030	Personal Survival:	30 total hours

As stated earlier the Mandatory courses are done in AMTA in Egypt, however, arrangement has reached an advanced stage for the courses to be conducted in Nigeria, before the end of 1992/93 academic year.

4.10 LEADERSHIP/PHYSICAL EDUCATION TRAINING

The leadership and physical education play decisive roles in education and training of cadets in the curriculum. This is seen as means to implement the whole training processes, through discipline and loyalty. Hence, the institution is a para-military.

The Regiment is led by a senior naval officer, assisted by junior naval personnels of the commandant. This system helps to set a high standards of personal appearance, conduct, team work and leadership that are in keeping with the finest tradition of the seagoing service. As some of us are familiar, regimental system is a process which assists in developing the leadership potential of cadets through:

- Ability to perform well under variable conditions

- Obedience and prompt response to instructions

- Pride in oneself and in one's profession

- Know of one's professional duties

- An unyielding sense of duty

- Military bearing and pride of one's personal appearance

- Physical fitness and mental adjustment

- An ability to work with other people

- An understanding of positive leadership skills.

The Regimental system is also a means through which upper midshipmen practice leadership through interpersonal skill example. It is the goal of the regimental system to develop leadership trails in upperclass cadets that will enable them lead other cadets through positive motivation. In keeping with this objective, the Regimental system assist the cadets in developing:

- concern and interest in the development of junior ones

- Professional knowledge and skill

- The techniques of firm but considerable leader

- Sound experience in teaching and counselling.

4.11 FACILITIES

The Maritime Academy has the following facilities :

1 A training ship
2 2 stand by generating plant
3 36 class rooms (including lab.)
4 2 technical drawing rooms
5 2 radar simulators
6 1 engine room workshop
7 1 engine room simulator
8 1 workshop for Lathe, Welding and forge machines
9 1 library
10 2 sports ground
11 1 accommodation for 200 students
12 2 restaurant
13 1 students'common room for with bar
14 1 typing pool office.

4.12 TEACHING STAFF

This area has been the major problem that plagued the 14-year old institution. Frankly, this has also been the most neglected sector right from the inception of the Academy. The staff strength of the engineering faculty as at now stands at:

Lectures - 2 (full time)

Assistant lecturer - 2 (full time)

Senior instructors - 2 (full time)

Part time lecturers- 2

TOTAL - 8

1.13 THE WEAKNESS OF CURRICULUM

Broadly, before an attempt is made to assess the success or failure, its merits and its drawback, its pluses and its minuses. We need evaluation as limit to an assessment of the outcomes of this curriculum, or, even more narrowly do an appraisal of the extent to which it had been successfully delivered. And how much it has solved the Maritime goals of the nation and meeting the IMO requirements on Standard of Training Certification and Watchkeeping for Seafarers.

There have been no worked out plan for the training and retraining of teaching staff. The curriculum has stagnated for more than a decade without a singe review, and there is no prescribed means to evaluate it. On this point, Kelly made the following observations:

> developments in evaluation theory in recent years have shown the evaluative process within education to be a highly sophisticated and complex matter.

He has, among other things, revealed the need for evaluation to be seen as part of the process of the curriculum change or development from the very onset. The current curriculum lacks a mean of constant feed back of understandings to inform the process of revising, modifying, adapting and indeed, restructuring, the original plans to reflect the experience of attempting to implement them.

4.14 ENEMY OF COMPETITION

Few desperate Nigerians have tried to give different reasons why the Academy remains so long without enough teaching staff. Out of desperation they complained about the sitting of the Academy of at Oron. For those who were honest enough, they talked about poor salary structure, that they should be paid the previous salaries they earned while working 24 hours onboard ship.

Some of these are people who were trained with the public fund. Obviously, the salary is poor, but this is a global problem in class room situations, the story is the same world-wide. At least a college professor in Nigeria earns same salary as his director-general counterpart in the Ministry. Generally, the salary structure in tertiary institutions in Nigeria is far more better than in the civil service.

What I will try to avoid is building bridges between what I said in the previous chapters and what I have written recently. Some foreign experts were seconded by the International Maritime Organization (IMO), to the Academy the same Nigerians Seafarers intimidated the said experts, and they left without replacement. From the author personal experience an average Nigerian seafarer finds it extremely very inconvenience to work with academicians. Whereas in Europe, America and Japan the University lecturers and maritime experts are working hand in hand to promote maritime education programmes in their Academies.

There is an obvious basic hypothesis that whatever interferes with the competitive process is bad. There is seemly, however, an implicit view that these things might have hit the cadets harder than they did to the image of the Academy. The classical example of this assertion is a case of Dr E. Emmah, a veteran Naval Architect and a Consultant. He came in briefly as a partimer, but rendered invaluable services within a very short time. At the end, he was badly treated and he left, since 1989 that he left, the subject has remained without qualified lecturer to teach it.

As Benard Crossland, (5) pointed out, " It should no longer be possible to have people who are proud of their ignorance of Mathematics, Science and technology" The acceptance of broad based education for the Academy would impose considerable strains on our maritime education system, which is even now suffering from a chronic shortage of lecturers in relevant subjects. There is no alternative to paying the going rate if we are to over come this shortage, even if this has to be achieved by a scarcity award on top of normal teachers'scale. What is important is that people must be patriotic, most probaly those who were trained with public fund.

4.15 ADMISSION

Generally, admission to the Academy is by competitive entrance examinations. Academy admits 40 - 50 students a year, but admission is strictly based on the qualifications of the applicant and is granted without regard to ethnic, religion and state of origin. Successful applicants should meet the requirement for the admission as stated below:

The applicants must be high school graduates or holder of a high school equivalent certificates, preferably West African School Examinations Certificate (WAEC), or GCE "O" level. The following courses are the minimum required for admission without exception:

Mathematics - credit or distinction

English Language - credit or distinction

Physics - credit or distinction and

Chemistry - credit or distinction

The entry level has been raised since 1989 with abolition of the remedial programme.
Additionally, applicants must be medically fit to withstand the strenuous training and exercises. It should be borne in mind that the entry qualifications for the Maritime Academy in Nigeria is the same as University.

4.16 MARINE ENGINEERING CURRICULUM IN RIVERS STATE UNIVERSITY PORT HARCOURT

The Marine Engineering Department offers a 5 years programme leading to bachelor of Technology degree in Marine engineering. The first two years of the 5-year programme are devoted to advanced courses in basic science and fundamental engineering concept. Lectures, tutorials and laboratory work are routed in broad-based, strong scientific background to enable the students to acquire the necessary skill in analyzing and solving complex engineering problems.

The minimum duration of the B.Tech. programme in marine Engineering is five years (10 semesters) comprising both classroom lecture and supervised industrial work experience scheme period. Nine semesters of course work are spent in the University made up of two semester in each of years I, II, III, and V and the first semester of year IV.

The long vacation periods of 3 months at the end of each year of years II and III are spent in shore-based establishments. A 6- months sea-training period from the end of the first semester of year IV is spent on board sea-going or coastal vessels owned by shipping, fishing or oil-rig servicing companies.

4.17 PROGRAMME STRUCTURE

The programme and the summarised versions of the syllabus are under Faculty courses. Some of the courses are Faculty courses while others are Departmental courses. The courses are common engineering courses taken by all students studying in the Faculty.

4.18 FORMAT FOR COURSE NUMBERING

A. Faculty courses

The Faculty courses are numbered according to the sanate curriculum and Instruction committee recommendation on course numeration. The course numbers start with FEC followed by (3) digits:

i) the first letter indicates (F)acult

ii) the second letter indicates (E)ngineering, and

iii) the third letter indicates (C)ommon courses

iv) the first digit indicates course level;

i.e. 0 - Diploma courses

1 - first year B.Tech. course

2 - second year B.Tech. course

3 - third year B.Tech. course

4 - fourth year B.Tech. course

5 - fifth year B.Tech. course

6 - first year M.Tech. course

7 - second year M.Tech. course

v) the second digit indicates the Department the particular course;

1 - Chemical/Petro-chemical Engineering Department

2 - Civil Engineering Department

3 - Electrical Engineering Department

4 - Marine Engineering Department and

5 - Machanical Engineering Department.

vi) the third digit indicates the subsequent number of common course offered by the particular department.

In view of the above format, the numeration of the common courses are as follows:

(a) Courses to offered by the Mechanical Engineering Department:

FEC 250 Engineering Drawing I

FEC 251 Engineering Drawing II

FEC 252 Applied Mechanics I

FEC 253 Thermodynamics I

FEC 254 Workshop Technology I

FEC 255 Workshop Technology II

FEC 256 Materials Science

FEC 257 Introduction to Engineering practice.

b) Courses to be offered by Civil Engineering Department

FEC 120 Technical Drawing I

FEC 121 Technical Drawing II

FEC 222 Strength of Materials I

FEC 223 Fluid Mechanics I.

C) Courses to be offered by Electrical Engineering Department:

FEC 230 Electrical Technology.

B. Departmental courses to offered by Mechanical Engineering Department.

The courses listed in the following group of subjects are taken by the Marine Engineering students. The courses number start with MEC, indicating (M)echnical (E)ngineering (C)ourses, followed by 3 digits which have the following conotation:

i) the digit first indicates the year in which courses are offered;

ii) the second digit indicates the course group; the following groups are employed;

Group 1 : Applied Machanics and Design

Group 2 : Thermal Engineering

Group 3 : Fluid Machanics

Group 4 : Strength of Materials

Group 5 : Materials Science

Group 6 : Production Engineering

Group 7 : Industrial Engineering

iii) the third digit indicates number of courses whithin the group.

4.19 GROUPS OF SUBJECTS

GROUP NO. GROUP TITLE/COURSE

1. APPLIED MACHANICS AND DESIGN

MEC 310 Applied Machanics II

MEC 311 Mechnics of Machines

MEC 312 Machanical Engineering Design I

MEC 313 Mechanical Engineering Design II

MEC Mechanical Vibration

2. THERMAL ENGINEERING

MEC 320 Thermodynamics II

MEC 522 Thermodynamics III

5. FLUID MECHANICS

MEC 330 Fluid Machanics II

4. STRENGTH OF MATERIALS

MEC 340 Strenght of Material II

5. MATERIAL SCIENCE

MEC 350 Metallurgy I

6. **PRODUCTION ENGINEERING**

MEC 255 Workshop Technology II

7. **INDUSTRIAL ENGINEERING**

MEC 370 Economics for Engineers .

MEC 571 Engineering Management

C. Departmental Courses to be offered by Electrical

Engineering Department

EEE 320 Electronics Instrumentation

EEE 375 Marine Electrical Technology.

D. **Marine Engineering Courses**

The course numbers start with MAR indicating (MAR)ine Engineering courses followed by three digits which have the following connotations:

i) the first digit indicates the year in which the course is offered;

ii) the second digit indicates the course group; the following groups are employed:

Group 1 : Ship Power Plants

Group 2 : Naval Architecture

Group 3 : Ship Building

Group 4 : Ship Auxiliary Systems

Group 5 : Ship Automation

Group 6 : Nautical Science

Group 7 : General Marine Engineering.

iii) the third digit indicates the number whithin the same group.

GROUP NO.	GROUP TITLE/COURSE	YEAR SEMESTER
1.	SHIP POWER PLANTS	
	MAR 410 Marine Diesel Engine I	IV - 1
	MAR 411 Ship Power Plants I	IV - 1
	MAR 412 Engines and power plants	IV - 1
	MAR 413 Marine Steam and Gas Turbines	IV - 1
	MAR 514 Marine Diesel Engine II	V - 1
	MAR 515 Ship power Plants II	V - 1
	MAR 516 Running and Maintenance of Ship Power Plants	v - 2

2. **NAVAL ARCHITECTURE**

MAR 420 Naval Architecture I	IV - 1
MAR 521 Naval Architecture II	V - 1
MAR 522 Naval Architecture III	V - 2
MAR 523 Ship Proplusion	V - 1

3. **SHIP BUILDING**

MAR 430 Ship Structures	IV - 1
MAR 431 Ship Strength	IV - 1
MAR 432 Ship-Yard Technology I	IV - 1
MAR 533 Shipyard Technology II	V - 1
MAR 534 Ship Design I	V - 2
MAR 536 Ship Design II	V - 2
Ship Design Construction	V - 2

4. **SHIP AUXILIARY SYSTEMS**

MAR 441 Marine Auxiliary Machinery	IV - 1
MAR 442 Heat Transfer	IV - 1
MAR 543 Refrigiration and Air-Conditioning	IV - 1

5. **SHIP AUTOMATION**

MAR 550 Ship Automation V - 2

6. **NAUTICAL SCIENCE**

MAR 360 Navigation and Meteorology III - 2

6. **GENERAL MARINE ENGINEERING**

MAR 570 Marine Operations IV - 1

MAR 571 Project V

4.20 CONCLUSION

The Engneering curricula in the Maritime Academy has stagnated for nearly 14 years without a single review. As we are aware shipping is a dynamic activity, which is under constant pressure to change. Most of human factors cited in Marine accidents were related to a lack of experience with the onboarb technology. Failure to use available equipments, inadequate numbers of qualified personnel, inability to operate highly automated systems. Properly functioning equipment is not the major problem, having crews who are able to make use of such equipment may be the heart of the matter.

Today, more sophistcated equipment is being developed to further aid the Mariner. Often such equipment is installed even before it is required by requlations. Creating the impression that all possible measures to provide for safety of the vessel have been implemented.

Additionally, steering systems have been greatly improved subsequently to the Amoco Cadiz casualty. Redundant power units and duplicate Control systems with associated failure alarm system to lessen the likelihood that casualty will result from the loss of steering control.

Ships are changing in sizes and shapes to take advantage of the advanced technology. It then means that the training of the Marine Engineer must be developed correspondingly with time. This means updating instructional material, which will involve reducing subjects of less significance to make way for subjects of increasing values in the current Maritime technologies.

In part of shortage of qualified lecturers, what this implies is that there must be all-out effort on the part of the authorities to motivate and induce the needed lecturers. To solve this problem, the authorities must be prepared to attract well qualified technical and maritime lecturers by placing them on salaries comparable with those of their colleagues in business and industry in order to keep them in teaching.

We should also remember that, our competitor countries are Ghana, Ivory Coast, Egypt, Britain, France to mention just are a few. The Britain which we copied the present curriculum from has since moved away from rigidity to some thing flexible and new.

Nigeria must understand therefore, recognize the instrument of the current policies and note some of the inadequacies in the current curriculum. Our Shipping industry must reflect the technology of the 1990s. We have to understand that Nigerian engineer is going to compete with European, Japanese, and American engineers. On the light of this, our system have to be restructured to reflect the global aspirations.

MARITIME ACADEMY OF NIGERIA ORGANIZATION CHART

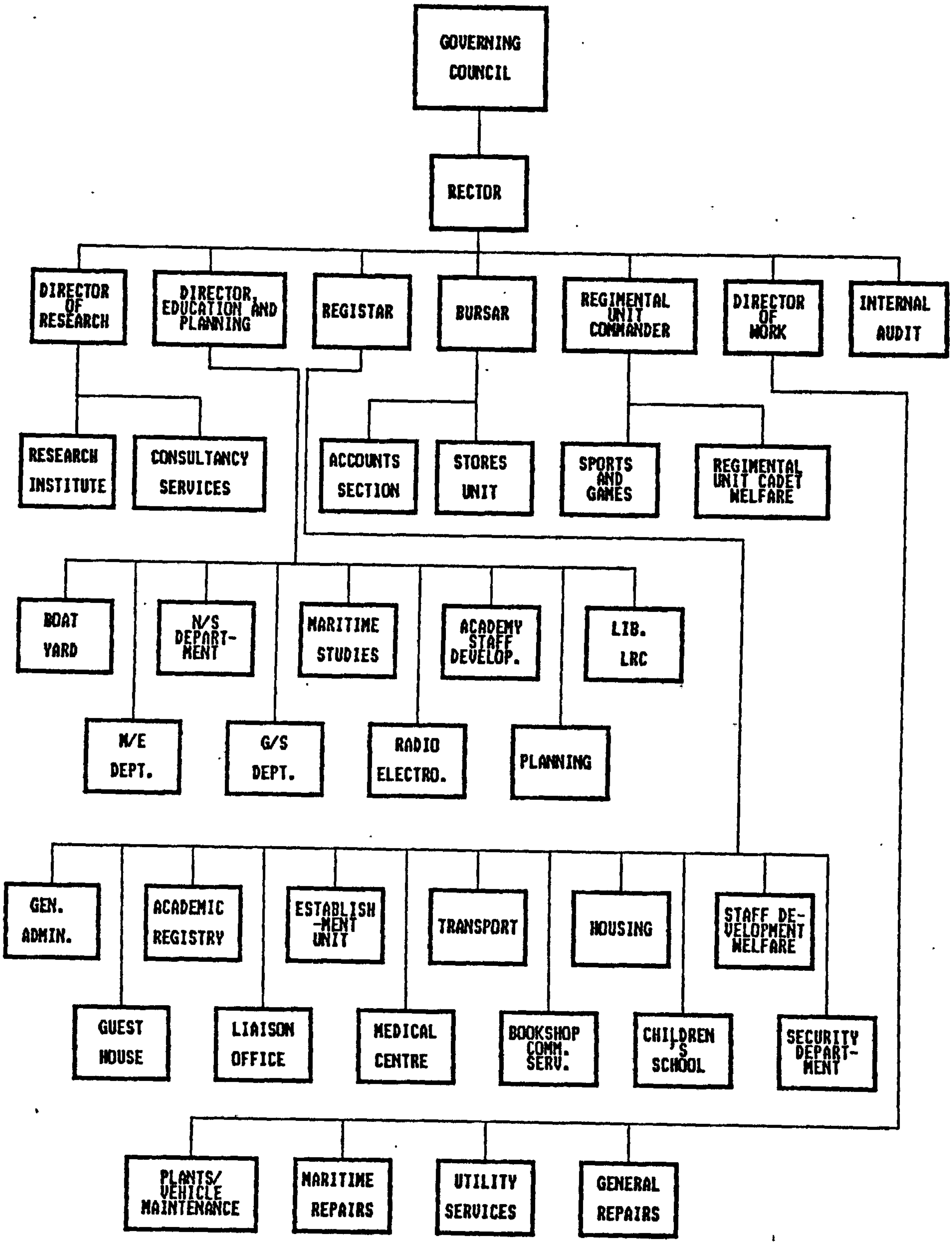


Fig. 4.1 Organization Chart: MAN - Oron

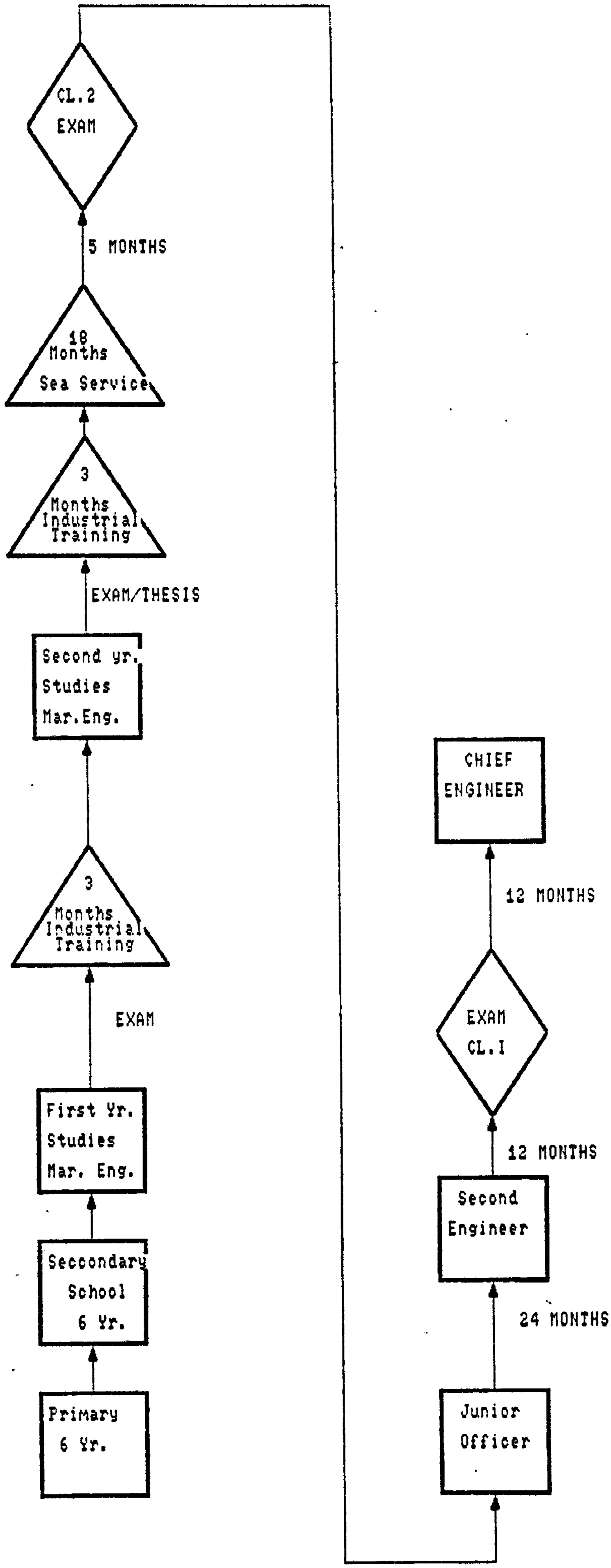


Fig. 4.2 The Existing Training System.

CHAPTER V

PROPOSED CURRICULUM DESIGN AND DEVELOPMENT

5.1 Introduction

The term "Curriculum" has a wide variety of definitions. The Latin root for the word "Curriculum" means "race course". presently, there is no commonly accepted definition for the term. The definition varies with the concepts that a researcher or practitioner uses in his or her curricula thinking and work.

Goodson (39) defined curriculum as follows:

- A general over-all plan of the content or specific materials of instruction that the school should offer the student by way of qualifying him for graduation or certification or for entrance into a professional or vocational field (Goodson, 1966, p. 29).

By contrast, many curriculum writers have developed curriculum designs which have deliberately focussed on process skills. The major thesis of this approach is that there are skills that students should learn that are not only useful in learning specific competencies within the school curriculum but will be useful in none-school related contexts, and helpful in future learning situations.

Among the type of processes that have served as organizers for curricula are problem solving, social processes, and valueing processes. Advocates of process oriented curricula have argued the following to support their views:

- Since the most significant goal of the school is the development of life long learning skills and interests central;

- the curriculum should be planned and organized so as to have maximum carry-over into life processes and skills; greater carry-over is likely to be when the curriculum design directly reflects these processes and skills;

- the process of valueing and other processes having a high effective element can be taught as well as essentially cognitive skills; the former should be as well represented in the curriculum as the latter.

(Saylor and Alexander 1974 p. 227)

5.2 THE NEW CURRICULUM

The principal aim of the new curriculum is that of educating the cadets generally, while simultaneously providing professional competence in marine engineering and naval architecture. To this end the curriculum is designed to be of such depth and quality that all
cadets would be fully prepared to enter directly the practice of their profession or go straight into graduate studies and research.

The content of the new programme is made to develop the cadet's capability for independent study and original thought as well as to foster those work habits which contribute to professional excellence.

Changes can be rough, and at times turbulent. We simply need to recognize the competitive threat in the global maritime industry, therefore, making the change is inevitable. I know that economy and culture may play their roles, but the latter is dynamic and variable with time.

In Nigeria, marine engineering education developed more as a professionally oriented subject, while in developed world the emphasis has been on engineering science. In a fast changing maritime technology it is disturbing to see certain things remaining constant when they should not. Training in the world of marine engineering is the case in point.

Considering the state of Nigerian economy and the present dynamic nature of maritime technology, the new training scheme should be able to produce a marine engineer, who should be able to measure up academically and scientifically with his land-based engineers. For example, in Electrical, Mechanical, Aviation and Civil counterparts, to mention just a few. Conversely, such development will remove once and for all cultural stigma associated with the professional certificate without academic degree backing.

It is not always and not only the money which attracts particularly young people to go into certain profession, but the professional pride. Additionally, high reputation enjoyed in the society may make the decision in favour of that very profession. The image of the seagoing professional is badly neglected in Nigeria, compared with his colleague in the Air craft industry. This needs to be polished up with sound academic and professional education.

The author's personal observation in the class room with the cadets, reveals that midshipmen aim toward obtaining bachelor degree that could give them wider job opportunities in their future lives. Technical training alone is not enough. Engineering educators and the society owe it to their students, and to the nation, to help them become not only good engineers but responsible world potential leaders.

At this point, one would like to ask will Nigeria organize creative educational programme to develop the skills and innovative abilities in our marine engineers? Will we at the long run break the traditional pattern by recognizing that education and training of marine engineers is a life long process?

Firstly, we must maintain a balance between fundamentals and specialization. Shakespeare wrote that during a life time, an individual goes through seven ages. But that of an engineer should be something in the neighbourhood five. Similarly, Anthony Giordano, president of American Society of Engineers, 1989-90 disputed that, in their professional lives, engineers pass through certain ages. These ages illustrate the spectrum of values that must be considered in design of a career-long system of engineering training following graduation:

- the age of the application engineer;

- the age of the design engineer;

- the age of the engineer supervisor;

- the age of the engineering manager and

- the age of the engineering vice-president and president.

Generally, the author does not expect new graduates engineers from the Maritime Academy to be seasoned veteran engineers, but we would like the graduates to know at least what engineers do and why. Looking critically at the marine engineering discipline, a discipline can be defined based on what is expected of those trained in that discipline. A list of competencies also serves as a guideline to the building of an engineering curriculum. Competencies for the marine engineering are classified as those expected to be met by all graduates of the programme.

The late philosopher Sidney Hook (7-9), suggested that among the characteristics all college graduates should have effective communication, knowledge, about the world and humanity, a grasp of physical principles that explains what they observe, and awareness of the function of the society.

Going by these principles, the proposed new curriculum should be able to produce engineers with the following ability:

- Solid fundamental knowledge of engineering sciences;
- Reasonable familiarity with computers, computational techniques, and computational aids;
- Ability to reduce data, concepts, and designs to clear picturial form;
- Ability to approximate solutions, make reasonable engineering assumptions when required, and produce specific recommendations in determining data;
- A developing sense of engineering ethics and some principles by which moral choices may be made within a professional context;

- Ability to carry design processes from problem definition to solution, including the ability to gather pertinent information and deal with incomplete problem definition and constraints involving esthetics, reliability, economics, politics, ecology, law, sociology, and general safety.

5.3 THREE DIMENSIONS OF THE NEW CURRICULUM

There are three distinct phases at all the real marine engineering student is supposed to pass through to become and acceptable engineer. This is illustrated in figure 5.1

Movement from one phase to the next requires a shift in paradigms. Engineering education should promote this shift, not inhibit it. When an engineer begins his or her education, the emphasis should be placed seriously on the -ics, this means:

- Mathematics;
- Physics
- Mechanics
- Electronics
- Chemiques
- Acoustics

- Elastics

The -ics at the end of each word signifies that the subject is scientific, analytic, synthetic, mathematic and academic. The key characteristic is the absence of concern for human values. No one can be considered a competent engineer who does not have a good grounding in the -ics.

The second phase of development occurs when a student graduates and move into gainful employment, where the key encounter with what I call the - ing phase:

- Operating

- Planning

- Designing

- Creating

- Delivering

- Servicing

- Optimizing

- Scavenging and above all managing.

Because each of the words has a very root, it connotes action. The -ics subjects are concerned with knowing and understanding. The -ing subjects are concerned with doing, or more accurately, with delivering to customers the promises of engineering education and training.

In the -ing phase, engineers are confronted with human values. The matter was put succinctly in 1857 by A.

Wellington, in the Art of Railway Location in the United States:

" It will be well if engineers were less generally thought of, and even defined, as art of operation or constructing. In a certain important sense it is rather the art of not constructing; or, to define it rudely, it is the art of doing well with one dollar".

It is the third phase, the -tion phase, that best prepares engineers to play significant roles in the governance of the systems required to support the society. In this phase engineers deal with society functions and institutions, which include transportation, communication, habitation and environmental protection. It is at this final stage, that human values, in all their complexity play the central role.

5.4 Curriculum for National Aspiration

The proposed new curriculum is intended to take into consideration the new development in the **National economy.** As Nigeria is marching into culture of ship building and repairs, the new curriculum, by and large must reflect this aspiration. Therefore, areas like **Naval Architecture** and **Design** must be given top priority in the new curriculum.

Curricula changes dictated by the future trends, as elaborated in the previous section, are more evolutionary than revolutionary. These curricula changes call for addition of many subjects and skills; in view of an already bulging four years curriculum, their incorporation will require fundamental restructuring of the engineering curricula.

To answer future needs, the following changes are suggested for incorporation into engineering curricula.

Mathematics: The mathematics base in marine engineering education needs to be broadened to emphasize subjects such numerical methods, approximate methods, finite mathematics, non-linear analysis, asymptotic methods, and mathematical principles of graphics.

This need has been brought about by advances in the engineering Sciences and computer technology. The author feels that these subjects should be part of future engineering education even at the expense of more classical mathematical subjects. Course content must be carefully scrutinized to eliminate less relevant subjects and mathematical rigour where it is not absolutely necessary.

Also to be encouraged is the use of computer software in symbolic algebra and calculus for both teaching mathematics and routine engineering analysis in engineering sciences that enables students to deal with "tougher" problems.

Natural Sciences: There is a fast growing body of knowledge in the natural sciences that engineering student must learn. The present and future technologies will be based on a broader spectrum of scientific subjects and disciplines. In teaching physics and chemistry, emphasis should be placed on this broadening scope of the scientific base, rather than on the standard subjects, some of which are taught in engineering sciences in greater depth and sophistication.

The common denominator of these requirements, together with those aspects of natural sciences that are an indispensable part of the general education of a modern engineer, should form the requirements.

Simulator:

On the present trend, there will be no meaningful training for real sea operation, in the absence of simulator. On the side of simulator training, Warrent Lebeck, (1) of the United Merchant Marine Academy, Kings, New York, made the following observations in the paper he presented to the 7th International Maritime Lecturer Association (IMLA) Conference held in New York 1992:

> simulator is a useful tool that can duplicate stressful and critical situations and sharpen our skills to deal with such real emergencies. Simulators can put deck and engineering officers through crises and emergencies that they would be training, including rectification of skills, it has a vital role to play in our efforts to create and maintain a strong competitive American Merchant marine.
>
> (Leback, 1992, pp.1).

We will expect the new curriculum under the new dispensation to produce an engineer who can compute trim and stability, in addition, make reasonable calculations using personal computers (Ibid., p.5). And, we will also need bridge officers who not only can plot a true course. They need to understand and direct the appropriate actions when the bridge-mounted engine console lights up with a plot "hot bearing" or other crucial malfunctions in a readout on one of the dozens of remote sensors. They will have to know because it is likely that there will be no one in the engine room.

The modern ships are becoming Electrical/Electronics oriented oweing to a departure from the traditional method to automation. The remote controls, in most cases rely so much on the electronics devices and circuitry.

Engineering Ethics and Humanities: The philosophy of the new syllabi would provide adequately for the study of engineering ethics and good grounding in humanities. Humanity is equally important as professional, many engineering students often wonder why they should be "bothered" with courses other than those professional ones they are admitted to read. Even among the senior academic staff, there are some intellectuals who also question the reason of humanist studies in the institution which, in their opinion should be devoted every bit of their time in attention to professional or technological courses.

What this actually means is that an engineer requires much more than just his engineering or professional knowledge to operate effectively in his society.

An engineer responsible for an organization of say, 30 or more crew members under him is faced with a professional as well as organizational problems. His success in such a task depends on his knowledge and understanding of the simple mechanics of group behaviour just as much as his expert knowledge of engineering.

In his part, the engineer also requires some extra-professional skills in the official or formal medium of expression. He should be able to communicate meaningfully and effectively with the group, more especially if the composition is a multi-ethnic setting.

A chief engineer either afloat or ashore will certainly rely more on communication skill than on his engineering know-how. Any marine engineer officer who is faced with such a challenge, shy away with what can be considered an integral part of his official responsibility, is no more than a " **ship mechanic**"

In the words of Paulo Freire, every human being no matter how "ignorant" or submerged in the culture of science" he may be, is capable of looking critically at his world in a dialogical encounter with others. Provided with the proper tools for such encounter, he can gradually perceive his personal and social reality.

With reference to the words of Freire, one can advance opinion that it is the humanist studies more than physical science that provide the tools for critical social, economical and political awareness.

Emphatically, the philosophy of the proposed new curricula should look like the pictorial view shown in figure 5.2. From this arrangement, the modern ships' officer is a professional and must understand the procedures and judgements of practice. It is primarily due to the education in fundamentals that enables him to satisfactorily cope with the variety and rapidity of technological change of the modern times. Multipurpose education includes engineering science education.

It has much to do with thinking, and identifying the essence of problems, and choosing logical solutions. Frequently in professional practice, "how you think about what you think about" may be more important than "what you think about".

Navigation: The change of standards in Maritime education training will place more emphasis on navigation. Due to automation, navigation as subject will become more important than ever. Based on the present standard status (1992) which may be characterized by not yet satisfying position determination, Arpa, auto-pilot (course control), Satcom, GMDSS, VTS, are areas which must be fully exploited in the new engineering curriculum, as long as the fully integrated bridge system is the general and popular concept for today's and tomorrow's ship. All officers, being deck or engine must be able to execute or monitor the navigation process, plan the passage, and assess critical situations. Examples: France, Germany/hamburg/Netherlands.

Computer: A substantial increase of computer-related subjects and skills in the curriculum is needed. These include fluency in computer languages, computer graphics, database management manipulation, familiarity with a standard operating system, text editing, construction and critical of large software packages. Some understanding of hardware elements, and computer controlled processes. The students should learn to apply these skills to solving engineering problems.

Effective data handling requires the capability to use a computer (Garbage in - Garbage out) and data processing techniques (example, filters), to acquire, store, analyze and assess data, and to have a thorough understanding of the controlled process and the ship as a total integrated system.

These changes in professional activities have a strong influence on objectives and contents of engineering training. It is observed that:

- operating systems using electronics technology and man-machine interfaces like keyboards, screens, and software tools, like flow diagrams, icons and menues have become very similar in different applications such as bridge operation, engine room operation, loading office operation and radio operation

- the skill to operate electronics based systems is also desirable in the proposed system.

Automation : No where do the words automation and computer appear in the existing curriculum. There are poliferation of automation processes on the modern ship. They appear in the engine room in bridge control systems, they appear on the bridge in the integrated navigation system, and they appear in cargo operations in such areas as mechanical hatches and automatic warning systems.

The computerized engine room automation system has the following advantages in the modern ship:

- Reduced fuel costs by limiting the usual gradual increase in specific fuel consumption through continous component condition control, proper cylinder balancing and optimal injection and combustion;

- Reduced maintenance costs through extended maintenance intervals by ensuring good operating conditions and by maintenance planning based on accurate information rather than on assumptions and statistics;

- Effective use of maintenance crew;

- Reduced risk of machinery breakdown and consequently "off-hire";

- safety against black-out because of extensive power consumption monitoring;

It has unlimited advantages in the operation of the modern ship.

Engineering Design: The movement toward the sciences in marine engineering training was, however, motivated by what Herbert Simon, (2) of Massachusetts Institute of Technology (MIT), called the "desire of academic respectability". In terms of the prevailing norms of general culture as existing in France, Japan, United States, Netherlands and Germany, Simon said academic respectability calls for such subject matters "that are intellectually tough, analytic, formalizable and teachable".

It is right to say that, engineering design or synthesis is the central theme of the engineering activity. In the existing curriculum, the subject has always been treated as "intellectually soft, intuitive, informal and cookbooky" and was by and large purged from engineering curricula.

The design element of the curriculum urgently needs to be strengthened by adding courses wherever possible on the fundamentals of design. within the generic ream of Computer Aided Design (CAD), major efforts should focus on improving the cadets' understanding of engineering principles, the design process and proper use of the computer in finding optimal solutions to engineering design problems.

English Language: The teaching of technical English should be replaced by the teaching of the English Language. Where necessary more attention should be paid to report analysis.

Communication: Greater emphasis should be placed on improving the written and oral communication skills of students. I will like to suggest that each year stress oral presentation, and at least one course each year have substantial writing requirements and several literature surveys.

Interdisciplinary Exposure: Marine engineering students are handicapped in this regard. Efforts should be made to incorporate elements of interdisciplinary work into the curriculum. One way to approach this problem is by forming small research or project team from different disciplines carrying out or engineering project.

Apparently, the same argument goes for other subjects in the curriculum, they must be reviewed in line with the other courses as the pressure from the high technology continues to influence the maritime industry.

Parallel to these changes, it is suggested that **overall course load for the 4 years curriculum** should take the following form:

- **Mathematics and Natural Sciences - 30 to 35 %**
- **Engineering Sciences - 35 to 40 %**
- **Design and Computer technology - 15 to 20 %**
- **Humanities, Social Sciences,**
- **English language and communication - 10 %**

The pictural view of the above arrangement is illustrated in fig. 5.3.

5.5 COURSE DURATION

Since the traditional 4 - year programme cannot be further stretched, new approaches are required to alleviate the situation. The approaches require significant changes in the philosophy, attitudes, goals, curricula contents and methodology of the Marine Engineering Department. The materials must be simply repacked to achieve economy of presentation. Marine Engineering also must try to develop intellectual curiosity, creativity and cohesive understanding of the fundamentals of the marine engineering profession.

4 years seem reasonably for the most countries. Duration of theoretical training, total duration of practice before/within theoretical education, total amount of engineering training, supporting and professional syllabi subjects, Certificate(s) of competency, academic degree differ considerably from country to country. Some of the relevant data can be taken from table 5.1:

Country	Entrance Level	Year Educ.	Educational Level	Academic Degree
France	Bacc	P+4	Polytech	Msc/Bsc ?
Holland	11 Y	2+P+1	Polytech	Bsc/Ing
U.K.	12 Y	-	Polytech	-
Ger/Hamburg	12 Y	P+4	Polytech	Ing.
Ger/Flensbg.	12 Y	P+3+1	Polytech	Ing.
USA	12 Y	P+4	Academy	Bsc
Japan	12 Y	4	Univ.?	Bsc

Table 5.1
(Courtesy of 7th IMLA conference, 1992.)

The author assumes that these data might have been updated. As shown in the table, "12 Y indicates entrance requirements for either polytechnic or University, while "p" stands for practical training.

The significance of the point raised in the above systems are sea time, total duration of theoretical education, for example, Germany, France, United States and Japan use four years. While Netherlands uses three years for theoretical training. Going by the popular standards, the four years duration should be maintained.

5.6 4-YEAR FRONT LOADED

The existing programme in the Academy is Sandwich. On the basis of time, it takes approximately 8 - 10 years, from cadetship to train first class engineer. Considering the level of knowledge, professional and academic achievements, most of the useful time must have been wasted on shipboard training. It is not suggested that we should abandon sea-training. It is the critical link between the classroom and the "real world". The focus of training remains at sea. It is what we teach aboard is becoming the critical question.

In sea training, academic is not emphasized at all. It serves as a background to practical tasks faced by the cadets in the "real world". The advantage of this system is that it is relatively cost-effective, does not require a high level of education for entrants. It provides the industry with a "Captive" work force of trainers. The disadvantages are the system, in general, is based on outdated needs, pre-supposes an on-board training which is not always available. It prescribes high standard, short term modular shore training, which in many states, including Nigeria, is not fully provided.

5.7 MAJOR PROGRAMMES IN THE CURRICULUM

The changing in the seafaring over the past years, have meant that many who do not see themselves remaining at sea need to acquire higher qualifications. It is still, very often, regards any one with more than a handful "GCE" "O" level as being too clever to remain at sea. Nevertheless, seafarers have relatively short career afloat of around seven years at the average.

Moreso, the existing programme in Nigeria and in most countries, do not make provision for the land-based side of the industry. It is on the light of this situation that prompted D. M. Waters, rector World Maritime University - Malmo, to make the following remarks:

> In this regard it interesting that - despite the considerable amount of debate currently being generated about the training of the seafarers - so little is said or done in respect of the shore-based positions, traditionally occupied by the ex-seafarers. There are, of course, a few countries where comprehensive University undergraduates Courses in maritime studies prepare students not only for seagoing positions, but also recognize that many of them will progress to managerial positions in the shore-side of the industry. However, the majority of the advanced countries appear to assume that the fleet managers, harbour masters, surveyors, maritime lecturers et al., will continue to be adequately prepared by the education they received for their certificate of the competency followed, hopefully, by extensive seagoing experience (D.M. Waters, 1991, p.4).

Considering the fore-going arguments, it is now suggested the new curriculum be reconstructed into 2 **major areas** viz,

A. Marine Engineering- Focus on shipboard engineering operations;

B. Naval Architecture - Attention directed towards A, with more emphasis on ship building and construction.

The structure of the degree programme is suggested to take the following arrangement:

PHASE 1: For the first two years, all students from the two major areas take common courses in the following component core areas and also courses from

A. Mathematics- Four courses in calculus (I, II, III,IV)

B. Sciences - Divided into:

i) physics - 4 courses

ii chemistry - 2 courses

C. English - 3 courses

D. Humanities- and Social Sci. - 6 courses

E. Naval Sci.- 4 courses

F. Physical Education/First Aid - 8 courses

G. Computer Science - 2 courses

The first phase will also include workshop technology and greater part of natural, applied, and engineering sciences. Introduction to some aspects of major areas will be included.

Since technical courses often require a sequence of prerequisites, it might be necessary for some engineering science courses to be extended into the second and third year. Each area of specialization would have exact course requirements. Most of the lecture courses would not differ substantially from courses currently taught in bachelors' degree programmes. Except that with strong pre-engineering preparation, the courses should be taught at a higher level and would include more materials.

Phase II

The main theme of phase two will be on major area of specialties and in-dept approach to natural and applied sciences and engineering science. This period will be directed towards land-based and shipboard training, and it should be at the ratio of 1:1 to maintain the equitable balance. Principally, such areas as marine propulsion machinery, automation, electro-technology, electronics, integrated bridge and engineroom control system et al. Equal amount of time should also be spent in the shipyard.

Phase III

This period will be the final phase of the programme. Here it will be mainly focused on deeper approach to the professional training and intellectual training. Additionally, the training must meet the following requirements:

Training to meet STCW provision, as contained inarticles:

- X and regulations 1 - 4 of the convention;

- Training to meet the STCW Convention requirements broadened to include non-STCW courses;

- Training to meet the STCW Convention requirements and expanded to enable candidates who wish to continue after bachelor degree and Certificate Competence respectively to continue to pursue higher degree.

The proposed restructuring **degree programme** is illustrated in tables, 5.1, for general Courses, table 5.2, for **Naval Architecture** and table 5.3 for **Marine Engineering** ship operation.

Restructuring Programmes for Bachelor Degree in Naval Architecture and Marine Engineering

COMMON: For the first two years, all students irrespective of the Department, must successfully achieve a minimum mastery level in the common subject areas. The maximum great point average must not be below 2.00 GPA, in each of the courses. However, if particular courses are not relevant to the student's need, they may be waived:

- **Mathematics**
- **Phys.I, Elem. Mech & II**
- **Chemistry I & II**
- **Data processing (basic)**
- **Automation**
- **Engineering grahics**
- **Strenght of materials**

- Introduction to Engr. Design
- Ship operation system
- Navigation
- Workshop Tech./practice
- Naval Arch. and propulsion
- Electrical Machinery
- Electronics / digital
- Solid / Fluid Mechanics
- Safety
- Computer programming
- Physical Education
- Seamanship
- Engr. Ethics
- Engr. Sci., Elective
- Engr.Man.Proc.
- Engine Simulator

Table 5.1 Common Curriculum

CURRICULUM FOR NAVAL ARCHITECTURE

SEMESTER I			SEMESTER II		
Subject	SEM hrs.	Classs hrs.	subject	SEM hrs	Class hrs.
English/Comm.	2	2	Mar.Engr.II	3	3
Chem. I	2 1/2	3	Calculus II	4	4
Calculus I	4	4	Comp.Program.	3	4
Engr.Draw.	3 1/2	6	Applied Chem.II	3	3
Naval Arch.	1 1/2	2	Physics II	3	4
Mar.Engr.	1 1/2	2	Elective	3	3
Physics I	4	4			
	19	23		19	21

It is obligatory that at the end of every semester the student must complete two months practical work.

SEMESTER III			SEMESTER IV		
Subjects	SEM hrs.	Class hrs.	Subjects	SEM hrs.	Class hrs.
Elective II	3	3	Calculus IV	4	4
Calculus III	3	3	Literature	3	3
Engr.Analy.	2	2 1/2	Phy. IV	3	4
Material Science	4	5	Fluid Mech.	3	3
Strenght of Mat.	4	4	Thermo.	3	3
Physics III	3	3		16	17
	19	20 1 /2			

Successful completion of two months practical work is required.

SEMESTER V			SEMESTER VI		
Subject	SEM hrs.	Class hrs.	Subject	SEM hrs.	Class hrs.
- Economics	3	3	Ethic & Pol.	3	3
- Probabli.			Modern Phys.	2	2
& Rand.Pro.	3	3	Naval Arch IV	4	4
Mach.Design	2	2	Engr.Lab.	2 1/2	4
Electro-Tech.	3	4	Naval Arch.	4	4
Marine Engr.	3	3	Elect.Engr.	3	4
Naval Arch.	2	2	Thesis	–	2
Thesis	–	1		21 1/2	24
	16	18			

SEMESTER VII			SEMESTER VIII		
Subject	SEM hrs.	Class hrs.	Subject	SEM hrs.	Class hrs.
Ethics & profession	3	3	Naval Arch.IX (ship design)	3 1/2	6
Communcation	2	2	Naval Arch.X (propell.design)	3	3
Sh.Vibra.	3	3	Mar.Engr. VI (Steam plants).	4 1/2	5
Naval.Arch.	4	7	Thesis		2
Mar.Engr.V (Design)	4 1/2	5	Seminar	3	2
Thesis	2 1/2	5			
	18	25		17	21

Table 5.2 Naval Architecture Curriculum.

MARINE ENGINEERING CURRICULUM

SEMESTER I

Subject	SEM hrs.	Class hrs.
English/ Comm.	2	2
Calculus	4	4
Ship System	3	4
Physics	4	4
Chemistry	2	3
Naval Arch.	2	3
Mar.Engr.I	1	2
	18	22

SEMESTER II

Subject	SEM hrs.	Class hrs.
Mar.Engr.II	3	3
Calculus	4	4
Chemistry	3	3
Comp.Prog.	3	4
Physics	3	4
Engr.Design	1	1
Elective	3	3
	20	22

SEMESTER III

Subject	SEM hrs.	Class hrs.
Elective II	3	3
Calculus	3	3
Elect,Engr.	3	4
Thermo.	3	3
P/E	1	1
Mar.Design	3	3
Engr.Man.proc.	1	1
	17	18

SEMESTER IV

Subject	SEM hrs.	Class hrs.
Literature	3	3
Calculus	4	4
Humanity	3	3
Material Strenght	3	3
Workshop	1	2
P/E	1	1
Elect.Mach.	3	4
	18	20

The Summer sea term of 4 credits hours must be maintained.

SEMESTER VII			SEMESTER VIII		
Subject	SEM hrs.	Class hrs.	Subject	SEM hrs.	Class hrs.
Humanity	3	3	Humanity	3	3
Naval Arch.	3	3	Engr.Econs.	3	4
Engr.Desgn	4	5	Mar. Law	2	4
Automation	3	3	Pern.Mangt.	3	3
Navigation	3	3	Engr.Design	3	5
Materials Strenght	1	2	Engr.Analy.	3	3
			Thesis	2	2
	17	19		19	24

Table 5.3 Marine Engineering Curriculum.

5.8 CERTIFICATION

A question frequently asked is what are the personnel requirement for a ship and what standards the personnel should be trained?

The obvious answer to this question is that a ship should carry sufficient crew to enable it safely navigate the oceans, without accident or loss to the crew, cargo itself and without damage to the environment. 85 % of marine accidents have been attributed to the human errors, and lacked proper training.

RECOMMENDATION

With the high level of professional and academic standards proposed in this dissertation only three levels of certificates are recommended. These are third class, second class and first class (all unlimited).

5.9 Examination

After four years of studies, with more than six months of accumulative sea-service training, class three engineer officer certificate should be given to the student after oral examination.

For the class two certificate, for the second engineer (unlimited 750 - 3000 kw), the candidate should have a minimum of 12 months approved sea-training and **8 weeks simulator training** as engineer Watckeeping officer. Three out of the 12 months must have been on ship above 3000 kw.

Chief engineer (unlimited). Any person seeking for examination at this stage should have a minimum of 15 months approved sea training and **8 weeks simulator** training as second engineer and 4 months out of 15 must have been on ship above 3000 kw.

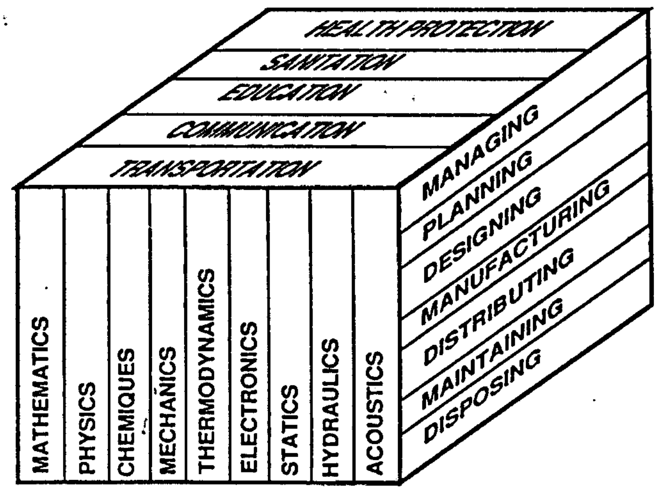
Simulator training is regarded by the author as integral part of sea training. This approach has since been adopted by France, which maritime training system is one of the best the world.

5.10 CRASH PROGRAMME

This is a short term arrangement, under this condition University graduate engineers in Mechanical and Electrical engineering, are admitted for short courses. The duration of such courses should be lasting between 3-4 months in the Academy, before a prolonged sea - service is embarked upon. This proposal if given a chance can go a long way to alleviate our manpower problems.

The Flow chart of the entire training Scheme proposed in this dissertation is shown in figure 5.4. Diagram A, shows programme for **Engineering graduates,** B illustrates programme for **Naval Architecture** and C, indicates **Marine engineering** scheme.

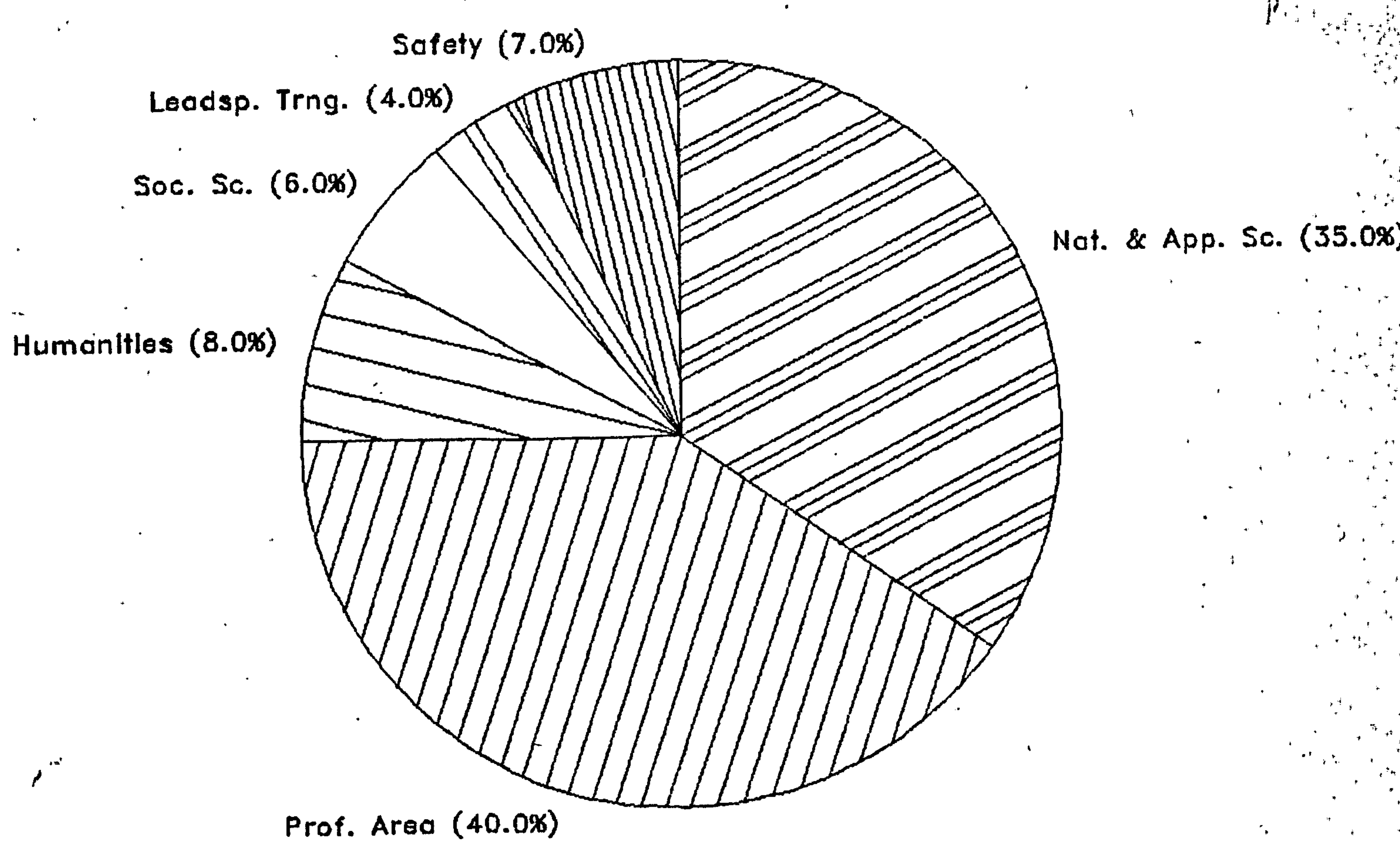
Three Facets of an Engineering Career



■ *The* -ics *face is academic in outlook and marks the start of the profession. The* -ing *face is the "doing" face. The* -tion *face is concerned with the functions of society. Each face is orthogonal to the others in spirit, style, and values.*

Fig. 5.1 Three Distinct Phases of Engineers. (Courtesy of Engineers Education).

Fig. 5.2 Philosophical view of the Curriculum



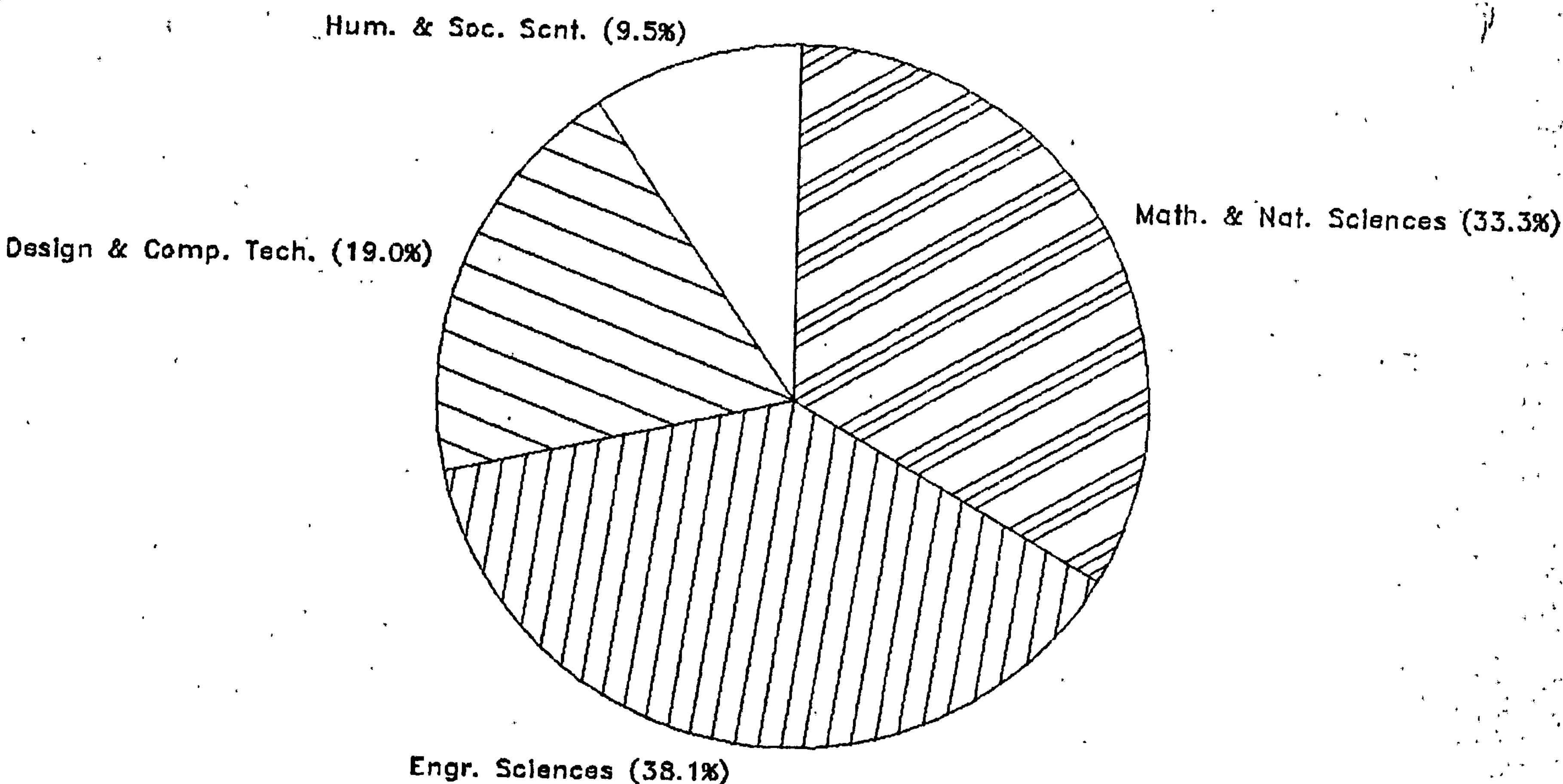


Fig. 5.3 Pictural view, Subjects combination

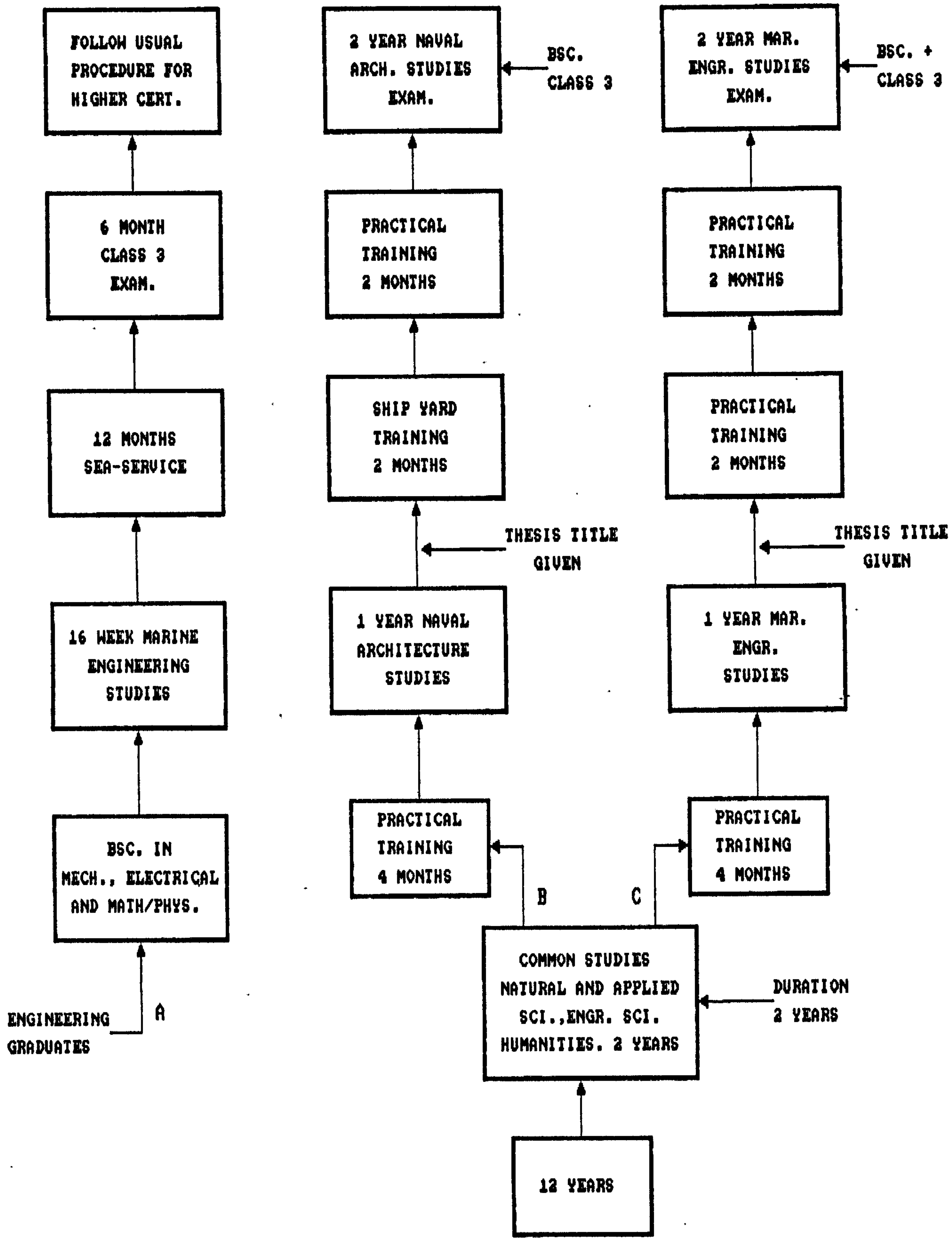


FIG. 5.4 PROPOSED RESTRUCTURING PROGRAMME

CHAPTER VI

RECOMMENDATIONS AND CONCLUSION

Introduction: The decline in number of Nigerian flag ships and jobs for Nigerian Seafarers has seriously reduced the support of our land-based marine industry. Also the training Scheme and the teaching staff, has been something of a serious threat to the Shipping industry in Nigeria. It is this unusual turn of events that has prompted me to propose a new approach to Marine engineering education in Nigeria. I believe that the opportunity has offered itself to remedy the deficiencies in the existing system, and to adopt a front loaded system into future. However, in doing so, we must maintain whatever is good about the present sandwich system and be flexible enough to allow for changes and innovations that will take place in the industry.

In assessing deficiencies, I noted an overburdened curriculum; insufficient integration of both early natural sciences, engineering sciences, Mathematics and problem-solving orientation. This limited cadets' appreciation of the diversity of subjects engineers need to cover; insufficient integration of engineering with non-engineering aspects of communications, business, technology, policy, arts and sciences; and virtually no exposure to the culture and practice of lifelong learning.

RECOMMENDATION

My assessment led me to conclude that pressure on the curriculum required the educational experience to be significantly restructured, and this restructuring should focus on the lower division. Such a focus would also become a driving force for changes in the rest of the curriculum. This paper, therefore, recommends retaining and strengthening elements of Mathematics, engineering sciences, natural sciences, and fundamental concepts of engineering analysis and design.

Additionally, it is also suggested that, however, more emphasis should be placed on synthesis and maintenance of depth and strength in technical subject matter; stronger emphasis on non-technical education to develop historical and societal perspectives; development of management skills.

While I acknowledge the inter-dependence of theory and practice, the focus of my analysis is the curriculum in action. This stance reflects my own experience as a long time teacher of engineering technology for nearly two decades, and which has given me an opportunity to share in the development of a curriculum. As a maritime teacher, my function here is to critically examine curriculum theory and practice in the light of each other. It has been a hard decision, in which theory has been forged on the anvil of practice. My approach is analytical, the aim here is a ratio of 1:1 for theory and practice.

The 4 - year cannot be further stretched, new approach are required to alleviate the situation. These approaches require significant changes in the philosophy, attitudes, goals, curricula content, and methodology of marine Engineering Department. The material must be simply repacked to achieve economy of presentation.

The Engineering Department must try to develop intellectual curiosity, creativity, and cohesive understanding of the fundamentals of the marine engineering profession.

RECOMMENDATION

In the light of the disadvantages associated with the existing sandwich programme, I recommend the abolition of the present sandwich system. This should be replaced with one-tier system of 4 years academic degree programme, leading to bachelor of science (Bsc), in marine Engineering, Naval Architecture and 3rd Class certificate of competency. The programme will include a period of guided sea-training. The entry qualification will be General Certificate Education GCE "A" level certificate or its equivalent.

IMPLEMENTATION

To speed up the process of the degree programme, it is suggested that the Authorities of the Maritime Academy in collaboration with the Federal Ministry of Transport, should open discussion with the River State University, Port Harcourt. Such discussion should centre on modalities for immeadiate affiliation. The allegiance will permit the Academy to go under the umbrella of the University Accreditation to award the degree, until the time it could do it alone.

The choice of the River State University, Port Harcourt, is based on proximity to the Academy, its long standing recognition by the International Maritime Organization (IMO), and the Institute of Marine Engineers London.

There is a substantial flow of seafarers from the developing countries to ships owned and managed from the developed world. In recognition of the situation, some shipowners' associations from Europe, Scandinavia and Japan have entered into agreement with the seafarers unions in the Philippines, Indonesia and India on salary structure for their seamen. In some cases assistance is offered for the training of the seafarers. Such agreed assistance has been rendered to the training institutions and some ship management companies. For this reason, the standard of training provided should be acceptable to the international shipping community.

The proposed new programme is designed to produce an officer who is scientifically sound, and professionally good enough to do the work of a 3rd engineer immediately after graduation.

FUNDING FOR THE SHORTAGES

The federal government alone cannot give enough fund to meet the needs of all it para-statal today in the present world of accelerating marine technology and tougher competition.

Recommendation

If essential training in marine engineering sector is to meet its real needs, both in terms of quality and quantity, it is recommended that the government, shipowners and the Union make choice between two main options:

- Bring in new, more rigorous rules designed to meet current and future training needs;
- Introduce a levy/grant system to all marine related industry in Nigeria to pay toward training.

As said earlier, the present method of funding and encouraging training has great limitations and hardly adequate for an institution which is changing beyond recognition. One gets worried about the attitudes of the private companies which are doing nothing and, like vultures, are just waiting to make lucrative offers to the trainee to entice them away while not spending a dollar on their training.

For foreign - going service, the shipowners should play greater overall role by, for example, **paying one third** of the general training fund. No organization within the industry should be exempted from the levy.

On the broader scale, industry, government and the University should collaborate effectively in research through consortia. In such alignment, the research body receives fund from both government and industry to support practical research of values to the industry.

SOLUTIONS TO MANPOWER SHORTAGE

The skill shortages are badly affecting all sectors of the marine industry in Nigeria. This is a symptom of failure of government, Shipowners and industry itself to invest in its future manpower needs. However, merely pouring more resources into training and buying unrelated equipment is not the whole answer, they must be backed up with changes in attitude. The old pattern would not do. Something much more flexible to meet the immediate needs is required.

Recommendation (general)

To arrest the present situation generally in all sectors of marine economy of the nation, it is suggested that government should organize crash pre-sea training programmes for the holders of the following academic degree:

- Bsc.- Mechanical Engineering;

- Bsc.- Elect/Electronics Engineering;

- Bsc.- Maths/Physics.

These candidates spend about one semester of **16** weeks in the Academy, this period should include **simulator training.** Later on, they go on sea-service for one year. On return, they go to the Academy for **6 months** duration, for third class engineer officer examination and Certification. There after, the trainee follows the laid down policy and procedures for getting higher certificates.

The idea of putting Bsc. engineering graduates through an accelerated cadet programme at the Maritime Academy should be considered as a priority.

TEACHING STAFF

As in all training situations, the ability, co-operation, skills and dedications of the teachers are the key components in the transfer of knowledge and skills to those being trained. In attempting this analysis I have come to the following conclusion that the current curriculum lacks means of evaluation, feed back and implementation. The teachers who were supposed to be key figures in the process of curriculum implementation were not considered. The welfare of teachers as well as the training to cope with ever increasing new technologies in the industry was not important to the administration. There will be no curricula if there were no teachers to interpret and execute them.

Recommendation

In view of the multi-functional roles of the teachers in transfer of knowledge, not even in the ordinary school system but in the sophisticated and complicated marine

Engineering setting. I recommend the following for immediate implementation to attract right calibre of maritime teachers into the institution:

- Remedial measurers should be taken by the government to **improve lecturers' salaries** generally and to adjust them periodically. Salary level, **comparable to other professionals** with similar qualifications, corresponding to knowledge and competence in teaching, should be considered as one of the keys to retention of qualified teachers in the profession;

- Government should consider **"scarcity award"** to maritime lecturers. Period of training, hazard and harsh environment associated with the maritime profession, should be a determining factor for such award;

- A programme should be worked out which allows senior engineers to accept full-time teaching or research position at the Academy while remaining on the payroll, as a last assignment before retiring;

- Special funds should be provided to the Academy to encourage experimentation and establishment of new programmes and curricula that will lead to improved industrial competitiveness between the industry and the academy.

- A professional approach to teaching should be seen in the same way as a professional approach to law, medicine, or engineering. It is not enough for a lecturer to be an exceptional Seafarer, advocate, or designer. He or she must be a distinguished

- Entry into the teaching profession should be maintained at a high level in order to avoid a a decline in the quality of education;

- Teachers need to be, or to become, committed to any planned change if it is to work. The motivation of teachers to make it work is crucial, because any change as far-reaching as the implementation requires that they be prepared to put in it more extra work;

- Involve individual departments in curriculum development and review every two years;

- Encourage **curriculum communication** with other sister Academies world-wide;

- The **rector** should spend time visiting teachers in the classroom;

- As the change will be based on the school and implemented not from above, **teachers** should **be involved** in the **process of** installing and **implementing** new programmes;

- The Academy should promote good interaction with the Accreditation Board, such as National Board of Technical Education (NBTE), the National Science Association of Nigeria and other appropriate agencies to advance issues important to engineering education and training.

- The Nigerian Society of engineers should talk straight to the government, arousing sympathy for the engineering education. Most specially in marine engineering which seems to be operating outside the national educational system.

- Many objectives should be drawn on students education and their level of training by systematic qualification upgrading of the teaching staff including their sea going experience

As the technology becomes more important in National life, we must educate the supporting structures of the society especially government about the potential impacts and importance of technological change. For example, the engineering society should be able to tell Federal government to borrow lead from Japan's situation. Japan spends just 1 % on defence, thereby making enough funds available for engineering and research.

Implementation

It is worth repeating that non-implementable programmes probably do more harm than good when they are attempted. The most responsible action may be to reject certain innovations which are bound to fail and work earnestly at those which have a chance to succeed.

In other words, change is not a fully predictable process. The answer is found not by seeking ready - made guidelines, but by struggling to understand and modify events and processes which are intrinsically complicated, difficult to pin down. Some of the ways in which we should attempt to effect the change include:

- Hiring or promoting new teachers who possess conceptual abilities, and who will in turn develop them in others;

- Adding training in the processes of implementation to in-service workshops and other project training activities directed at programme change;

- Adding courses in the theory of practice of change to pre-service programmes for lecturers, rector and other administrators.

CONCLUSION

The need for adequate training has again been highlighted by Lloyd's Register, whose latest casualty statistics show that 258 vessels of 1.5m gt. were totally lost during 1991, the highest total since 1986. It marked an increase of 422,000 gt. on the previous year. More than 1,200 people died in these losses, although structural or other technical failures may have played an important part, as well as human error through fatigue, inadequate training is recognised as the major contributing factor.

A maritime nation like Nigeria cannot prosper without good shipping. We are in danger of ignoring that simple truth. For some time now shipping in general, and the Merchant Navy in particular, has not had a high priority, except in a crisis. For example, that of River Quorra's accident in 1988 in which many Nigerians were killed and goods and property worth million of dollars perished. That is something we may all come to regret.

Many highly placed Nigerians do not know that nearly 98 % of our foreign trade is sea-borne. It has been so many years back and will continue to be so for foreseeable future.

Generally, there is nothing more gratifying than being able to make changes in the important issue that affect the lives of hundreds of thousands or millions of people. I will like to conclude with what American poet Ralph Waldo

Emerson wrote more than a century age, "What lies behind us and what lies before us are small matters compared with what lies within us". It is only through dedication and commitment that we will accomplish impossible tasks. Let us join to shape the future.

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