MODERNISING AND STRENGTHENING THE EDUCATIONAL PROGRAMME OF THE FEDERAL SCHOOL OF SURVEYING IN NIGERIA

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ABSTRACT

In December 1998 the International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede The Netherlands and the Federal School of Survey (FSS) at Oyo, Nigeria signed a preliminary collaboration document, whereby the two institutions would cooperate in modernizing the curricula offered at FSS. The project will address the problem of capacity building and capacity utilization in surveying and mapping organizations as well as training institutions in Nigeria by strengthening the FSS. The paper describes briefly the educational collaboration between the two institutes in the field of geoinformatics.

1.0 INTRODUCTION

As a result of advances in computer and space technologies, surveying and mapping have been totally revolutionized. Conventional methods and instruments in surveying and mapping have been transformed to analytical and full digital. We now have at our disposal, the use of geoinformation technology (GIT) tools to perform our professional duties in efficient and effective ways (Groot, 1997; Groot and Kraak, 1999). Thus, instead of surveying, we now talk of geoinformatics or geomatics.

The central tool in geoinformatics is the geospatial information system (GIS). Apart from the establishment of national geodetic framework (which also serves as framework for GIS applications) the other aspects of surveying and mapping activities are now subsumed in GIS applications whose instrumentation and methods are fast becoming a black box.

Nigerian Surveying and Mapping practitioners must therefore be necessarily well prepared to face the challenges of the new millennium as astute producers and managers of geo-spatial information. This requires thorough knowledge of GIS technology, awareness of the many sources of data for input to a GIS, and an understanding of the way in which the data can be handled and analyzed to solve problems associated with management of land and water resources. This calls for the combination of traditional skills with those of new technology and spatial data handling skills (Kufoniyi, 1999a; 1999b). These can be achieved only through a curriculum that is adaptive to changes. This means that appropriate education and training schemes must be immediately put in place in order not to be left behind with the 20th century.

From the foregoing sections, it is obvious that additional activities have been added to the mandate of a surveyor. Apart from being computer literate, he must be good in Information Technology in order to be relevant in the 21st Century (i.e. be 21st Century compliant!).

Geoinformatics education should be strong at conceptual level so that the graduates of the course can be versed not only in the use of GIS packages but also in GIS development. In short apart from the basic knowledge required for surveying and mapping, other subject areas are now required for geoinformatics education. Four broad specialized areas can be identified and have been generally implemented in various forms by notable institutions all over the world (Kraak, 1997; Kainz, 1997; Kufoniyi, 1999c). These four areas are:

(a) Spatial data acquisition (instrumentation & methods)
  (i) Computer-aided Surveying (land and hydrographic)
  (ii) Digital Photogrammetry and Remote sensing
  (iii) Conversion of analogue map and other geospatial data into digital form using manual digitizing and scanning
  (iv) Attribute data collection methods (e.g. social survey)

(b) Spatial data management (instrumentation and methods) which requires knowledge of database design and creation, database management systems, data transfer and exchange, spatial query development, spatial statistics, etc.

(c) Cartography and Geoinformation Visualization, dealing with data formats, generalization, information presentation, etc. and

(d) Geospatial information infrastructure and management, dealing with aspects such as spatial data standard, GIS policy, implementation issues, optimization of geoinformatics processes, etc.

As stated earlier, relevant to each of the four broad areas are fundamental subjects such as mathematics (including set theory, graph theory and topology), computer science, artificial intelligence and expert system (Kainz, 1996; Molenaar, 1998).

Thus it is necessary to design new surveying curricula which would address the four groups above as well as the fundamental subjects to be able to produce surveyors who will be experts in Geoinformatics and therefore 21st Century-Compliant! Unfortunately, it is convincingly clear that surveying education and practice in Nigeria are lagging behind in the area of modern technology.

2.0 PROBLEM TO BE ADDRESSED

In Nigeria at the moment, more than 90% of all professionals, technologists and technicians in various surveying and mapping organizations were trained in the obsolete methods of map production whereas, the introduction of GIT demands a critical mass of well-trained staff at all levels within a reasonable time frame. It is therefore necessary to (i) ensure that those undergoing new training are trained in modern technology and (ii) retrain the existing staff in modern technology.

The problem is not limited to the production sector. Most of the training institutions in the country are still running the old surveying curriculum based on the use of analog methods and equipment. In fact it was only in 1998 that the Federal School of Surveying championed the review of survey curricula by the National Board for Technical Education (NBTE). The new curricula are for the National Diploma (Technician level), Higher National Diploma (Technologist level) and Professional (Post-HND) Diploma programmes in surveying and geoinformatics. The new curricula are supposed to be introduced in all Polytechnics/Monotechnics running surveying in the country. But due to lack of qualified staff and facilities only the Federal School of Surveying, easily the most equipped of all Nigerian survey-training institutions, could commence the new programmes in the 1998/99 session. All other institutions are now looking up to the School to assist them with the training of their own members of staff (training of trainers). Unfortunately, neither the institutions of higher learning nor the production organizations could afford to send their members of staff abroad for training due to financial constraints, especially considering the number of persons to be trained before achieving capacity utilization.

Thus the School, because of its limited facilities, has to ration out the little number of student in-takes it can cope with among production organizations and institutions of learning. But if the institution can be strengthened in terms of curriculum, personnel and equipment, its specialized role as a unique staff development survey training institution will be put into maximum benefit such that the national training requirements in geoinformatics can be met within the shortest possible time.

The required institution strengthening can be achieved through collaboration with a reputable higher institution whose mandate is somewhat similar to that of the School and which has been well

established in the education and training of geoinformatics personnel. The FSS has found such an ally in the International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede, The Netherlands. The ITC is reputable world wide as a front-line training institution in geoinformatics.

A preliminary memorandum of understanding on implementing the collaboration as a project has been reached by the two institutions. The project will address the problem of capacity building and capacity utilization in surveying and mapping organizations as well as training institutions by strengthening the FSS.

3.0 THE COLLABORATING INSTITUTIONS

Two institutions are involved in the project, namely the Federal School of Surveying (FSS), Oyo, Nigeria and the International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede, The Netherlands.

3.1 Federal School of Surveying (FSS)

What is today known as Federal School of Surveying, at the present site – Oyo, Oyo State, Nigeria, started off as Survey School on 1st July, 1908 at Onikan, Lagos. It was then designed to provide a 3-year survey course for recruits who had completed full secondary education. It thus became the pioneer of survey training in the whole of Africa. The School was moved to Ibadan in 1926 and finally relocated to Oyo in 1929. The 3-year course structure continued until the School was merged with Yaba Higher College in 1936 when a four-year course structure was introduced. The 4-year arrangement lasted up to 1948 when the survey training in Nigeria was temporarily taken over by the then University College Ibadan, when she took off in 1948. The University College inherited Yaba Higher College and subsequently Survey School at Oyo. The proposed degree programme was short lived because it was scraped by the colonial administration.

The School re-opened in 1952 as a regional school of the then Western Region Government of Nigeria while the Federal Government established another survey school at Okene, Nigeria. The two Schools were merged to become one and on the present site at Oyo in 1965.

The mandate of the School was to provide articulated programmes of training in Surveying for:
(i) Technicians;
(ii) Technologists; and
(iii) Professionals.
Student-intake per session has always been based on the ratio of 80% from Government organizations and 20% from private practising firms. In other words, all candidates of the school must be sponsored.

In order to achieve the above objective, the School mounted programmes that were later streamlined with those of National Board for Technical Education (NBTE) to have:
(i) National Diploma (ND) in surveying
(ii) Higher National Diploma (HND) in surveying
(iii) Professional Diploma (PD or Post-HND) in surveying.

In addition, Intermediate and Advanced Certificate courses were run in Photogrammetry and Cartography. Those certificate courses were later stopped with the last set graduating in the 1997/98 session. The name of the School formally became Federal School of Surveying in June 1990 with the signing into law, the edict that established the School.

The School had been in the forefront of surveying manpower development in Nigeria and has trained over 90% of Nigerian Surveyors at various levels of education. The School has also been moving with changes. This is why the institution championed the review of the ND, HND and Post-HND curricula by the NBTE for surveying to incorporate the modern trend in Information Technology in March, 1998. This has been followed up by a workshop organized by NBTE to fine-tune the proposed syllabi in March 1999. The School has led others by adopting the new curricula and a change in nomenclature for its programmes from "Land Surveying" to "Surveying and Geoinformatics" effective from 1998/99 session. In addition to her list of courses, the School has again introduced a 12 – month Postgraduate Diploma in GIS. The focus of these programmes is the training of professionals that will be capable of

handling projects using Geoinformation Technology. The programs currently run at FSS are indicated in Table 1.

Table 1: FSS Courses and Entry Requirements

S/N	PROGRAM	CODE	DURATION	ENTRY REQUIREMENT
1.	National Diploma in Surveying and Geoinformatics	ND	2 Years	GCE Ordinary level or equivalent with credits in Math, Physics and two other subjects and at least a pass in English Language
2.	Higher National Diploma in Surveying and Geoinformatics	HND	2 Years	ND with minimum of lower credit
3.	Pre-Professional Diploma in Surveying and Geoinformatics	PPD	1 Year	B.Sc. in Math, Physics, Geography or other related subjects
4.	Professional Diploma in Surveying and Geoinformatics	PD	1.5 Years	HND with upper credit or PPD
5.	Post Graduate Diploma in GIS	PGD GIS	1 Year	B.Sc. or HND in relevant subjects
6.	Short term courses in GIS and Computer Studies	-	Maximum of 6 months	Variable

3.2 International Institute for Aerospace Survey and Earth Sciences (ITC)

ITC is an autonomous foundation partially supported by the Netherlands' Ministry of Education, Culture and Science and the Directorate General for International Co-operation of the Ministry of Foreign Affairs. It was founded in 1950, and its principal mission is to assist developing countries in the process of human resource development in aerospace surveys and remote sensing applications for natural resource development and environmental planning and management. This includes the establishment of geographic information systems and the management of geoinformation.

Scientific Divisions: Fifteen Scientific Divisions are responsible for training, research and development:

- Geoinformatics and Spatial Data Acquisition
- Geoinformatics, Cartography and Visualization
- Geoinformatics, Spatial Information Theory and Applied Computer Science
- Geoinformatics Management and Infrastructure
- Soil Science
- Forest Science
- Agriculture, Conservation and Environment
- Social Sciences
- Urban Planning and Management
- Geological Survey
- Applied Geomorphology
- Water Resources and Environmental Studies
- Engineering Geology
- Mineral Exploration
- Applied Geophysics

They receive support from the following laboratories, facilities and services:

- Information Technology Department (IT)
- Photogrammetric/digital map production facilities
- Geoinformation processing centres
- Geochemical and geophysical laboratories and equipment
- Cartographic, reprographic and printing facilities
- Photographic laboratory

ITC's training programmes offer some 40 different specialization courses, most at professional master, MSc and PhD levels. In 48 years, ITC has trained approximately 13,000 scientists and other professionals from more than 150 countries, thus creating a worldwide network of alumni.
The educational system is international and intended primarily for mid-career professionals and scientists from developing countries. ITC's education programmes thus contribute to manpower development within production organizations, and educational and scientific institutes in the third world.

Educational programme levels:

- Special courses
  Tailor made short courses, duration various
- *Diploma course (not equivalent to post-graduate diploma)*
  Diploma course in Geoinformatics, duration approx. 9 months (GFM.4)
- *Professional Master*
  Programme of Professional Master degree course, duration 12 months
- *MSc*
  Programme of Master of Science degree courses, duration ranging from 18 – 24 months
- *Doctorate*
  PhD study and research programme, duration at least 3 years

Advisory services: Since 1958, ITC has been involved in approximately 750 advisory projects in more than 70 countries. These assignments are co-ordinated by ITC's Bureau Project Coordination (BPC), which is responsible for project acquisition and administration. BPC also supports the scientific divisions in the co-ordination and execution of assignments.

The principle objective of ITC's advisory services is to assist developing countries in human resource development in compliance with its mission and within its fields of expertise. These services are available to government agencies and organizations, international funding agencies, consulting engineering and private companies, NGO's, educational and research institutes.

The spectrum of ITC's advisory services includes:

- Development of human resources
- Institutional support
- Contract research and development
- Technical assistance

Research: The thrust of the Institute's research and development is multi-disciplinary and problem-oriented. The Research Programme is entitled: "Geoinformation Management for Sustainable Natural and Human Resources Development".

Regional institutes with a long lasting relationship with ITC

- Indian Institute of Remote Sensing – IIRS, Dehra Dun, India (since 1966)
- The Department of Education and Investigation at the Instituto Geográfico 'Agustin Codazzi' – IGAC (formerly CIAF), Bogotá, Colombia (since 1967)
- Regional Centre for Training in Aerial Survey – RECTAS, Ile-Ife, Nigeria (since 1972)
- Department of Geodesy at the Institute of Technology of Bandung – ITB, Bandung, Indonesia (since 1975)
- The School of Urban Studies – SUS (formerly ECURSPAM) at Wuhan Technical University of Surveying and Mapping (WTUSM), P.R. China (since 1987)
- Universidad Major San Simon, Cochabamba, Bolivia (since 1996)
- Polytechnic of Namibia, Windhoek, Namibia (since 1997)
- University of Zimbabwe, Dept. of Geography, Harare, Zimbabwe (since 1997)
- University of Dar es Salaam, University College of Lands and Architectural Studies (UCLAS), Tanzania, (since 1998)

4.0 THE COLLABORATION PROJECT

4.1 Name and acronym of the project

Project for modernizing and strengthening the educational programmes of the Federal School of Surveying, Oyo, Nigeria. A programme of institutional collaboration between the International Institute for Aerospace Survey and Earth Sciences (ITC), Enschede, The Netherlands and the Federal School of Surveying, Oyo, Nigeria. Acronym: MOSEPO.

4.2 Objectives and brief description of the project

Part of the objective of this collaboration is to put the FSS in a better position:

(i) for the training and re-training of geospatial professionals, technologists, and technicians who had been working in the analogue environment to enable them convert to the digital environment and

(ii) for the production of graduates who can work with this new technology.

In short, the project is directed at strengthening the educational abilities and increasing the speed of modernization of the Federal School of Surveying in the area of spatial data handling. The graduates of the School will then be equipped with the skills to solve problems in the areas of geospatial information production, land management, land reform, cadastre, optimization of geoinformatics processes, etc. This can be achieved by transferring ITC courses/course elements to FSS educational programs.

Four programs were identified and proposed for implementation, namely

(a) Three months certificate course in any of the following four ITC specialization modules of the Professional Master Degree in Geoinformatics (GFM 3) to be run at FSS:

- Photogrammetry and Remote Sensing
- Cartography and Geoinformation Visualization
- Spatial Information Systems
- Optimization of Geoinformation Processes

This course is designed for holders of FSS Postgraduate diploma in GIS or Professional Diploma in Surveying or equivalent qualification.

(b) Professional Masters in Geoinformatics, to be run at FSS with joint certification with ITC.
A continuous program of FSS PGD GIS plus specialization in one of the four ITC Geoinformatics specialization modules including the final project of FSS course. Duration of 15 months

(c) ITC' MSc in Geoinformatics to be run at FSS and ITC as a sandwich program.
This will be done by adding a six months thesis work at ITC to the Professional Masters, see above, and award joint MSc in Geoinformatics to successful candidates.
Up to the end of specialization of the program to be held in FSS while the thesis work would be held at ITC.

(d) Refresher courses and workshops of one to four weeks duration to be run at FSS. This is designed for professionals, managers and mid-career officers on such topics as GI Infrastructure, GIS Implementation, Spatial Data Updating, Optimization procedures, etc. to be held at FSS.

The above academic courses are to be used as integral components of the FSS academic programmes, and will continue beyond the period of this project.

4.3 Activities

The following components are envisaged in the project:

- A project management input and policy level technical advice;
- ITC academic staff will backstop FSS activities from home base and implement quality control measures on FSS courses, ITC staff will jointly develop course material jointly with FSS staff and supervise FSS students at ITC on MSc theses. ITC staff will run PM specializations at FSS and

transfer these specializations to FSS. ITC staff will also advise on and contribute to MSc developments and special workshops.

- Fellowships are provided for study at ITC for different purposes: FSS staff will be upgraded for the PM specializations – 4 staff will be trained for 3 months at ITC each year for 3 years. Fellowships are provided 2 staff to follow PM programs at ITC and 2 staff to follow MSc programs (staff development). Fellowships are also provided for FSS MSc sandwich course students to study at ITC. 8 students will supported at ITC for 6 months each year for 2 years. (The intention is to seek additional funding after the completion of the proposed project to ensure the continuation of the ITC component in the MSc sandwich course).
- The project will provide supporting equipment and provide operating expenses.

4.4 Duration of the project:

January, 2000 to December, 2003

4.5 Cost estimate

Approximately 5 million Dutch Guilders are required to fund the project. A funding source is to be identified. FSS will provide counterpart staff input and infrastructure for the project. Limited support from existing budgets will be considered such that counterpart funds (largely in kind) equivalent to 1 million Dutch Guilders are available from FSS.

4.6 Expected result

With the successful implementation of the project, an appreciable increase in national development is expected. The project will ensure the availability of modern equipment, qualified teaching staff and modern curricula. This will significantly improve the School's capacity to train at least 50 people per year at each level of technician, technologist and professional. About the same number of people will benefit from short term refresher courses. This will contribute to rapid national development by:

- Providing qualified graduates for immediate employment and productivity.
- Retraining existing personnel for improved productivity and introduction of modern production techniques.
- Retraining academic staff of other institutions so as to be able to modernize their curricula in line with modern trend.
- Significant saving in foreign exchange through efficient local training.
- Ability to assist production organizations through well-equipped consultancy services.

4.7 Target beneficiaries

The prime beneficiary of the project is the Nigerian nation and specifically the various sector of the national economy that produce and/or use spatial information including other survey training institutions. Also expected to benefit is the ITC through its continued recognition by the Dutch Government and the international community as a reputable International training institution.

5.0 CONCLUSION

This paper has described an innovation in the internationalization of geoinformatics education with the primary aim of modernizing the educational programmes of the Federal School of Surveying in Nigeria. The institution handles the training of survey and mapping personnel for Government and Educational institutions in Nigeria. The collaboration with ITC would lead to the introduction of specialization modules of ITC' geoinformatics professional masters and MSc programmes into the programmes of FSS. This will result in a rapid training and retraining of survey and mapping personnel for the Nigerian economy. International funding is thus being solicited for the successful implementation of the project.

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