THE PARTICIPATION OF NIGERIAN LICENSED ENGINEERS IN PROFESSIONAL DEVELOPMENT ACTIVITIES RELATED TO MANAGEMENT

DISSERTATION

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by

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Many engineers perform managerial roles; however, their professional education in engineering usually does not include management education. Thus, this study examined the participation of the Nigerian licensed engineers in professional development activities in management. The study proposed (1) to determine if, in fact, Nigerian licensed engineers participate in management education and training; (2) to determine the management programs in which the engineers participated and whether participation was voluntary or required, or within Nigeria or overseas; (3) to test hypotheses dealing with these variables: age, management level, academic level, years of experience in a managerial role, and sector of employment; and (4) to identify the mean number of hours of participation. Also, the engineers were asked to judge the value of non-credit versus credit programs.

The questionnaire specifically designed for the study was tested twice; first with 15 licensed engineers in Denton, Texas, and a second time with 17 licensed engineers and council members of the Nigerian Society of Engineers (NSE). Among the 200 randomly selected Nigerian licensed engineers,
131 returned the questionnaire. Data was collected during the Annual Conference of the NSE held in Kano, Nigeria in 1984.

Management/administration was found to be the primary job responsibility of 62.6 percent of the engineers. The mean hours of participation in the credit and non-credit programs were 107.9 and 255.7, respectively. Age, management level, academic level and years of experience did not influence participation in the non-credit programs. Academic and management level influenced the participation in academic credit programs. The engineer managers indicated a preference for the non-credit programs. Outside the required programs, self-directed learning and correspondence courses attracted the highest number of engineers.

This study has implications for the programming of management education and training for Nigerian engineers. It also implies that the need for inclusion of management training and development into the professional development of engineers should be reviewed by the NSE and COREN.
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CHAPTER I
INTRODUCTION

During the past few decades, complex changes in industrial technology have made it necessary for engineers and scientists to ascend the managerial ranks of many organizations, particularly those dealing with high technology. More than half of today's technically oriented corporations are headed by people with engineering education (5). "Unfortunately, scientists and engineers are not formally educated within their professional background to assume managerial positions" (2, p. 13).

A search of the literature indicates the need for engineers to be better prepared for managerial work. Coombs (4) indicated that managerial skills and the formation of managerial values and attitudes conducive to effective management are partly created by education and training. Engineers are often deficient in such management education and training. Williamson (10), in encouraging colleges and universities to teach management skills to their engineering students, stated that a large percentage of those taking the master of business administration (MBA) degree in the executive program are engineers. While this may not be true for every MBA-granting institution, it is important for engineers to acquire management knowledge and skills because
the practice of engineering involves identifying, analyzing, and facilitating the solution to management problems (10).

Girgius (5) compared the motivation to manage between engineering managers and business managers in the high technology industry. He concluded that business managers were more motivated to manage at all levels of management. Despite the deficiency in the engineer's college curriculum and the level of motivation to manage, engineers aspire to positions in management (8). Ritti (8) studied 4,582 engineers and 33 research scientists in the same company. He found that "most engineers initially aspire to positions in management." This finding verifies indications in the literature that engineering students have a decided orientation toward management (7).

Williamson (10) has encouraged any organization or collection of engineers who purport to be influential to make provision for acquiring knowledge in managerial aspects of engineering practice. The acquisition of management knowledge and skills enhances upward mobility. Comish (3) studied the criteria for promoting engineers to management positions in the petro-chemical industry. He identified "special management training," "MBA degree" and "human relations skills," among other criteria, as necessary for the assignment of greater managerial and supervisory responsibility.

In the U.S., engineers are beginning to acquire management knowledge and skills. The MBA counseling office
of the University of Texas at Arlington reported that about 25 percent of the 677 students enrolled in their MBA program obtained undergraduate degrees in engineering. The profile of the MBA class of 1983 from the Southern Methodist University, Dallas, shows that 8 percent of the class obtained their undergraduate degrees in engineering (9). While the size of the MBA class of 1983 is not indicated, the percentage of engineers has increased to about 16 percent in 1984, a 50 percent increase between 1983 and 1984.

Aslanian and Brickell (1) stated that every change in status triggers "the learning of new knowledge, new skills, and/or new attitudes or values." They found in their study of Americans in transition that about 60 percent of adults 25 years or older "felt they would have to learn something in order to make a transition to a new job or career." They also found that 49 percent (or 62 million) of the 126 million Americans 25 years of age and older participate in learning. Their study revealed that "adults engaged in professional and technical work are more likely to learn, while those in farm work are least likely to learn" (1, p. 46).

The 1981 yearbook of the National Council of Engineering Examiners reported a survey of licensed engineers in the United States of America. According to the survey, 34 percent of the 5,000 randomly selected licensed engineers said
that management and administration was their primary job responsibility as compared with 24 percent who indicated that their primary job responsibility was design. Research and development, manufacturing, and teaching were indicated as the primary job responsibility by 24 percent, 12 percent and 12 percent of the subjects, respectively (6, p. 191). These percentages add up to 106 percent, indicating some error in reporting the data, or some subjects were counted twice.

The lack of formal preparation for managerial work among engineers can hamper their effectiveness as engineer managers. A search of the literature has revealed a lack of data on the participation of engineers and engineer managers in professional development activities related to management.

Statement of the Problem

The problem of this study was the participation of Nigerian licensed engineers in professional development activities related to management.

Purposes of the Study

The purposes of the study were to (1) determine if Nigerian registered (licensed) engineers participate in management education and training; (2) identify the management development programs in which the engineers participate; (3) evaluate the value of the management
Development programs based on the perception of the engineers; (4) test a series of hypotheses concerning the (a) age, (b) number of years in management role, (c) level in management; (d) level of academic preparation and the engineers' participation in management development activities; and (5) make recommendations for the programming of management education and training of engineers.

Research Hypotheses

The following research hypotheses were tested:

1. The mean number of hours of participation in management development activities will be greater among Nigerian licensed engineers aged 25 to 45 than among the Nigerian licensed engineers aged 46 and over, participating in management development programs categorized as (a) development, (b) academic credit.

2. The mean number of hours of participation in management development activities will be greater for Nigerian licensed engineer managers having 0 to 3 years' experience in a managerial role than for those having 4 or more years in a managerial role and participating in programs categorized under (a) development, (b) academic credit.

3. The mean number of hours of participation in management development activities will be greater for Nigerian licensed engineers holding graduate (post-graduate)
degree(s) in engineering (but not in management) than for the Nigerian licensed engineers holding undergraduate degree(s), participating in programs categorized as (a) development, (b) academic credit.

4. The mean number of hours of participation in management development activities will be greater for Nigerian licensed engineer managers at top management level than for supervisory and middle (combined) management level licensed engineer managers participating in (a) development programs, (b) academic credit programs.

5. The mean number of hours of participation in management development activities is greater in the non-credit development programs than in the academic-credit programs for the Nigerian licensed engineers working in the (a) private sector, (b) public sector, (c) government.

6. The majority of the Nigerian licensed engineers who participate in both the non-credit management development programs and the management development programs for academic credit will report that the non-credit development programs rather than the programs for academic credit (a) are more pertinent to their needs and interest, (b) help them do a better job for their organization, and (c) provide a more desired educational experience.

Significance of the Study

The study will add to the existing body of knowledge on adult participation in learning that is work-related.
This study focused on an occupational group (engineers) licensed to practice a profession (engineering). No study on adult participation in adult learning has investigated the actual participation of a professional group (licensed engineers) in learning the knowledge and skills of another profession (management) that is relevant to the effective performance of the professional group's (engineering profession) day-to-day responsibilities.

Scholars and management educators in Nigeria and outside Nigeria will find the study significant in that it will provide some information on the participation of engineers in professional development activities related to management. The literature and authorities (2, 5, 6, 10) acknowledge that engineers perform managerial roles. The engineer-manager transition should trigger some learning (1), but no research has been conducted to measure the rate of participation in such learning activity in terms of the variables used in this study.

From the practical standpoint, this study should provide some information for programming the management development activities organized for technically oriented persons in Nigeria. It should provide information on the types of programs in which the licensed engineer managers participate and how they perceive such programs.

This study revealed some demand for management education and training among engineers who have already been
licensed to practice engineering. The Center for Management Development (CMD) is mandated by law to sponsor, promote and conduct research into all aspects of management and allied subjects in relation to the Nigerian situation. No research has been conducted focusing on the licensed engineers who are contributing in meeting Nigeria's needs for management personnel.

Definition of Terms

In this study, the following terms will be defined as below:

**Engineering manager** is an engineer whose education and training was in engineering but who presently functions "as a leader of a team, concentrating efforts on getting things done through others" (95, p. 13).

**Participation in learning** is enrolling in a course(s) for credit or non-credit in a classroom setting, or by correspondence, or taking part in a seminar or workshop, or engaging in self-directed learning.

**Current participation in learning** is the participation which has occurred within the past twelve months.

**Rate of participation** is defined as the ratio of the number of programs to the number of participants.

**Mean hours of participation** refers to the ratio of the total hours of participation to the number of participants.
Post-graduate education in Nigeria means the same as graduate education in the United States and refers to education beyond the bachelors degree.

Delimitations

This study is delimited to engineers who are currently registered with the Council of Registered Engineers in Nigeria (COREN) as professional engineers, and who are members of the Nigerian Society of Engineers.

Collection of the Data

A questionnaire was administered to 200 registered engineers randomly selected from the list of all registered engineers who were members of both COREN and the Nigerian Society of Engineers. The data collection period for this study, November 20, 1984 to January 10, 1985 coincided with the annual conference and general meeting of the Nigerian Society of Engineers held at Daula Hotel in Kano, Nigeria from December 6-8, 1984.

One hundred twenty registered engineers received their questionnaire at the national engineering conference. However, 110 questionnaires were returned at the conference while 21 out of the 80 engineers who did not attend the conference returned their questionnaires by mail; a self-addressed stamped envelope was enclosed in the questionnaire packet to facilitate the return of the completed questionnaire. The detailed procedure for collecting the data is described in Chapter III.
Analysis of the Data

The data collected for this study were analyzed in sections based on the research hypotheses and the categories of programs and the groups of subjects identified in each hypothesis. The $t$-test of difference between the means at the 0.05 significance level was used in testing hypothesis 1 through 5, while descriptive statistics such as means and percentages were used in analyzing hypothesis 6. The significance of the difference between the proportions was tested using the $Z$ test of difference between the hypothesized proportion, 51 percent, and the observed proportion at the 0.05 level of significance. All calculations were done using the Statistical Analysis System (SAS) computer program at the North Texas State University Computing Center. The detailed procedure for analyzing the data is described in Chapter III.
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CHAPTER II
SYNTHESIS OF THE RELATED LITERATURE

Introduction

Due to the lack of literature on the participation of engineers in management development activities, the related literature for this study has been drawn from the fields of education and management. The synthesis is done in three sections. Section one discusses the participation of adults in learning (general adult courses and work-related knowledge and skills). The second section focuses on the engineer manager and management development. In this section, the characteristics (values and attitudes) of engineers and managers, and the problems of transition from engineer to manager, are discussed to establish the need for the engineer's participation in professional development activities related to management. Finally, the status of management education, training and development in Nigeria is explored to identify the providers and participants in management education and training in Nigeria.

Participation in Adult Learning

There is lack of agreement on the rate of adult participation in learning. The disagreement comes from the definition adopted for "learning activities and participation"
and the research methodology used for measurement. Tough (37) defined learning as "sustained, highly deliberate efforts to learn knowledge or a skill," and used the probing interview methodology to arrive at the finding that 98 percent of the adults in his research sample were active learners. According to Cross (15, p. 51), "If a more limited definition of learning is used, and the probing is less intensive, the participation rate may be much less." Authorities (9, 23, 25) who limited "participation" to the "receipt of instruction" or "organized learning" found that the rates of adult participation in learning ranged from 12 to 30 percent in the United States of America. Other authorities accept "participation" as the "sustained deliberate efforts to learn" and would classify every adult as a participant in learning (11, 29, 37).

Several studies have focused on the participation or non-participation of adults in organized learning activities (4, 8, 9, 19, 23, 25), self-directed learning (11, 21, 29, 37), and adult learning for academic credit (30, 31, 35, 36). Participants in organized learning activities include part-time learners in organized instruction, organized for credit or non-credit. According to Cross (15), the organized learning activities may be:

offered by continuing education and extension divisions, as well as by industry, community, agencies, and labor unions; and they are usually, but not always, offered in class-like formats to groups of learners. Research definitions generally exclude worship services
and completely self-directed learning projects, but they generally do include tutorials and independent pursuits of a course of instruction that has been prepared by a professional (for example, television and correspondence study) (15, p. 53).

The National Center for Education Statistics in the 1978 survey of adult participation in organized instruction found that the participation rate for adults aged 17 to 34 was 16.7 percent. This rate declined with an increase in age. The rate was 13.0 and 4.5 percent for adults aged 35 to 54 and 55 and over, respectively. As concluded by Cross (15),

In almost all surveys, both interest and participation in education start to decline in the early 30s, continue to decline gradually through the 40s but then drop precipitously for those 55 and older (p. 57).

Cross also notes that while younger adults tend to be pursuing credentials and laying the groundwork for later career specialization, those in the age ranges of 25 to 45 are concentrating largely on occupational and professional training for career advancement; and those 50 and older are beginning to prepare for the use of leisure time (p. 57).

The extent of participation in learning varies over a person's lifespan. Cross (15) noted that the teachable moment (period in life when the motivation for learning is exceptionally high) for job skills has passed for persons about to retire. It can be expected that participation in job related learning (voluntary or mandatory) will be low for professionals approaching their retirement. Aslanian and Brickell (6) noted that career transitions motivate adults to participate in job related learning. Professionals going
through career transitions are therefore likely to have a high rate of participation in learning and gain from mandatory continuing education.

Dubin, Alderman and Marlow (16) studied the managerial and supervisory educational needs of business and industry in Pennsylvania. Their study involved 705 top managers from 209 companies, 1202 middle managers from 222 companies and 1713 first-line supervisors from 220 companies. They found that 37 percent of the middle managers were aged 40 or under. Among the middle managers, 695 managers indicated that they would participate in a course offered locally for credit, although it would not count toward a degree. The number of middle managers who indicated that they would enroll in non-credit courses was 851. Only 26 middle managers were enrolled for a college degree at the time of the survey, while 90 planned to enroll in a degree program.

Among the first line supervisors, 43 percent were age 40 or younger. Willingness to enroll in a course offered locally for college credit even though it would not count toward a college degree was indicated by 888 first-line supervisors. A majority of the supervisors (1,215) indicated that they would enroll in non-credit courses if they were offered locally. The number who were enrolled for a college degree and the number who were planning to enroll for a college degree were 52 and 116 respectively.
For those holding a master's degree in the first-line supervisor group, 58 percent majored in business administration, 13 percent in liberal arts and 9 percent in engineering. The profile of the top level managers was not reported. However, it is likely that most of the top level managers were aged 40 and over.

Prior academic preparation has great influence on participation in adult education. Several authorities (4, 9, 23, 25, 26) after studying the participation of adults in adult education concluded that a college graduate's participation in adult education is likely to be more than twice that of a high school graduate, and a high school graduate's participation is likely to be more than twice that of a non-high school graduate. This suggests that participation in adult learning increases with the level of academic preparation.

Riessman (30), Johnstone and Rivera (23), and Anderson and Darkenwald (4) have studied the level of participation in adult education among the "well-educated" and "poorly-educated." They concluded that the gap between their levels of participation was not necessarily due to the socioeconomic status (such as income and occupation), but mainly due to lack of interest in adult education among the poorly educated. According to Riessman (30, p. 12), among the poorly educated, "there is practically no interest in knowledge for its own sake; quite the contrary, a pragmatic anti-intellectualism
prevails." Cross (14) adds that the lack of participation in adult learning is due to a lack of adequate connection between adult learners and learning resources.

Adult learners also participate in self-directed learning. Self-directed learning is measured by the "learning project" defined by Tough (37) as

> a series of related episodes, adding up to at least seven hours. In each episode more than half of a person's total motivation is to gain and retain fairly clear knowledge and skill, or to produce some other lasting change in himself (p. 6).

According to Tough, almost 75 percent of the learning projects conducted by adults are completely self-directed; about 15 percent, 10 percent and 3 percent involve group learning, one-to-one learning situations and pre-programmed, non-human resources such as tapes, programmed instruction, and television, respectively. Tough also found in his study that only about "20 percent of all learning projects are planned by a professional who is paid or institutionally designated to facilitate the learning."

In 1970 a study of the learning projects undertaken by adults ("60 or 70 persons") was conducted at the Ontario Institute for Studies in Education. The finding as reported by Tough (37, p. 18) indicated that the typical adult subject "spent about 700 or 800 hours a year at his learning projects, though the range was very large, from 0 to 2509."

Rymell (32) found in his study of engineers' learning projects that an engineer spends an average of 1702.1 hours each year on learning projects.
Penland (29) studied the learning engagements of 1,501 adults 18 years of age or older. He found that 79 percent were engaged in one kind of learning effort or another. Among these learners, 16 percent were taking formal courses in addition to engaging in self-directed learning projects; 60 percent were engaged in learning projects only; and 3 percent were involved in formal classes only. This finding does not vary significantly from Tough's finding that "less than 1 percent of all the learning projects uncovered by the interviews" of 1970 were undertaken for credit (37, p. 18).

Rymell (32) studied the learning projects pursued by 30 adult degreed engineers between ages 25 to 35. His sample included 14 aerospace engineers, 2 civil engineers, 8 electrical engineers and 6 mechanical engineers. He found that (1) the largest percentage (30.7) of the learning projects undertaken by the engineers was job-related; (2) some of the vocational category of learning projects were related to effective report writing and technical presentation; and (3) one of the five most frequent problems encountered by the engineers while pursuing the learning projects was deciding what knowledge or skills they wanted to learn.
The Engineer Manager

The jobs of engineers go beyond the solving of engineering problems. In practicing engineering as a profession, the engineer engages in management activities (40). It is becoming increasingly necessary for engineers to understand management and administration. This realization led to the offering of courses in research administration in the late 1940s and the organization and teaching of an "entire course on the administration of research" at the University of Pennsylvania (40).

Williamson (40) stated that engineering management is growing fast as a university discipline. He noted:

The last 15 years have shown a phenomenal growth in these graduate programs. Also, during that time, undergraduate programs came into being. There are reportedly at present about 90 masters degree programs, some 25 baccalaureate ones, and a few doctoral programs (40, p. 12).

Nigerian universities do not offer engineering management as a major. As revealed through a review of the courses offered by the 20 Nigerian universities contained in the Commonwealth Universities Yearbook of 1983, only 3 universities offer programs in industrial engineering. While 9 universities offer the master of business administration (MBA) programs, none of the universities offer programs in engineering management (10). The chances of the Nigerian trained engineers becoming familiar with the field of management is therefore reduced unless the
engineers enroll in the MBA programs. The Nigerian licensed engineers must, therefore, depend on their participation in management development activities in order to fit into the technological age in which the engineer's job requires him or her to identify, analyze and facilitate the solution of managerial problems.

Cronstedt (13) stated that while few engineer managers are born, some are made. The "human-made" engineer managers are usually identified early in their engineering careers and are made to reach their ultimate high level of proficiency through the guidance of a mentor. Cronstedt noted that the engineer manager must train himself to live in two separate and distinct worlds; in addition to his extraordinary flair for scientific and technical subjects, the candidate for engineer manager must be well-versed in commercial and business subjects. He must be completely at home in the role of the businessman as well as able to meet the engineer and scientist on their own ground (13, p. 9).

The guidance of a mentor is part of the engineer's training. Additional participation in management development activities may tend to provide the managerial training conducive to effective management. Such management training is lacking in the formal engineering education (20).

Coombs (12) indicated that education helps to form the values and attitudes conducive to effective management. Ahanotu (1) studied the relationship between the self-perceived effectiveness/subordinate perceived effectiveness and education/training of Nigerian managers from businesses
such as agriculture, banking and manufacturing. He found that college education has a positive influence on managerial effectiveness. However, undergraduate and graduate engineering programs do not provide the engineer with the specific knowledge, skills, values and attitudes conducive to effective management (20, 40). Heimer (20), in *Management for Engineers*, wrote:

In the undergraduate curriculum, there is little place for the humanities, and the young professional engineer must give most of his attention to acquiring technical knowledge. Later he should balance his mental input by adding the humanistic background, for broad-gauged men are required to translate technological advancement into social gain (p. 13).

The view that the engineer should "balance his mental input by adding the humanistic background" is shared by Koen (24), p. 117) who noted that "it is becoming increasingly difficult to practice modern engineering without the humanities." He added that engineers should not leave "quality of life" issues with the humanists and social scientists, because "optimum engineering situations neglecting this axis" (human condition) ultimately prove to be sub-optimum.

Although education in general influences managerial effectiveness, Girguis (18) found that business managers (those who studied business in their formal education) were more motivated to manage than engineering managers (engineers-turned-managers). These engineering managers tend to be more concerned with their own work, placing less
value on team-work and getting things done through others. According to Sanford (33) the technically-oriented professionals "focus on their own optimal functioning" and get their job satisfaction from the tasks or services they perform. In contrast, business managers see a broader picture of their work and the organization.

The problem of transforming the technically-oriented professionals into managers must be tackled by every organization which uses such professionals in achieving its goals. This problem was identified by Bayton and Chapman (7) in their study of the transformation of scientists and engineers into managers. They conducted 610 interviews with scientists and engineers, ranging from those working as specialist through senior managers with ten or more years experience in predominantly managerial responsibilities. They found that

1. Senior management officials tended to ignore the importance of the transition process and its problems;

2. The development of management training to overcome the transition problems received minimal attention;

3. Much of the training offered was irrelevant to the transition problems;

4. "One of the greatest unmet needs" was a more effective orientation process that familiarized the new employee with the formal organization, its goals and procedure (7, p. 1).
Amos and Sanchet (3) observed that the transition from engineer to an engineer manager is difficult. The transition involves

1. Moving the engineer from the ranks he or she achieved during some years of engineering practice to the bottom of the managerial ranks.

2. Developing new perspectives in the engineer. His narrow problem-solving perspective is changed to that of achieving the collective goals and objectives of the company through motivating others.

3. The rearrangement of work values and devotion of time to activities which formerly ranked low in the engineer's scale of priorities.

4. Dealing with the imprecise nature of the world of humans rather than making decisions based upon well-defined scientific principles (3, p. 25).

The licensed engineers and management educators in Nigeria thus can play an important role in effecting the engineer-to-manager transition. The engineer's role is to participate in the management education, training and development programs which the management educators must provide. Girgius (18) observed that

An understanding of management principles is essential to the individual if he is to make the best use of his ability and education. Thus an understanding of management assumes an important role for the engineer as he strives to develop the requisite skills to meet the demands of engineering management (p. 14).
The engineer-to-manager transition calls for participation in professional development activities related to management. Aslanian and Brickell (6) in their study of Americans in transition found that a person has the need to gain additional knowledge and learn skills necessary to effectively function in a new career or new stage whenever there is a change in status, relationship, career or responsibility.

Aplin (5), in a study of the issues on problems in developing managerial careers and potential, identified four career stages which professionals pass through. These stages include (1) trial stage; (2) growth/preparation stage; (3) productive stage; and (4) decline stage (5, p. 24). The number of years of service associated with the career stages are 0-3, 3-7, 7-20, and over 20 years, respectively.

Aplin's study involved over forty managers and professionals in one instance, and 75 managers in another instance. These managers were selected from various levels of the organization and from all types of functional departments. The subjects had organizational service ranging from less than 2 to over 30 years.

The study revealed that the likelihood of problems such as turnover, and lowered rates of motivation among individuals experiencing career crises reached its peak within the first three years, between 7 to 10 years of
service, and about 20 years after the first entry into the organization. Aplin explained that the "peaks" were due to the transition between career phases which resulted from changes in status (promotion, increased responsibility or even demotion). Such changes, according to Aslanian and Brickell, trigger learning (6).

Aplin noted that industry and government predominantly focus their managerial and personal development programs on the late growth (5-7 years) and early productive (7-15 years) stages. However,

developmental programs conducted during the trial and decline stages may reduce the high probability of turnover in the trial stage or increase the level of employee satisfaction and commitment during the decline stage. Interviewees initiated this idea and strongly reinforced this view. They consistently noted the need for more training in these periods and less during the productive stage. Unfortunately, the importance of matching training or developmental programs with career stages is seldom recognized (5, p. 25).

One would, therefore, expect licensed engineer managers in their first three years in the managerial role to have a higher rate of participation in management development programs than those in the other three career stages.

Management Development in Nigeria

Management education and training have become important in Nigeria within the last two decades. This importance is shown by the establishment of institutions and organizations which cater for the training and development of managerial knowledge and skills in Nigeria. The institutions and organizations include the Center for Management Development (CMD),
Administrative Staff College of Nigeria (ASCON), the Industrial Training Fund (ITF), and the Nigerian Council for Management Education and Training.

Ajuogu (2) studied the management and administrative practice and development in selected organizations in the United Kingdom and Nigeria. He found that in 1975 alone, about 200 programs were offered in Nigeria. The formal educational institutions involved in academic degree and diploma programs offered 20 programs while professional institutions and consultancy firms offered 60 programs. The government agencies and corporations involved in non-degree and non-diploma programs and the private business enterprises involved in non-degree and non-diploma programs offered 30 and 110 programs, respectively.

According to the Shell-BP Petroleum Development Company report on training, 1972, the number of man-days training received by its management staff grew from 11,753 in 1970 to 19,869 in 1972 (34). The Shell-BP report also indicated that the number of management staff engaged in training duties was 52 at the end of 1972. The total (off-job) training received during 1970-72 equivalent to management staff was 170 man-years. While these figures may be impressive, the report does not show how much of the training and development time was devoted to the training and development of engineers performing supervisory and managerial functions.
The great need for management education in Nigeria has been expressed by several authorities (17, 22, 26, 27, 38). Ajuogu (2) attributes the present need for management staff to the little attention that was given to training in management skills during the early development of Nigeria's educational system.

Onah (27) studied the management training needs of managers in 940 companies in Nigeria. A total of 213 companies responded fully to the questions on the questionnaire. The survey revealed that:

1. Over 75 percent of the company respondents needed management training for their managers.

2. The demand for senior and middle management courses was more (77.68 percent) than for junior courses (22.32 percent).

3. Out of 213 companies, 99 or 46.61 percent preferred locally trained graduates to the overseas trained graduates; 28.16 percent of the 213 respondents preferred overseas trained graduates, and 25.23 percent did not indicate their preference.

4. The majority (61 percent) of the Nigerian companies had no training schools or centers.

5. The four major providers of management training in Nigeria are the Nigerian Institute of Management, Universities, Walter Solomon and Associates, and Polytechnics, Institute of Management and Technology.
Some Nigerian Universities have made attempts to reduce the gap in the managerial and supervisory "manpower" requirements in the country. These institutions convert graduates of any discipline to a professional manager through the Master of Business Administration (MBA) programs (28). The universities taking the lead in this effort include Ahmadu Bello, Nsukka, Lagos and Ife. According to Osuji, "this may be a positive realization of the fact that many people prefer degrees in business administration to other forms of degrees when considering various management positions" (28, p. 183). The extent to which the engineers in Nigeria participate in such programs designed for graduates of other disciplines has not been investigated.

Uzoaga (39) reviewed the achievements of Nigerian business schools since independence (in 1960). He found that the business schools still refuse to admit many eligible applicants. While admission into business schools is restricted to a few, managers on the job are encouraged to participate in management training and education. The MBA programs and other non-credit courses are available to the engineer managers. Fubara (17) asserts that

the Nigerian manager must be exposed to continual symposia, conferences, workshops, in-plant courses and research so as to enable him to tailor management style to the requirement of the moment (p. 61). Although there are no data on the involvement of engineers in management in Nigeria, they play an important role in the transfer of new technology into Nigeria.
Olumorin (26) claims that Nigeria unfortunately does not have the capacity to absorb advanced technology. The lack of capacity for advanced technology absorption is due to the lack of competent managers who can understand and manage the transfer of new technology. Olumorin suggested that management educators would need to equip such personnel (engineers) with essential management techniques, skills and knowledge as would facilitate their subsequent management of the human and work systems in their respective organizations for that much-needed technological take-off in the 80s (p. 73).

The extent to which the engineers are participating in such needed management education and training is unknown and deserves to be studied.

**Summary**

Undergraduate and graduate programs in engineering do not prepare engineers for management. Engineers while on their jobs, identify, analyze and facilitate the solution to managerial problems. Some licensed engineers declare that their major job responsibilities are managerial and administrative. The new area of job responsibility (different from the prior academic preparation) has necessitated their participation in adult learning related to management. Authorities in Nigeria and the United States acknowledge the need for engineers to participate in management development programs.

Studies have been conducted to measure the rate of participation of adults in general adult education and in
some work-related learning. A search of the literature has revealed that no study has been conducted to verify the participation of engineers in general, and Nigerian licensed engineers in particular, in management training or education.
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CHAPTER III
RESEARCH METHODOLOGY

Introduction

The primary purposes of this study were to (1) verify if, in fact, Nigerian professional engineers participate in management training and education; (2) determine and evaluate the management development programs in which the engineers participate; (3) test a series of hypotheses concerning some variables which influence the participation of adults in professional development activities; and (4) make programmatic recommendations on the management education and training of Nigerian engineers. The lack of data on the participation of engineers in professional development activities related to management and a lack of an instrument designed to achieve the purposes listed above, made it necessary for an instrument to be designed specifically for this study. The purpose of this chapter is to describe the instrument used in the study, the data collection procedures, and the procedures for analyzing the data.

The Instrument

The Registered Engineer's Participation in Management Development Programs Questionnaire, specifically designed for this study, was used in collecting data. The questionnaire consists of three parts. Part one seeks general
demographic information about the registered engineers. Part two deals with the management development programs in which the licensed engineers participate. The programs are divided into two categories: (1) those for which academic credit cannot be earned and (2) those for which academic credit can be earned, and in which participation meets part of the requirements for a degree. Part three provides a means of evaluating the management development program based on the judgment of the engineers.

The engineering disciplines listed in part one (item number 9) are those listed as Subjects of Study in the Nigerian Universities reported in the Commonwealth Universities Yearbook (2, p. 1994). The four job responsibilities listed in item number 12 are those identified in the study conducted by the United States National Council of Engineering Examiners (8, p. 191). The categories used in categorizing the programs were obtained through a review of the literature on the participation of adults in learning and modified as recommended by the doctoral advisory committee. Programs number 1, 2, 3, 4, and 13 were taken from the study conducted by Dubin (3). Program 7 was adapted from program 12. Programs 9, 10, 11 and 12 were recommended by the doctoral advisory committee. All the evaluation questions were selected or modified from the set of questions suggested by Kirkpatrick (5, p. 18-1 -- 18-27) as
appropriate in evaluating a training or development program. The response options to the evaluation questions are in a five-point Likert Scale format and are treated as interval level data (8, p. 515).

The instrument was subjected to two separate pilot tests to ensure that the correct meanings are conveyed and that valid data on the registered engineers' participation in management development activities could be collected. The first pilot test was conducted in Denton, Texas where the questionnaire was administered to 15 licensed engineers. The organizations for which the licensed engineers worked include: the City of Denton, engineering consulting firms and North Texas State University. The second pilot study was conducted in Nigeria where the questionnaire (written in English) was administered to 17 officers and council members of the Nigerian Society of Engineers. In both pilot studies, all the engineers were licensed by some board of registration of professional engineers to practice the engineering profession. Each of the subjects in the pilot study groups had earned college degrees in engineering. Twenty-five out of the 32 licensed engineers in the pilot program returned the questionnaire. The engineers completed all parts of the questionnaire which applied to them. Their comments did not suggest any change in any of the items on the questionnaire. The instrument was therefore determined to be appropriate with no changes required. The reader should note that the reliability of the instrument has not been established. The nature of the questions did not produce absolute responses.
Population and Sample Selection

Data used in this study were obtained from engineers who were registered with the Council of Registered Engineers of Nigeria (COREN) and were members of the Nigerian Society of Engineers (NSE). The Nigerian Society of Engineers has six grades of membership (see appendix E for the membership requirements for each grade). For this study, only engineers with "Fellow" or "Corporate" grades of membership were used. These two grades of membership require that the aspirant to membership be an engineer, undergo or "have undergone post-graduate practical training in a field relevant to his or her qualification and acquired varied engineering experience for at least four years," and pass a professional interview conducted by the Society (9, p. 18).

The Council of Registered Engineers of Nigeria (COREN) is mainly a regulatory body which regulates the standards of operation and the engineering curriculum in the Nigerian institutions of higher education. On the other hand, the Nigerian Society of Engineers promotes research in the field of engineering and through its activities, facilitates the professional development of engineers in Nigeria. An engineer who desires to be a member of both NSE and COREN must gain at least the corporate membership status in the NSE. The majority of the council members (governing council) of COREN are also council members of NSE and are responsible for the admission of engineers into COREN and NSE. The
secretary general of NSE and a few other council members of NSE confirmed that membership in both NSE and COREN is an indication of an engineer's level of contribution to the growth and practice of engineering in Nigeria. Membership in both NSE and COREN was therefore the criteria in selecting subjects for this study.

The list of the members of COREN and a list of members of the NSE were obtained from COREN's office and the NSE office, respectively. The names of 1,673 engineers appeared on both lists. Each name was assigned a number from one to 1,673. The table of random numbers in Borg and Gall (1, p. 732-6) was used to select 200 Nigerian registered engineers. The names and addresses of the selected engineers were then compiled.

Procedure for Data Collection

The Registered Engineers' Participation in Management Development Programs Questionnaire was administered to the 200 randomly selected registered engineers in Nigeria. One hundred twenty out of the 200 engineers were at the Nigerian Society of Engineers' (NSE) annual conference and general meeting held at Daula Hotel in Kano, from December 6-8, 1984. Eighty subjects did not attend the annual conference.

The pre-registration list for the annual engineering conference was obtained from the NSE office at 350 Herbert
MaCaulay Street, Yaba, Lagos on November 22, 1984. A review of the list revealed that 90 engineers from the selected sample preregistered for the engineering conference. Permission was therefore obtained from the secretary general of the NSE to administer the questionnaire to the 90 engineers and other subjects at the conference, and to allow the NSE administrative staff to collect the completed questionnaires at the registration table during the period for the conference. The coded questionnaires for the 90 preregistered engineers were taken to the registration table at the conference on December 5, 1984 and delivered to the subjects as they collected their conference packages. The 120 subjects at the conference were instructed to return the completed questionnaires to the registration table by 12:00 noon on December 8 (the last day for the conference).

A total of 110 questionnaires was mailed to the engineers who were not preregistered for the conference. A self-addressed stamped envelope was enclosed to facilitate the return of the completed questionnaire. However, the engineers who received their questionnaires by mail were instructed to submit the completed questionnaires at the registration table at the conference if they attended the engineering conference. Twenty of these engineers did not carry the questionnaires mailed to them to the conference and were given another set of questionnaires from the extra
copies taken to the conference. The registered engineers who did not plan to attend the conference were instructed in a letter to return the completed questionnaires in the self-addressed stamped envelope.

Four follow-up procedures were used in collecting the data. The first was a personal contact with subjects, at the conference. The subjects were verbally reminded to return the completed questionnaire before the end of the conference. This procedure was also used in following up one subject who was in Rivers State. In this case, the subject was verbally instructed to return the questionnaire by hand delivery. In the second follow-up procedure, the NSE publicity secretary was asked to announce, at every session during the conference, that subjects at the conference should return the completed questionnaires to the registration table. The third follow-up procedure was a telephone contact with the 12 subjects in Lagos city who did not return their questionnaire by December 20, 1984. The fourth follow-up procedure was a letter mailed to subjects who were not at the conference and who were outside Rivers State. The cut-off dates for receiving the completed questionnaires were December 8, 1984, and January 10, 1985, for subjects who attended the engineering conference and subjects who did not attend the conference, respectively.
Procedure for Analysis of Data

Data collected from the respondents were transferred to IBM sheets and stored in a MUSIC system file at North Texas State University Computer Center for data processing. The data were analyzed using the Statistical Analysis System (SAS) computer program to provide descriptive statistics, such as measures of central tendencies and providing t-test of difference between two means at the 0.05 significance level. A review of the SAS and the Statistical Package for the Social Sciences (SPSS) Computer Programs revealed that neither of these programs could provide Z tests of difference between the hypothesized proportion (51 percent) and the observed proportion in order to make inferences about the hypothesized proportion. A desk calculator was therefore used in doing the calculations needed for hypothesis six.

The analysis of data was done in sections based on the research hypotheses and the categories of programs and groups of subjects identified in each hypothesis. In hypothesis one through four, the one directional greater than (> t-test of difference between means was used to test the difference between the mean number of hours of participation in management development activities among the identified groups for each category of (development or academic credit) programs. Each t-test was done at the 0.05 significance level using the SAS Computer Programs. The
one-directional (>) t-test of difference in means was also used in testing hypothesis five. The significant difference between the mean number of hours of participation in management development activities in the programs categorized as development and academic credit were tested for the subjects working in the (1) private sector, (2) public sector, and (3) government. Hypothesis five was tested at the 0.05 significance level using SPSS Computer Programs.

Hoaglin et al. (4) noted that careful users of the mean watch for pitfalls. They suggested that in order to use the mean carefully, the user can remove the outliers (very extreme, unrepresentative observations) and then use the mean in analyzing any set of data. The "very extreme observations can be removed from the data by inspection or by reference to the physical data" (4, p. 397). The extreme unrepresentative reported durations of the development and academic credit programs were therefore removed from the data by inspection before testing hypothesis one to five. The extreme durations greater than or equal to 1000 hours, or less than or equal to 8 hours, were removed. Hypotheses one through five were tested before and after removing the outliers to check if such careful use of the mean made a difference in the results of the t-tests of difference between the means.

In analyzing hypothesis six, the SAS Computer Programs were used to provide a frequency count of the number of subjects who participated in both development and academic
credit programs and gave a higher rating or evaluation to
the development programs in each of the following evaluation
questions:

(1) Was the program pertinent to your needs and
interests?

(2) To what extent will the program(s) help you do a
better job for your organization?

(3) How would you rate the overall program as an
educational experience?

The (observed) proportions of the subjects who gave a
higher rating to the development programs, for each of the
evaluation questions, were calculated.

The Z test of proportions was used to determine whether
the observed proportion was statistically different from
the hypothesized 51 percent. To test this difference, the
hypothesis was stated in the null; there is no significant
difference between the hypothesized and the observed pro-
portions. That is,

\[ H_0 : P = p \text{ and} \]
\[ H_1 : P \neq p \]
where \( P \) = the hypothesized proportion
\( p \) = the observed proportion
\[ = f/n \]
where \( f \) = the number of subjects who gave a higher rating to development programs.

\( n \) = the number in the sample who participated in both the development and academic credit programs.

For sample size of \( n \), the sampling distribution of \( P \) has a standard deviation of:

\[
\sigma_p = \sqrt{\frac{P(1-P)}{n}}
\]

The value of \( Z \) was calculated by using the formula

\[
Z = \sqrt{\frac{P - p}{n}}
\]

The calculated value of \( Z \) was compared to the table values for \( Z \) (5, pp. 401-5) at an \( \alpha \) (level of significance) of 0.05. If the calculated value of \( Z \) was greater than or equal to the table value, then the difference between \( P \) and \( p \) was significant at 0.05 level and the null hypothesis, \( H_0 \), should be rejected in favor of the alternative, \( H_1 \). However, if the calculated value of \( Z \) was less than the table value, the null hypothesis was retained. That is, there is no significant difference between the hypothesized proportion (51 percent) of subjects who gave a higher rating to the development programs and the observed proportion.
CHAPTER BIBLIOGRAPHY


CHAPTER IV
PRESENTATION AND ANALYSIS OF THE DATA

The data presented and analyzed in this chapter were obtained from a randomly selected group of registered engineers who were members of both the Nigerian Society of Engineers (NSE) and the Council of Registered Engineers of Nigeria. The demographic data on the subjects are presented before analyzing the data to test the hypotheses concerning the age, experience, academic level, management level, the sector in which the subjects are employed, and the subjects' participation in professional development activities related to management.

Among the 131 subjects who returned the questionnaire, 127 or 97 percent were Nigerian citizens, while four were non-Nigerian citizens. The majority of the subjects were between the ages of 25 to 45 years. Table I shows the age groups of the subjects. Ninety-one subjects, or 69.5 percent, were between the ages of 25 to 45 years, while 39 subjects were between the ages of 46 to 55 years. One subject was over 55 years. Five of the 131 subjects were females.
Data in Table II indicate the industries in which the subjects work. The largest percentage (25.2) of the engineers are employed with the government. The lowest percentage (2.3) of the subjects indicated that they work in the agricultural or the electrical industry. The industries employing over 10 percent of the Nigerian licensed engineers are government, petroleum/mining, manufacturing, education, and construction. Subjects who work in other industries constituted 3 percent of the research sample. These subjects are either self-employed or work for an engineering consulting firm. The majority of the subjects (61.1 percent) work in the private sector, while 38.9 percent work in the public sector.
TABLE II
INDUSTRY WHERE SUBJECTS ARE EMPLOYED
N = 131

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number of Engineers</th>
<th>Percent of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>33</td>
<td>25.2</td>
</tr>
<tr>
<td>Petroleum/Mining</td>
<td>26</td>
<td>19.8</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>21</td>
<td>16.0</td>
</tr>
<tr>
<td>Education</td>
<td>17</td>
<td>13.0</td>
</tr>
<tr>
<td>Construction</td>
<td>15</td>
<td>11.5</td>
</tr>
<tr>
<td>Chemical Processing</td>
<td>9</td>
<td>6.9</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>3.0</td>
</tr>
<tr>
<td>Agriculture</td>
<td>3</td>
<td>2.3</td>
</tr>
<tr>
<td>Electrical</td>
<td>3</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>131</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

The registered engineers in the sample indicated some years of experience in administrative/managerial roles. The number of engineers with less than 3 years, 4 to 10 years, and over 10 years of experience in a managerial role were 43, 59, and 29, respectively. This corresponded to some extent with the managerial levels of the subjects. As shown in Table III, 41.2 percent of the engineers were at
middle management level in their organizations, while 31.3 and 22.1 percent were at supervisory and top management levels, respectively. None of the three managerial/administrative levels applied to 7 subjects or 5.3 percent. These

<table>
<thead>
<tr>
<th>Management Level</th>
<th>Number of Engineers</th>
<th>Percent of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisory</td>
<td>41</td>
<td>31.3</td>
</tr>
<tr>
<td>Middle</td>
<td>54</td>
<td>41.2</td>
</tr>
<tr>
<td>Top</td>
<td>29</td>
<td>22.1</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>5.3</td>
</tr>
<tr>
<td>Total</td>
<td>131</td>
<td>99.9*</td>
</tr>
</tbody>
</table>

*Less than 100.0 due to rounding error.

7 subjects stated that they did not function in a managerial capacity. Regarding the terms used in classifying the subjects' jobs, 71 subjects or 54.2 percent stated that they were engineer managers, 30 subjects or 22.9 percent indicated that they were engineers, and 24 subjects or 18.3 percent stated they were managers/administrators. The remaining 6 subjects indicated that they were educators.
Data in Table IV present the academic levels of the 131 subjects. The highest academic degree held by the majority (52.7 percent) of the subjects is the bachelors degree. The subjects whose highest academic level is a master's degree are twice as many as those who hold the doctorate degree. Two engineers held the Master of Business Administration (MBA) degree.

**TABLE IV**

**HIGHEST ACADEMIC DEGREES HELD BY SUBJECTS**

\[ N = 131 \]

<table>
<thead>
<tr>
<th>Degree</th>
<th>Number of Engineers</th>
<th>Percent of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelors</td>
<td>69</td>
<td>52.7</td>
</tr>
<tr>
<td>Masters</td>
<td>40</td>
<td>30.5</td>
</tr>
<tr>
<td>Doctorate</td>
<td>20</td>
<td>15.5</td>
</tr>
<tr>
<td>MBA</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>131</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Information in Table V pertains to the engineering disciplines in which the subjects obtained their undergraduate degrees. The highest number of undergraduate degrees was obtained in mechanical engineering.

The engineers who returned their questionnaire received their engineering education either in Nigeria only, overseas
TABLE V
UNDERGRADUATE ENGINEERING MAJORS OF SUBJECTS

<table>
<thead>
<tr>
<th>Major</th>
<th>Number of Engineers</th>
<th>Percent of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical</td>
<td>6</td>
<td>4.6</td>
</tr>
<tr>
<td>Civil</td>
<td>32</td>
<td>24.4</td>
</tr>
<tr>
<td>Communications</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Electrical</td>
<td>20</td>
<td>15.3</td>
</tr>
<tr>
<td>Industrial</td>
<td>4</td>
<td>3.0</td>
</tr>
<tr>
<td>Mechanical</td>
<td>34</td>
<td>25.9</td>
</tr>
<tr>
<td>Metallurgical</td>
<td>13</td>
<td>9.9</td>
</tr>
<tr>
<td>Petroleum</td>
<td>13</td>
<td>9.9</td>
</tr>
<tr>
<td>Production/Production Technology</td>
<td>3</td>
<td>2.3</td>
</tr>
<tr>
<td>Textile</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Transport</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Water Resources</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>131</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

only, or both Nigeria and overseas. As indicated in Table VI, the largest percentage (45.8) of the engineers received all their engineering education overseas. The
engineers who received their engineering education in Nigeria and overseas completed only part of their education in Nigeria.

TABLE VI
LOCATION WHERE SUBJECTS RECEIVED ENGINEERING EDUCATION

N = 131

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of Engineers</th>
<th>Percent of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nigeria only</td>
<td>47</td>
<td>35.9</td>
</tr>
<tr>
<td>Overseas only</td>
<td>60</td>
<td>45.8</td>
</tr>
<tr>
<td>Nigeria and Overseas</td>
<td>24</td>
<td>18.3</td>
</tr>
<tr>
<td>Total</td>
<td>131</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The subjects were asked what they considered to be their primary job responsibility. Data in Table VII reveal that management and administration was the primary job responsibility of 62.6 percent of the engineers.
Design, research and development, teaching/training and development were stated as the primary job responsibilities of 20.6 percent, 6.9 percent, and 9.9 percent of the subjects, respectively. Compared to the results of the study conducted in the United States by the National Council of Engineering Examiners (3, p. 191), a greater percentage (62.6 as compared with 34 in the U.S.) of the Nigerian licensed engineers are doing management/administrative work. Correspondingly, a greater percentage (24 as compared with 6.9 in Nigeria) of the United States licensed engineers have research and development as their primary job responsibility (3, p. 191).

Data regarding the percentage of an eight-hour work day spent by the subjects in doing managerial work are shown in Table VIII. The largest percentage of the subjects (16.0)
<table>
<thead>
<tr>
<th>Percent of 8-hour day</th>
<th>Number of Engineers</th>
<th>Percent of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10%</td>
<td>9</td>
<td>6.9</td>
</tr>
<tr>
<td>11 - 20</td>
<td>10</td>
<td>7.6</td>
</tr>
<tr>
<td>21 - 30</td>
<td>12</td>
<td>9.2</td>
</tr>
<tr>
<td>31 - 40</td>
<td>11</td>
<td>8.4</td>
</tr>
<tr>
<td>41 - 50</td>
<td>7</td>
<td>5.3</td>
</tr>
<tr>
<td>51 - 60</td>
<td>20</td>
<td>15.3</td>
</tr>
<tr>
<td>61 - 70</td>
<td>21</td>
<td>16.0</td>
</tr>
<tr>
<td>71 - 80</td>
<td>17</td>
<td>13.0</td>
</tr>
<tr>
<td>81 - 90</td>
<td>13</td>
<td>9.9</td>
</tr>
<tr>
<td>91 - 100</td>
<td>11</td>
<td>8.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>131</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

do managerial/administrative work 61-70 percent of the time during an eight-hour work day. The percentage of the registered engineers who do managerial/administrative jobs 81-90 percent and 91-100 percent of the time are 9.9 and 8.4 percent, respectively.
Data in Table IX reveal that the largest percentage (24.4) of the licensed engineers in the study do engineering work 0-10 percent of the time, or for less than 48 minutes, during an eight-hour work day. Twenty-three of the subject (or 17.6 percent) do engineering work 21-30 percent of the

<table>
<thead>
<tr>
<th>TABLE IX</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERCENTAGE OF AN EIGHT-HOUR WORK DAY</td>
</tr>
<tr>
<td>USED IN DOING ENGINEERING JOB</td>
</tr>
<tr>
<td>N = 131</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of work day</th>
<th>Number of Engineers</th>
<th>Percentage of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10%</td>
<td>32</td>
<td>24.4</td>
</tr>
<tr>
<td>11 - 20</td>
<td>19</td>
<td>14.5</td>
</tr>
<tr>
<td>21 - 30</td>
<td>23</td>
<td>17.6</td>
</tr>
<tr>
<td>31 - 40</td>
<td>17</td>
<td>13.0</td>
</tr>
<tr>
<td>41 - 50</td>
<td>9</td>
<td>6.9</td>
</tr>
<tr>
<td>51 - 60</td>
<td>9</td>
<td>6.9</td>
</tr>
<tr>
<td>61 - 70</td>
<td>9</td>
<td>6.9</td>
</tr>
<tr>
<td>71 - 80</td>
<td>7</td>
<td>5.2</td>
</tr>
<tr>
<td>81 - 90</td>
<td>5</td>
<td>3.8</td>
</tr>
<tr>
<td>91 - 100</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Total</td>
<td>131</td>
<td>100.0</td>
</tr>
</tbody>
</table>
time, or more than 7 hours during an eight-hour work day. See Table IX for the other percentages of an eight-hour work day which the subjects used in doing engineering work.

The largest percentage (90.1) of the subjects do other jobs which are neither managerial nor engineering, 0-10 percent of the time. The subjects reported that the non-managerial and non-engineering job which they do mainly includes teaching. Three subjects (or 2.3 percent) indicated that they do non-managerial and non-engineering jobs 40 percent of the time during an eight hour work day.

Information on the number of programs in which the subjects participated within the 12 months preceding the data collection for the study is contained in Table X. Data in Table X reveal that two subjects participated in a maximum of 6 programs. The largest percentage (35.9) of the subjects participated in two programs while 11 subjects, or 8.4 percent, did not participate in any program.
TABLE X

NUMBER OF PROGRAMS IN WHICH SUBJECTS PARTICIPATED

\[ N = 131 \]

<table>
<thead>
<tr>
<th>Number of Programs</th>
<th>Number of Engineers</th>
<th>Percentage of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>11</td>
<td>8.4</td>
</tr>
<tr>
<td>1</td>
<td>29</td>
<td>22.1</td>
</tr>
<tr>
<td>2</td>
<td>47</td>
<td>35.9</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>17.6</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
<td>13.0</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Total</td>
<td>131</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The engineers in the study were asked what percentage of their professional development activities was related to management, engineering, and other areas of learning (neither management nor engineering). Table XI presents the data concerning the percentage of the subjects' professional development activities related to management.

The largest percentage (21.0) of the subjects had 71-80 percent of their professional development activities in areas related to management/administration. Over 50.0 percent of the subjects had above 60 percent of their professional development activities in areas related to management.
TABLE XI
PERCENTAGE OF THE SUBJECTS' PROFESSIONAL DEVELOPMENT ACTIVITIES RELATED TO MANAGEMENT
N = 120

<table>
<thead>
<tr>
<th>Percent of Activities</th>
<th>Number of Engineers</th>
<th>Percent of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10%</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td>11 - 20</td>
<td>7</td>
<td>5.8</td>
</tr>
<tr>
<td>21 - 30</td>
<td>10</td>
<td>8.3</td>
</tr>
<tr>
<td>31 - 40</td>
<td>11</td>
<td>9.1</td>
</tr>
<tr>
<td>41 - 50</td>
<td>15</td>
<td>12.5</td>
</tr>
<tr>
<td>51 - 60</td>
<td>14</td>
<td>11.7</td>
</tr>
<tr>
<td>61 - 70</td>
<td>16</td>
<td>13.3</td>
</tr>
<tr>
<td>71 - 80</td>
<td>25</td>
<td>21.0</td>
</tr>
<tr>
<td>81 - 90</td>
<td>15</td>
<td>12.5</td>
</tr>
<tr>
<td>91 - 100</td>
<td>4</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>120</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Equal numbers of the subjects (15) had 41-50 percent and 81-90 percent of their professional development activities in areas related to management.

The subjects reported that within the past twelve months, they had some professional development activities
in engineering. Data presented in Table XII reveal that the largest percentage (21.0) of the subjects had 11-20 percent of their professional development activities in engineering. Less than one percent of the subjects devoted 81 to 90 percent and 91 to 100 percent of their PDA to engineering.

TABLE XII
PERCENTAGE OF THE PROFESSIONAL DEVELOPMENT ACTIVITIES WHICH IS IN ENGINEERING

N = 120

<table>
<thead>
<tr>
<th>Percent of Professional Learning Activities</th>
<th>Number of Engineers</th>
<th>Percent of Engineers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>21</td>
<td>17.5</td>
</tr>
<tr>
<td>11 - 20</td>
<td>25</td>
<td>21.0</td>
</tr>
<tr>
<td>21 - 30</td>
<td>20</td>
<td>16.7</td>
</tr>
<tr>
<td>31 - 40</td>
<td>11</td>
<td>9.2</td>
</tr>
<tr>
<td>41 - 50</td>
<td>22</td>
<td>18.3</td>
</tr>
<tr>
<td>51 - 60</td>
<td>9</td>
<td>7.5</td>
</tr>
<tr>
<td>61 - 70</td>
<td>8</td>
<td>6.7</td>
</tr>
<tr>
<td>71 - 80</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>81 - 90</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>91 - 100</td>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Data on the number of subjects who participated in a specific program were also obtained. These data measure the frequency of participation in programs. Tables XIII and XIV present the frequencies of participation in the development or non-academic credit management development programs and the academic credit programs, respectively. Approximately one-third of the total participation in the non-credit development programs was in workshops or seminars on managerial topics. The frequency of participation in company inservice management training courses was less than the frequency of participation in workshops or seminars on managerial topics. The participation in self-planned or self-directed learning on managerial topics was greater than the combined participation in short refresher courses at colleges and universities, regional or national meetings of professional management societies, management courses taken for self-development, correspondent non-credit management course(s), and managerial coaching and counseling programs organized by superior/supervisor.
<table>
<thead>
<tr>
<th>Program</th>
<th>Frequency of Participation</th>
<th>Percentage of Total Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshops or seminars on managerial topics</td>
<td>73</td>
<td>33.2</td>
</tr>
<tr>
<td>Company inservice management training courses</td>
<td>70</td>
<td>31.8</td>
</tr>
<tr>
<td>Short refresher courses at colleges and universities</td>
<td>7</td>
<td>3.2</td>
</tr>
<tr>
<td>Regional or national meetings of professional management societies</td>
<td>13</td>
<td>5.9</td>
</tr>
<tr>
<td>Management courses taken for self development</td>
<td>12</td>
<td>5.5</td>
</tr>
<tr>
<td>Self-planned or self-directed learning on managerial topics</td>
<td>41</td>
<td>18.6</td>
</tr>
<tr>
<td>Correspondent, non-credit management course(s)</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Managerial coaching and counseling program organized by superior/supervisor</td>
<td>3</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>220</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table XIV contains the frequency of participation in the academic credit programs for both the Nigerian citizens and the 4 non-citizens. The highest frequency of participation (16) was in correspondent courses in management. Post-graduate
management courses in business administration attracted a greater number of participants than the undergraduate management courses in business administration. Data in Table XIV also indicate that the frequency of participation in management courses taken in engineering management degree programs is equal to the frequency of participation in the undergraduate management courses in business administration.

**TABLE XIV**

FREQUENCY OF PARTICIPATION IN MANAGEMENT/ADMINISTRATION LEARNING PROGRAMS BY ACADEMIC CREDIT PROGRAMS FOR ALL SUBJECTS

<table>
<thead>
<tr>
<th>Program</th>
<th>Frequency of Participation</th>
<th>Percent of Total Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management courses taken in engineering management degree programs</td>
<td>9</td>
<td>14.5</td>
</tr>
<tr>
<td>Undergraduate management courses in business administration</td>
<td>9</td>
<td>14.5</td>
</tr>
<tr>
<td>Post-graduate management courses in business administration</td>
<td>15</td>
<td>24.2</td>
</tr>
<tr>
<td>Other business courses (e.g., accounting, finance, marketing etc.)</td>
<td>13</td>
<td>21.0</td>
</tr>
<tr>
<td>Correspondence courses in management</td>
<td>16</td>
<td>25.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
Table XV presents the frequency of how the Nigerian citizen in the research sample participated in the development and academic credit management programs. The subjects participated in the programs voluntarily or were required by their organization to participate. The percentages of voluntary and required participation, based on the total participation in the individual programs, are also shown in Table XV.

As indicated in Table XV, the number of required participation in workshops or seminars on managerial topics is greater than the number of voluntary participation. As one would expect, the largest percentage of participation in company inservice management training courses was required rather than voluntary. Five of the 7 subjects who participated in short refresher courses at colleges and universities were required to participate. Twice as many subjects participated in management courses taken in engineering management degree programs because they were required to participate. The ratio of voluntary to required participation in other business courses (finance, accounting, marketing, et cetera) is 2:1. The total number of cases in which the subjects attended programs voluntarily was slightly greater than the number of cases in which they were required to participate.
<table>
<thead>
<tr>
<th>Program</th>
<th>Voluntary Participation</th>
<th>Required Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Cases</td>
<td>Percent of total* participation</td>
</tr>
<tr>
<td>Workshops or seminars on managerial topics</td>
<td>30</td>
<td>41.7</td>
</tr>
<tr>
<td>Company inservice management training courses</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>Short refresher courses at colleges and universities</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Regional or national meetings of professional management societies</td>
<td>9</td>
<td>69.2</td>
</tr>
<tr>
<td>Management courses taken for self-development</td>
<td>10</td>
<td>83.3</td>
</tr>
<tr>
<td>Self-planned or self-directed learning on managerial topics</td>
<td>37</td>
<td>100.0</td>
</tr>
<tr>
<td>Correspondent, non-credit management courses</td>
<td>1</td>
<td>100.0</td>
</tr>
<tr>
<td>Managerial coaching and counseling program organized by superior/supervisor</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Management courses taken in engineering management degree programs</td>
<td>3</td>
<td>33.3</td>
</tr>
<tr>
<td>Undergraduate management courses in business administration</td>
<td>8</td>
<td>88.9</td>
</tr>
<tr>
<td>Post-graduate management courses in business administration</td>
<td>15</td>
<td>100.0</td>
</tr>
</tbody>
</table>
### TABLE XV--Continued

**FREQUENCY OF VOLUNTARY AND REQUIRED PARTICIPATION BY PROGRAM, FOR NIGERIAN CITIZENS**

<table>
<thead>
<tr>
<th></th>
<th>Voluntary Participation</th>
<th>Required Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Cases</td>
<td>Percent of total participation</td>
</tr>
<tr>
<td>Other business courses (e.g., finance accounting, marketing, etc.)</td>
<td>8</td>
<td>66.7</td>
</tr>
<tr>
<td>Correspondence courses in management</td>
<td>16</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>140</strong></td>
<td><strong>51.1</strong></td>
</tr>
</tbody>
</table>

* based on total number of cases of participation.
** total number greater than N (some subjects participated in more than one program).

Table XVI indicates how the non-Nigerians participated in the management programs. The subjects who were non-Nigerian citizens participated voluntarily in workshops or seminars on managerial topics, and self-directed learning while their participation in company inservice management training courses and other business courses was required.

Table XVII contains the frequency of where the subjects (excluding non-Nigerian citizens) participated in the development and academic credit programs. Participation in the programs took place mainly in Nigeria. The table also presents the percentage of participation that took place in Nigeria and overseas. These percentages are based on the total participation in the individual programs.
TABLE XVI
FREQUENCY OF VOLUNTARY AND REQUIRED PARTICIPATION
BY PROGRAM FOR NON NIGERIANS

<table>
<thead>
<tr>
<th>Program:</th>
<th>Voluntary Participation</th>
<th>Required Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of cases</td>
<td>Percent of total participation</td>
</tr>
<tr>
<td>Workshops or seminars on managerial topics</td>
<td>1</td>
<td>100.0</td>
</tr>
<tr>
<td>Company in-service management training courses</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Self-planned or self-directed learning on managerial topics</td>
<td>4</td>
<td>100.0</td>
</tr>
<tr>
<td>Other business courses, e.g., finance, accounting, marketing etc.</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>62.5*</td>
</tr>
</tbody>
</table>

*The percentage is based on the total number of cases of participation.
**TABLE XVII**

**FREQUENCY OF PARTICIPATION TAKING PLACE IN NIGERIA AND OVERSEAS BY PROGRAM (NIGERIANS ONLY)**

<table>
<thead>
<tr>
<th>Program:</th>
<th>Number of participations in Nigeria</th>
<th>Percentage of participation in Nigeria</th>
<th>Number of participations overseas</th>
<th>Percent of participation overseas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshop or seminars on managerial topics</td>
<td>65</td>
<td>90.3</td>
<td>7</td>
<td>9.7</td>
</tr>
<tr>
<td>Company in-service management training courses</td>
<td>57</td>
<td>83.8</td>
<td>11</td>
<td>16.2</td>
</tr>
<tr>
<td>Short refresher courses at colleges and universities</td>
<td>4</td>
<td>57.1</td>
<td>3</td>
<td>42.9</td>
</tr>
<tr>
<td>Regional or national meetings of professional management societies</td>
<td>12</td>
<td>92.3</td>
<td>1</td>
<td>7.7</td>
</tr>
<tr>
<td>Management courses taken for self-development</td>
<td>12</td>
<td>100.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Self-planned or self-directed learning on managerial topics</td>
<td>37</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Correspondence, non-credit management course(s)</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>100.0</td>
</tr>
<tr>
<td>Program:</td>
<td>Number of participations in Nigeria</td>
<td>Percentage of participation in Nigeria</td>
<td>Number of participations overseas</td>
<td>Percent of participation overseas</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------------------------------</td>
<td>---------------------------------------</td>
<td>-----------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Managerial coaching and counseling program organized by superior/supervisor</td>
<td>3</td>
<td>100</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Management courses taken in engineering management degree program</td>
<td>7</td>
<td>77.8</td>
<td>2</td>
<td>22.2</td>
</tr>
<tr>
<td>Undergraduate management courses in business administration</td>
<td>8</td>
<td>88.9</td>
<td>1</td>
<td>11.1</td>
</tr>
<tr>
<td>Post-graduate management courses in business administration</td>
<td>14</td>
<td>93.3</td>
<td>1</td>
<td>6.7</td>
</tr>
<tr>
<td>Other business courses (e.g. finance accounting, marketing, etc.)</td>
<td>11</td>
<td>84.6</td>
<td>2</td>
<td>15.4</td>
</tr>
</tbody>
</table>
TABLE XVII
FREQUENCY OF PARTICIPATION TAKING PLACE IN NIGERIA AND OVERSEAS BY PROGRAM (NIGERIANS ONLY) (CONT'D)

<table>
<thead>
<tr>
<th>Program:</th>
<th>Number of participations in Nigeria</th>
<th>Percentage of participation in Nigeria</th>
<th>Number of participations overseas</th>
<th>Percent of participation overseas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correspondence courses in management</td>
<td>10</td>
<td>62.5</td>
<td>6</td>
<td>37.5</td>
</tr>
<tr>
<td>Total</td>
<td>240**</td>
<td>87.3*</td>
<td>35**</td>
<td>12.7*</td>
</tr>
</tbody>
</table>

*This percentage is calculated based on the total number of cases of participation. It is not the sum of the percentages in columns two and four.

**The total number of cases is greater than N because some subjects participated in more than one program.

As indicated in Table XVII, less than 10 percent of the total participations in the workshop or seminar on management topics took place overseas. The majority (83.8 percent) of the participation in company inservice management training courses occurred in Nigeria. All (100 percent) the participation in the management courses taken for self-development, self-planned or self-directed learning on managerial topics, and managerial coaching and counseling programs organized by superior/supervisors took place within Nigeria. Only one Nigerian citizen participated in a correspondence non-credit management course and this
took place overseas. Ten of the 16 (or 62.5 percent) cases of participation in correspondence credit courses in management took place in Nigeria. For short refresher courses at colleges and universities, the number of participation in Nigeria to the number of participation overseas was in the ratio 4:3. The majority (87.3 percent) of the total participation in management development activities took place in Nigeria.

Table XVIII contains the frequency of participation occurring in Nigeria and overseas, for non-Nigerian citizens. The non-Nigerian citizens had 7 instances of participating in professional development activities related to management. Six of the 7 instances were in Nigeria, while there was one company inservice management training course overseas.

Table XIX contains the number of subjects participating in each program, the mean number of hours of participation, the minimum and maximum number of hours spent in each program and the total number of hours of participation in the management programs. Data presented in Table XIX pertain to only the Nigerian citizens. The first eight programs are non-credit development programs, while the last five programs are academic credit programs. The sum of the number of subjects reported in Table XIX is greater than the 127 Nigerian citizens participating in this study, because some subjects participated in more than one program. The number of hours of participation include the time spent learning management inside and outside the classroom setting.
TABLE XVIII

FREQUENCY OF PARTICIPATION TAKING PLACE IN NIGERIA AND OVERSEAS BY PROGRAM FOR NON-NIGERIAN CITIZENS

<table>
<thead>
<tr>
<th>Program:</th>
<th>Number of participation in Nigeria</th>
<th>Percent of participation in Nigeria</th>
<th>Number of participation overseas</th>
<th>Percent of participation overseas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshops or seminars on managerial topics</td>
<td>1</td>
<td>100.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Company inservice management training courses</td>
<td>1</td>
<td>50.0</td>
<td>1</td>
<td>50.0</td>
</tr>
<tr>
<td>Self-planned or self-directed learning on managerial topics</td>
<td>4</td>
<td>100.0</td>
<td>1</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6</strong></td>
<td><strong>85.7</strong></td>
<td><strong>1</strong></td>
<td><strong>14.3</strong></td>
</tr>
</tbody>
</table>

*This percentage is based on the total number of cases of participation. It is not the sum of the percentages in columns two and four.*
TABLE XIX
NUMBER OF SUBJECTS, MINIMUM, MAXIMUM, AND TOTAL HOURS OF PARTICIPATION IN
MANAGEMENT DEVELOPMENT ACTIVITIES BY PROGRAM FOR ONLY NIGERIAN
CITIZENS

<table>
<thead>
<tr>
<th>Program:</th>
<th>No. of subjects</th>
<th>Mean</th>
<th>Minimum hours</th>
<th>Maximum hours</th>
<th>Total hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshops or seminars on managerial topics.</td>
<td>72</td>
<td>61.4</td>
<td>4.0</td>
<td>200.0</td>
<td>4421.0</td>
</tr>
<tr>
<td>Company inservice management training courses.</td>
<td>68</td>
<td>116.2</td>
<td>15.0</td>
<td>1140.0</td>
<td>7900.0</td>
</tr>
<tr>
<td>Short refresher courses at colleges and universities.</td>
<td>7</td>
<td>136.9</td>
<td>72.0</td>
<td>400.0</td>
<td>958.0</td>
</tr>
<tr>
<td>Regional or national meetings of professional management societies.</td>
<td>13</td>
<td>41.2</td>
<td>8.0</td>
<td>100.0</td>
<td>535.0</td>
</tr>
<tr>
<td>Management courses taken for self-development.</td>
<td>12</td>
<td>259.3</td>
<td>30.0</td>
<td>700.0</td>
<td>3112.0</td>
</tr>
<tr>
<td>Self-planned or self-directed learning on managerial topics.</td>
<td>37</td>
<td>174.6</td>
<td>10.0</td>
<td>800.0</td>
<td>6460.0</td>
</tr>
<tr>
<td>Correspondent non-credit management courses.</td>
<td>1</td>
<td>300.0</td>
<td>300.0</td>
<td>300.0</td>
<td>300.0</td>
</tr>
<tr>
<td>Program:</td>
<td>No. of subjects</td>
<td>Mean</td>
<td>Minimum hours</td>
<td>Maximum hours</td>
<td>Total hours</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-----------------</td>
<td>------</td>
<td>---------------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Managerial coaching and counseling program organized by superior/supervisor</td>
<td>3</td>
<td>18.3</td>
<td>8.0</td>
<td>24.0</td>
<td>55.0</td>
</tr>
<tr>
<td>Management courses taken in engineering management degree programs</td>
<td>9</td>
<td>291.3</td>
<td>80.0</td>
<td>860.0</td>
<td>2622.0</td>
</tr>
<tr>
<td>Undergraduate management courses in business administration</td>
<td>9</td>
<td>276.0</td>
<td>30.0</td>
<td>600.0</td>
<td>2484.0</td>
</tr>
<tr>
<td>Post-graduate management courses in business administration</td>
<td>15</td>
<td>356.0</td>
<td>20.0</td>
<td>1600.0</td>
<td>5340.0</td>
</tr>
<tr>
<td>Other business courses (e.g., accounting, finance, marketing etc.)</td>
<td>13</td>
<td>213.2</td>
<td>50.0</td>
<td>420.0</td>
<td>2771.0</td>
</tr>
<tr>
<td>Correspondent courses in management</td>
<td>16</td>
<td>164.8</td>
<td>20.0</td>
<td>600.0</td>
<td>2636.0</td>
</tr>
</tbody>
</table>
A majority (72) of subjects participated in workshops or seminars on managerial topics. Considering all the programs, the reported maximum number of hours (1600) and the highest mean number of hours of participation in management development activities was in post-graduate management courses in business administration. The 1600 hours were reported by only one subject at the middle management level. One participant in company inservice management training courses reported 1140 hours of participation.

The training took place overseas. Although the highest number of subjects participated in workshops or seminars on managerial topics, this program ranks fourth in terms of total number of hours of participation. The minimum number of hours of participation was in workshops or seminars on managerial topics. Company inservice management training courses, self-planned or self-directed learning on managerial topics and post-graduate management courses in business administration rank first, second, and third in terms of the total number of hours of participation.

However, in terms of the mean number of hours of participation, post-graduate management courses in business administration, correspondent non-credit management courses, and management courses taken in engineering management degree programs rank first, second and third. It should be noted that only one subject participated in correspondent
non-crédit management courses compared to 16 who participated in the correspondent courses in management for academic credit.

Data in Table XX show the mean number of hours of participation in the development and academic credit management programs for the various industries represented in this study. The highest (33) number of subjects work for either the state or federal government. The highest mean number of hours of participation in the development non-credit programs and the academic credit programs were in the agricultural and manufacturing industries, respectively. None of the four subjects from the industry categorized as "other" participated in management development activities for academic credit. This "other" industry also had the lowest (10.0) mean number of hours of participation in the non-credit development programs. Subjects from the education industry had the lowest (10.7) mean number of hours of participation in the academic credit management programs. As shown in Table XX, the mean number of hours in all the industries were consistently higher for the development programs than for the academic credit programs.
TABLE XX
MEAN HOURS OF PARTICIPATION IN DEVELOPMENT AND ACADEMIC CREDIT MANAGEMENT PROGRAM BY INDUSTRY

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number of subjects</th>
<th>Mean Development</th>
<th>Mean Academic credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>17</td>
<td>92.4</td>
<td>10.7</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>21</td>
<td>242.7</td>
<td>192.3</td>
</tr>
<tr>
<td>Government</td>
<td>33</td>
<td>100.3</td>
<td>38.7</td>
</tr>
<tr>
<td>Chemical Processing</td>
<td>8</td>
<td>297.3</td>
<td>139.3</td>
</tr>
<tr>
<td>Petroleum/Mining</td>
<td>26</td>
<td>156.8</td>
<td>146.1</td>
</tr>
<tr>
<td>Agriculture</td>
<td>3</td>
<td>331.1</td>
<td>166.7</td>
</tr>
<tr>
<td>Construction</td>
<td>15</td>
<td>166.6</td>
<td>13.8</td>
</tr>
<tr>
<td>Electrical</td>
<td>3</td>
<td>125.6</td>
<td>55.6</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>10.0</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>131</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The subjects were asked to evaluate the development and academic credit programs in which they participated. The subjects were asked to evaluate the programs' (1) pertinence to their needs and interest, (2) the benefit derived from participating, in terms of knowledge, skills and techniques, and (3) to indicate the extent to which the programs help them do a better job for their organizations. The subjects were also asked to rate the programs, as an educational
experience and indicate the level of their desire to attend future programs of a similar nature. All evaluation was done on a five point Likert Scale ranging from 1 to 5 with 5 as the most positive evaluation.

Table XXI contains the minimum, mean and maximum response scores to each of the five evaluative questions and for each program. In each cell, the first, second and third scores represent the minimum, mean, and maximum scores, respectively. As shown in Table XXI, the subjects consistently gave a higher rating to the development programs in terms of the program that helped them do a better job for their organizations. Considering all the evaluation questions, managerial coaching and counseling programs organized by the superior or supervisor received the lowest mean response scores. The managerial coaching and counseling program received the lowest (3.3) mean response score in terms of the program that benefited the subjects in providing managerial knowledge, skills and techniques. It also had the lowest (3.0) mean score in terms of the subjects' desire to attend similar programs in the future. The minimum score was 1.0, indicating no desire to attend similar programs in the future.

The subjects who participated in self-directed or self-planned learning stated that their learning projects were very pertinent to their needs and interests, of great benefit in getting managerial knowledge, skills and techniques, and would, to a very large extent, help them (the subjects) do a better
<table>
<thead>
<tr>
<th>PROGRAM</th>
<th>Number</th>
<th>Very Pertinent</th>
<th>Partially Pertinent</th>
<th>Not Pertinent</th>
<th>Very Great Benefit</th>
<th>Partially Great Benefit</th>
<th>No Benefit</th>
<th>Very Great Extent</th>
<th>Partially Great Extent</th>
<th>No Extent</th>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Greatest Desire</th>
<th>No Desire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshops or seminars on managerial topics</td>
<td>71</td>
<td>2.0</td>
<td>3.0</td>
<td>2.0</td>
<td>3.0</td>
<td>4.0</td>
<td>2.0</td>
<td>4.0</td>
<td>4.0</td>
<td>2.0</td>
<td>3.0</td>
<td>2.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Company inservice management training courses</td>
<td>68</td>
<td>3.0</td>
<td>4.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>2.0</td>
<td>3.0</td>
<td>2.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Short refresher courses at colleges and universities</td>
<td>70</td>
<td>4.0</td>
<td>3.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Regional or national meetings of professional management societies</td>
<td>13</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
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<td>4.0</td>
<td>4.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Management courses taken for self-development</td>
<td>11</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
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<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Self-planned or self-directed learning on managerial topics</td>
<td>36</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
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<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Correspondent non-credit management courses</td>
<td>10</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
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<td>4.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Managerial coaching and counseling program organized by superior/supervisor</td>
<td>3</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>PROGRAM:</td>
<td>N</td>
<td>Very pertinent</td>
<td>Not pertinent</td>
<td>How much benefit do you feel you got from the knowledge and techniques?</td>
<td>To what extent will the program(s) help you do a better job for your organization?</td>
<td>How would you rate the educational experience?</td>
<td>How would you rate your desire to attend a similar program?</td>
<td></td>
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<td>---------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management courses taken in engineering management degree programs</td>
<td>90</td>
<td>4.0 4.0 4.0 4.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate management courses in business administration</td>
<td>90</td>
<td>4.0 4.0 4.0 4.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
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<td></td>
</tr>
<tr>
<td>Post-graduate management courses in business administration</td>
<td>150</td>
<td>4.0 4.0 4.0 4.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other business courses (e.g., accounting, finance, marketing, etc.)</td>
<td>130</td>
<td>4.0 4.0 4.0 4.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
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<td></td>
</tr>
<tr>
<td>Correspondence courses in management</td>
<td>160</td>
<td>4.0 4.0 4.0 4.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
<td>5.0 5.0 5.0 5.0</td>
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<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
job for their organizations. The 36 subjects who evaluated the self-planned learning also had a mean score of 4.9 on a 5-point scale, indicating that their self-directed learning was an excellent educational experience. The mean response score for the question concerning the subjects' desire to attend future programs was 4.9. This indicates that the subjects have great desire to attend future programs of similar nature (self-directed learning).

Information pertaining to the types of providers of management education and training and the number of subjects who participated in their programs within the 12 months preceding November 1984 is contained in Table XXII. The names of all the providers reported by the subjects are shown in the Appendix, page 162. These providers were grouped into the seven types of providers shown in Table XXII.

Data in Table XXII show that the subjects had 245 instances of participation in programs offered by seven types of providers of management education and training. Fifteen subjects indicated that they participated in workshops or seminars provided by more than one provider. Thus, some subjects were counted more than once in arriving at the total number of subjects who participated. The largest number (93) of programs or 37.9 percent of the 245 programs was offered by the various companies for which the subjects work. These companies, classified as industry, offer company based training for which academic credit cannot be earned. Government agencies (state and federal government ministries)
# TABLE XXII

PROVIDERS OF MANAGEMENT EDUCATION/TRAINING AND THE FREQUENCY OF INVOLVEMENT IN EACH PROVIDER'S PROGRAMS

\( N = 245 \)

<table>
<thead>
<tr>
<th>Type of Provider</th>
<th>Number of subjects</th>
<th>Percentage of subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universities</td>
<td>54</td>
<td>22.0</td>
</tr>
<tr>
<td>Industry (Company based training)</td>
<td>93</td>
<td>38.0</td>
</tr>
<tr>
<td>Professional Societies</td>
<td>33</td>
<td>13.5</td>
</tr>
<tr>
<td>Polytechnics or Community Colleges</td>
<td>11</td>
<td>4.5</td>
</tr>
<tr>
<td>Training Firms/Consultancy</td>
<td>17</td>
<td>6.9</td>
</tr>
<tr>
<td>Overseas Providers</td>
<td>35</td>
<td>14.3</td>
</tr>
<tr>
<td>Government Agencies</td>
<td>2</td>
<td>0.8</td>
</tr>
</tbody>
</table>

\( 245^* \) 100.0

*This number does not include participants in self-directed learning.

offered the least number of programs. A greater percentage of the subjects attended programs offered by the professional societies than those offered by training firms/consultancy.

Overseas providers (providers located outside Nigeria and participation took place overseas) offered 35 programs. Nineteen of the 35 programs were offered by universities while 11 programs were company based training provided by the
subjects' employers. Professional societies and training or consulting firms offered 3 and 2 programs, respectively. The countries involved in the management education and training were United States of America, India, Germany, Britain, and U.S.S.R. The number of participants involved in the programs offered by these countries were 20, 8, 2, 4, and 1, respectively.

Research Hypothesis 1

The first research hypothesis stated that the mean number of hours of participation in management development activities would be greater among Nigerian licensed engineers aged 25 to 45 than among the licensed engineers aged 46 and over, participating in management development programs categorized as (a) development, and (b) academic credit. The t-test of difference between two means was used in testing the statistical significance of the difference between the mean number of hours of participation of the two groups specified above.

Table XXIII contains the mean, standard deviation and t for the number of hours of participation in development programs for the subjects aged 25 to 45 and those aged 45 and over. Numerically, the mean number of hours of participation in management development activities for non-academic credit programs is greater for the Nigerian licensed engineers aged 25 to 45 than for the engineers aged 46 and over.
There was no statistical significance at the 0.05 significance level.

**TABLE XXIII**

**MEAN, STANDARD DEVIATION AND t FOR THE NUMBER OF HOURS OF PARTICIPATION IN DEVELOPMENT PROGRAMS CATEGORIZED BY AGE OF SUBJECTS**

<table>
<thead>
<tr>
<th>Group age (yrs.)</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>t*</th>
<th>Deg. of freedom</th>
<th>One-tail probability*</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-45</td>
<td>80</td>
<td>232.5</td>
<td>253.8</td>
<td>28.4</td>
<td>-1.45</td>
<td>110</td>
<td>0.07</td>
</tr>
<tr>
<td>46 and over</td>
<td>32</td>
<td>160.6</td>
<td>189.9</td>
<td>33.2</td>
<td>-1.45</td>
<td>110</td>
<td>0.07</td>
</tr>
</tbody>
</table>

* for equal variance

** Standard Deviation (SD)

** Standard Error (SE)

The values shown in Table XXIII indicate that the mean hours of participation, in the development (non-academic credit) programs, among the Nigerian licensed engineers aged 25 to 45, were not statistically greater than the mean hours of participation for the engineers aged 46 and over. This also meant that a significant statistical difference did not exist between the mean hours of participation in management development programs for the licensed engineers in the age groups during the past 12 months preceding November, 1984. The hypothesis was therefore rejected at the 0.05 level of
significance. Although the mean number of hours of participation in development programs was numerically greater for engineers aged 25 to 45, the difference was not statistically significant at the 0.05 level.

Table XXIV contains the mean, standard deviation and t for the number of hours of participation in the academic credit management programs for the subjects aged 25 to 45 and those aged 46 and over. As indicated in Table XXIV,

**TABLE XXIV**

**MEAN, STANDARD DEVIATION AND t FOR THE NUMBER OF HOURS OF PARTICIPATION IN ACADEMIC CREDIT PROGRAMS CATEGORIZED BY AGE OF SUBJECTS**

<table>
<thead>
<tr>
<th>Group age (yrs.)</th>
<th>No. of subs.</th>
<th>Mean **</th>
<th>SD **</th>
<th>SE **</th>
<th>t*</th>
<th>Deg. of freedom</th>
<th>One-tail probability*</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-45</td>
<td>47</td>
<td>306.0</td>
<td>325.8</td>
<td>47.5</td>
<td>-0.44</td>
<td>51</td>
<td>0.33</td>
</tr>
<tr>
<td>46 and over</td>
<td>6</td>
<td>245.0</td>
<td>214.8</td>
<td>88.1</td>
<td>-0.44</td>
<td>51</td>
<td>0.33</td>
</tr>
</tbody>
</table>

* For equal variances

**Standard Deviation (SD)**

**Standard Error (SE)**

the mean number of hours for the subjects aged 25 to 45 was numerically greater than the mean number of hours for the subjects aged 46 and over. However, the difference between the mean number of hours is not significant at the
0.05 level of significance. This means that the mean number of hours of participation for engineers aged 25 to 45 was not significantly greater than the mean number of hours for the licensed engineers aged 46 and over.

There was no significant difference between the mean number of hours of participation in the academic credit program for the subjects aged 25 to 45 and those aged 46 and above. The hypothesis was therefore rejected at the 0.05 level of significance.

The removal of the outliers (1) from the data did not significantly affect the results of the t-test of difference done on the data. Extreme unrepresentative total development and academic credit program duration greater than or equal to 1000 hours, and less than or equal to 8 hours, were removed. As shown in Table XXV, the mean number of hours for the subjects aged 25 to 45 is higher than the mean number of hours for those over 46, participating in the development (non-credit) programs. The treatment of the data for representativeness reduced the number of subjects from 80 and 32 to 75 and 31, respectively.

The $t$ and one-tail probability changed to $-1.36$ and 0.09, respectively. After removing the outliers, the mean number of hours of participation in development programs was still not significantly greater at the 0.05 level in favor of the subjects aged 25 to 45.
### TABLE XXV

**Mean, Standard Deviation and t for the Number of Hours of Participation in Development Programs Categorized by Age of Subjects Excluding Outliers**

<table>
<thead>
<tr>
<th>Group age (yrs.)</th>
<th>No. of subj.</th>
<th>Mean (hrs.)</th>
<th>SD**</th>
<th>SE**</th>
<th>t*</th>
<th>Degree of freedom</th>
<th>One-tail prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-45</td>
<td>75</td>
<td>228.0</td>
<td>224.8</td>
<td>25.0</td>
<td>-1.36</td>
<td>104</td>
<td>0.09</td>
</tr>
<tr>
<td>46 and over</td>
<td>31</td>
<td>165.5</td>
<td>188.9</td>
<td>33.9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variance  
** Standard Deviation (SD)  
*** Standard Error (SE)

Table XXVI contains the mean, standard deviation, and t for the number of hours of participation in the academic credit programs after removing the outliers for the subjects aged 25 to 45 and those over 46 years. The mean number of hours of participation and the number of subjects remained the same for the subjects over 46. Removing the outliers from the data resulted in a lower number of subjects and a lower mean number of hours of participation for the subjects aged 25 to 45. Numerically, the mean number of hours of participation in the academic credit programs was still higher for the Nigerian licensed engineers aged 25 to 45 than for those over 46 years. There was no significant
difference between the mean hours of participation in academic credit programs for the two age groups.

Hypothesis 1 was therefore rejected at the 0.05 level of significance. The mean number of hours of participation in academic credit management programs was, statistically, not significantly greater for the Nigerian licensed engineers aged 25 to 45 than for those aged 46 and over.

**TABLE XXVI**

<table>
<thead>
<tr>
<th>Group age</th>
<th>No. of subj.</th>
<th>Mean (hrs.)</th>
<th>SD**</th>
<th>SE**</th>
<th>t</th>
<th>Degrees of freedom</th>
<th>One-tail prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-45</td>
<td>43</td>
<td>261.0</td>
<td>229.7</td>
<td>35.0</td>
<td>-0.16</td>
<td>47</td>
<td>0.44</td>
</tr>
<tr>
<td>Over 46</td>
<td>6</td>
<td>245.0</td>
<td>215.8</td>
<td>88.1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variance

** Standard Deviation (SD)

** Standard Error (SE)

Research Hypothesis 2

This hypothesis tested if the mean number of clock hours of participation in (a) development (non-credit) programs and (b) academic credit programs was greater for the Nigerian
licensed engineers with 0 to 3 years experience in a managerial role than for the Nigerian licensed engineers with 4 or more years experience in a managerial role. Table XXVII contains the results of the t-test of difference between the means of the hours of participation in the development programs for the two groups of subjects according to their experience in managerial roles.

**TABLE XXVII**

**MEAN, STANDARD DEVIATION AND t FOR THE NUMBER OF HOURS OF PARTICIPATION IN DEVELOPMENT PROGRAMS CATEGORIZED BY THE YEARS OF MANAGERIAL EXPERIENCE OF THE SUBJECTS**

<table>
<thead>
<tr>
<th>Experience (years)</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>t*</th>
<th>Deg. of freedom</th>
<th>One-tail prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 3</td>
<td>36</td>
<td>222.5</td>
<td>214.8</td>
<td>35.0</td>
<td>0.32</td>
<td>110</td>
<td>0.37</td>
</tr>
<tr>
<td>Over 4 yr.</td>
<td>76</td>
<td>207.0</td>
<td>251.9</td>
<td>28.9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variances
** Standard Deviation (SD)
** Standard Error (SE)

As data in Table XXVII indicate, the mean number of hours of participation in development programs is higher for the 36 subjects having 0 to 3 years of experience than for the 76 subjects with over 4 years experience. However, there is no significant difference between the mean number of hours of
participation in development programs for Nigerian licensed engineers with 0-3 years and over 4 years experience in a managerial role.

Table XXVIII contains the results of the t-test after treating the data for fair representativeness. Extreme cases with development program duration greater than or equal to 1000 hours and less than or equal to 8 hours were eliminated. A total of six extreme, unrepresentative values were removed from the data by inspection (1, p. 397)

<table>
<thead>
<tr>
<th>TABLE XXVIII</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN, STANDARD DEVIATION AND t FOR THE NUMBER OF HOURS OF PARTICIPATION IN DEVELOPMENT PROGRAMS CATEGORIZED BY THE YEARS OF MANAGERIAL EXPERIENCE OF THE SUBJECTS EXCLUDING OUTLIERS</td>
</tr>
<tr>
<td>Exper. (yrs.)</td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>0 - 3</td>
</tr>
<tr>
<td>Over 4 (yrs.)</td>
</tr>
</tbody>
</table>

* For equal variance
** Standard Deviation (SD)
*** Standard Error (SE)

before conducting the t-test. It was found that the number of subjects with 0 to 3 years experience in a managerial role changed from 36 to 34, and those with 4 or more years of
experience changed from 76 to 72. The corresponding changes in the mean number of hours of participation in the development programs were from 222.5 to 233.0 and 207.0 to 198.7 hours, respectively. After treating the data for extreme unrepresentativeness, the probability from the F-statistic was 0.84, indicating that the difference between the mean number of hours of participation in the development programs was not statistically significant at the 0.05 level of significance for the subjects with 0 to 3 years experience and those with over 4 years experience in a managerial role.

Table XXIX contains the mean, standard deviation and t for the mean hours of participation in the academic credit programs for the Nigerian licensed engineers having 0 to 3 years and over 4 years experience in a managerial role. The mean number of hours of participation in the academic credit programs was higher for the 27 engineers having 0 to 3 years of experience in a managerial role than for the 26 engineers with over 4 years experience. As data in Table XXIX reveal, there is no significant difference between the mean number of hours of participation in the academic credit programs for those with 0 to three years and the subjects with over 4 years of experience in a managerial role. This will be interpreted that the mean number of hours of participation is not statistically different for the two groups of engineer managers.
### Table XXIX

**Mean, Standard Deviation and t for the Number of Hours of Participation in Academic Credit Management Programs Categorized by the Managerial Experience of the Subjects**

<table>
<thead>
<tr>
<th>Exper. (yrs.)</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>t*</th>
<th>Deg. of freedom</th>
<th>One-tail prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 3</td>
<td>27</td>
<td>333.0</td>
<td>299.5</td>
<td>57.6</td>
<td>0.79</td>
<td>51</td>
<td>0.22</td>
</tr>
<tr>
<td>Over 4 (yrs.)</td>
<td>26</td>
<td>264.0</td>
<td>331.1</td>
<td>64.9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variance

** Standard Deviation (SD)

** Standard Error (SE)

The results before treating the data for extreme non-representative cases were similar to the results after the treatment. Data in Table XXX show the results of the t-test after treatment. The number of subjects with 0 to 3 years experience in a managerial role and over 4 years decreased to 25 and 24, respectively. The mean number of hours of participation in the academic credit programs also decreased to 301.4 and 215.0 for the subjects with 0 to 3 years and over 4 years managerial experience, respectively. The F-statistic probability of 0.24 indicated that there is no significant difference between the means at 0.05 level of significance. This means that after removing the outliers,
TABLE XXX

MEAN, STANDARD DEVIATION AND $t$ FOR THE NUMBER OF HOURS OF PARTICIPATION IN ACADEMIC CREDIT MANAGEMENT PROGRAMS CATEGORIZED BY THE YEARS OF MANAGERIAL EXPERIENCE OF THE SUBJECTS EXCLUDING OUTLIERS

<table>
<thead>
<tr>
<th>Exp. (yrs.)</th>
<th>No. of eng.(s)</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>$t$*</th>
<th>Deg. of freedom</th>
<th>One-tail prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 3</td>
<td>25</td>
<td>301.4</td>
<td>248.9</td>
<td>49.8</td>
<td>1.35</td>
<td>47</td>
<td>0.09</td>
</tr>
<tr>
<td>Over 4</td>
<td>24</td>
<td>215.0</td>
<td>194.8</td>
<td>39.9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For equal variance

**Standard Deviation (SD)**

**Standard Error (SE)**

The mean number of hours of participation in academic credit programs is not statistically greater for the subjects having 0 to 3 years experience in a managerial role than for those having over 4 years experience in a managerial role. The hypothesis is therefore still rejected at the 0.05 level of significance after removing the extreme unrepresentative data. The mean number of hours in the academic credit programs is not significantly greater at the 0.05 level of significance for the Nigerian licensed engineers with 0 to 3 years experience in a managerial role than for those with over 4 years experience in a managerial role.

Research Hypothesis 3

Research hypothesis 3 stated that the mean number of hours of participation in management development activities
will be greater for Nigerian licensed engineers holding graduate degree(s) in engineering (but not in management) than for the Nigerian licensed engineers holding undergraduate degree(s) and participating in programs categorized as (a) development, (b) academic credit. The t-test of difference between the two means was used in testing the statistical significance of the difference between the mean number of hours of participation for the groups identified in this hypothesis.

Table XXXI presents the results of the t-test for the development programs. As indicated in Table XXXI, the mean number of clock hours for the 61 subjects holding undergraduate degrees and participating in the development

<table>
<thead>
<tr>
<th>Acad. level</th>
<th>No. of subj(s)</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>t*</th>
<th>Deg. of freedom*</th>
<th>2-tail prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under-grad.</td>
<td>61</td>
<td>225.9</td>
<td>254.9</td>
<td>32.6</td>
<td>0.99</td>
<td>108</td>
<td>0.16</td>
</tr>
<tr>
<td>Grad.</td>
<td>49</td>
<td>181.2</td>
<td>212.3</td>
<td>30.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variance
** Standard Deviation (SD)
*** Standard Error (SE)
programs is higher than the mean number of hours for the 49 subjects holding graduate degree(s) (but not in management). The t and one-tail probability indicate that the mean number of hours of participation in development (non-credit) programs for holders of undergraduate degrees is statistically not significantly different from the mean number of hours of participation in development programs for holders of graduate degrees. The numerical difference is due to chance. Before eliminating the outliers, the first part of the third hypothesis was therefore rejected at the 0.05 level of significance.

Table XXXII contains the mean, standard deviation and t for the number of hours of participation in the development programs by the subjects holding only undergraduate degrees and those holding graduate degrees in engineering. Extreme unrepresentative data were removed before calculating the values presented in Table XXXII. The removal of extreme unrepresentative data reduced the number of subjects, reduced the mean and standard deviation for the subjects holding only undergraduate degrees, increased the mean and reduced the standard deviation for holders of graduate degrees. The t and one-tail probability were reduced and increased, respectively. As shown in Table XXXII, the mean number of hours for the holders of undergraduate degrees is higher than the mean number of hours for holders of graduate degrees. The values of t and one-tail probability indicate that there is no significant difference between the means at the 0.05 level. The removal of extreme unrepresentative data did not
make a difference at the 0.05 level of significance. There is still no statistically significant difference between the mean number of hours of participation in development programs for subjects holding undergraduate degrees and those holding graduate degrees.

TABLE XXXII
MEAN, STANDARD DEVIATION AND \( t \) FOR THE NUMBER OF HOURS OF PARTICIPATION IN DEVELOPMENT PROGRAMS CATEGORIZED BY ACADEMIC LEVEL OF THE SUBJECTS EXCLUDING OUTLIERS

<table>
<thead>
<tr>
<th>Acad. level</th>
<th>No. of subj(s)</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>( t )*</th>
<th>Deg. of freedom*</th>
<th>One-tail prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergrad.</td>
<td>59</td>
<td>210.4</td>
<td>213.0</td>
<td>27.7</td>
<td>0.65</td>
<td>105</td>
<td>0.26</td>
</tr>
<tr>
<td>Grad.</td>
<td>48</td>
<td>183.3</td>
<td>211.8</td>
<td>30.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variance

** Standard Deviation (SD)

** Standard Error (SE)

The second part of hypothesis 3 is concerned with the academic credit management programs. Table XXXIII presents the mean, standard deviation and \( t \) for the number of hours of participation in the academic credit management programs for the subjects holding undergraduate degrees and those who hold graduate degrees (but not in management).

As indicated in Table XXXIII, the mean number of hours of participation in academic credit management programs for
TABLE XXXIII
MEAN, STANDARD DEVIATION AND \( t \) FOR THE NUMBER OF HOURS OF PARTICIPATION IN ACADEMIC CREDIT PROGRAMS CATEGORIZED BY ACADEMIC LEVEL OF THE SUBJECTS

<table>
<thead>
<tr>
<th>Acad. level</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD **</th>
<th>SE **</th>
<th>( t ** )</th>
<th>Deg. of freedom*</th>
<th>One-tail prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergrad.</td>
<td>33</td>
<td>340.3</td>
<td>330.6</td>
<td>57.6</td>
<td>1.48</td>
<td>50</td>
<td>0.07</td>
</tr>
<tr>
<td>Grad.</td>
<td>19</td>
<td>208.6</td>
<td>268.3</td>
<td>61.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variances

** Standard Deviation (SD)

** Standard Error (SE)

the 33 subjects holding only undergraduate degrees was higher than the mean number of hours for the 19 subjects holding graduate degrees in engineering. As indicated in Table XXXIII, at the 0.05 level of significance, the mean number of hours of participation in the academic programs was statistically not significantly different for the Nigerian licensed engineers whose highest academic level was an undergraduate degree and those who held graduate degrees, but not in management.

The second part of hypothesis 3 was analyzed excluding the 4 extreme unrepresentative values. Table XXXIV contains the results of the \( t \)-test of difference between the mean
TABLE XXXIV

MEAN, STANDARD DEVIATION AND t FOR THE NUMBER OF HOURS OF PARTICIPATION IN ACADEMIC CREDIT PROGRAMS CATEGORIZED BY ACADEMIC LEVEL OF THE SUBJECTS EXCLUDING OUTLIERS

<table>
<thead>
<tr>
<th>Acad. level</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>t*</th>
<th>Deg. of freedom</th>
<th>One-tail prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergrad.</td>
<td>31</td>
<td>307.3</td>
<td>246.4</td>
<td>44.3</td>
<td>3.11</td>
<td>44.4</td>
<td>0.002</td>
</tr>
<tr>
<td>Grad.</td>
<td>17</td>
<td>147.6</td>
<td>107.5</td>
<td>26.1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For unequal variances
** Standard Deviation (SD)
*** Standard Error (SE)

number of hours of participation in academic credit programs for the subjects holding graduate degrees and those holding only undergraduate degrees, but excluding 'outliers.' The removal of the extreme cases reduced the number of subjects holding only the undergraduate degrees and those holding the graduate degrees from 33 to 31 and from 19 to 17, respectively. The mean number of hours of participation in academic credit programs were reduced for both holders of undergraduate and graduate degrees. As shown in Table XXXIV, the one-tail probability of 0.002 and the value of t indicate that the mean number of hours of participation in the academic credit management programs for the subjects holding
only undergraduate degrees and those holding graduate degrees are statistically significantly different at the 0.05 level of significance. The fractional degrees of freedom (44.4) shown in Table XXIV are due to a correction factor built into the SAS computer program to deal with cases of unequal variance.

Although part one of hypothesis 3 was rejected before and after removing the extreme unrepresentative cases, part two of the hypothesis was accepted at the 0.05 level of significance after removing the extreme cases. Before and after removing the extreme cases, the mean number of hours of participation in development programs was not significantly greater for the Nigerian licensed engineers holding undergraduate degrees than for those holding graduate degrees (but not in management). However, after removing the extreme cases, the mean number of hours of participation in academic credit management programs was significantly greater at the 0.05 level of significance for the Nigerian licensed engineers holding only undergraduate degrees than for those holding graduate degrees.

Research Hypothesis 4

Research Hypothesis 4 stated that the mean number of hours of participation in management development activities will be greater for Nigerian licensed engineer managers at top management level than for supervisory and middle (combined) management level licensed engineer managers participating in (a) development programs and (b) academic credit programs. The result of the t-test of difference
between the two means for the subjects at top management level and those at supervisory and middle management level, participating in the development programs is presented in Table XXXV.

As shown in Table XXXV, the mean number of hours of participation in the development programs for the 20 engineering managers at top management level is higher than the mean number of hours for the 87 engineering managers at the supervisory and middle management levels. The probability of equal variances obtained from the F-statistic was 0.90, indicating that no significant difference exists at the 0.05 level.

**TABLE XXXV**

**MEAN, STANDARD DEVIATION AND t FOR THE NUMBER OF HOURS OF PARTICIPATION IN DEVELOPMENT PROGRAMS CATEGORIZED BY MANAGEMENT LEVEL OF THE SUBJECTS**

<table>
<thead>
<tr>
<th>Mgmt. level</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>t*</th>
<th>Deg. of freedom</th>
<th>One-tail prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>20</td>
<td>195.9</td>
<td>244.8</td>
<td>54.7</td>
<td>0.45</td>
<td>105</td>
<td>0.33</td>
</tr>
<tr>
<td>Supervisory and middle</td>
<td>87</td>
<td>222.9</td>
<td>242.7</td>
<td>26.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variance

** Standard Deviation (SD)    ** Standard Error (SE)
Data in Table XXXV indicate that there is no significant difference between the mean number of hours of participation in development programs for the subjects at top management level and those at supervisory and middle management level.

Data for part one of hypothesis 4 was also treated for representativeness. Six extreme unrepresentative cases were removed from the data. This treatment reduced the subjects at top management level to 18 and those at supervisory and middle management levels to 83. Table XXXVI contains the mean, standard deviation and t for the number of hours of participation in development programs after the extreme cases have been removed.

**TABLE XXXVI**

**MEAN, STANDARD DEVIATION AND t FOR THE NUMBER OF HOURS OF PARTICIPATION IN DEVELOPMENT PROGRAMS CATEGORIZED BY MANAGEMENT LEVEL OF THE SUBJECTS EXCLUDING OUTLIERS**

<table>
<thead>
<tr>
<th>Mgmt. level</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>t*</th>
<th>Deg. of freedom*</th>
<th>One-tail prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>18</td>
<td>214.6</td>
<td>243.8</td>
<td>59.3</td>
<td>0.03</td>
<td>99</td>
<td>0.49</td>
</tr>
<tr>
<td>Supervisory and middle</td>
<td>83</td>
<td>216.1</td>
<td>213.5</td>
<td>23.4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variance
** Standard Deviation (SD) ** Standard Error (SE)
The removal of the extreme values increased the mean number of hours of participation in development programs from 195.9 to 214.6 for the subjects at top management level, while it was decreased from 222.9 to 216.1 for the subjects at supervisory and middle management levels. The probability of equal variances from the F-statistic was 0.33. Data in Table XXXVI indicate that there is no significant difference at the 0.05 level of significance. The mean hours of participation in development programs for the Nigerian licensed engineering managers at top management level is not significantly greater than the mean number of hours of participation for Nigerian engineering managers at supervisory and middle management levels. Hypothesis 4a was therefore rejected at the 0.05 level of significance.

Among the subjects who participated in the academic credit programs, 51 were at supervisory and middle management levels, while one subject was at top management level. The t-test procedure was not possible due to the limited number of subjects at top management level who participated in the academic credit programs. The case of the hypothesis stating that the mean number of hours of participation in management development activities will be greater for Nigerian licensed engineer managers at top management level than for supervisory and middle (combined) management level licensed engineer managers participating in academic credit programs was thrown out of the analysis.
Research Hypothesis 5

Research hypothesis 5 stated that the mean number of hours of participation in management development activities will be greater in the development programs than in the academic credit management programs for the Nigerian licensed engineers working in the (a) private sector, (b) public sector, and (c) government. The t-test of difference between the mean hours of participation in the development programs and the academic credit programs for each of the sectors was used in analyzing hypothesis 5.

Table XXXVII presents the results of the t-test for the mean number of hours of participation in the development and academic credit program for the subjects working in the private sector. The mean number of hours of participation for 68 out of the 76 subjects working in the private sector was higher for the development programs than for the credit programs. As shown in Table XXXVII, there is a significant difference at the 0.05 level between the mean hours of participation in development programs and the academic credit programs. This means that for the Nigerian licensed engineers who work in the private sector, the mean number of hours of participation is significantly greater in the development programs than in the academic credit programs. Hypothesis 5a is therefore accepted at the 0.05 level of significance.

Excluding the four identified extreme values in the private sector, the mean number of hours of participation
TABLE XXXVII
MEAN, STANDARD DEVIATION AND \( t \) FOR THE NUMBER OF HOURS OF PARTICIPATION IN DEVELOPMENT AND ACADEMIC CREDIT PROGRAMS FOR SUBJECTS EMPLOYED IN THE PRIVATE SECTOR

<table>
<thead>
<tr>
<th>Type of program</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>( t^* )</th>
<th>Deg. of freedom</th>
<th>One-tail prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>68</td>
<td>233.7</td>
<td>231.7</td>
<td>28.1</td>
<td>1.70</td>
<td>67</td>
<td>0.04</td>
</tr>
<tr>
<td>Acad. credit</td>
<td>158.5</td>
<td>261.9</td>
<td>31.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For equal variance
** Standard Deviation (SD)
*** Standard Error (SE)

in the development and academic credit programs were 190.4 and 162.9, respectively. The value of \( t \), and the one-tail probability, were 1.61 and 0.04, respectively, indicating that there is a significant difference at the 0.05 level of significance. Hypothesis 5a is therefore accepted at the 0.05 significance level. This means that among the Nigerian licensed engineers working in the private sector and participating in both the development and academic credit management programs, the mean number of hours of participation in the development (non-credit) programs is greater than the mean for the academic credit programs.
Table XXXVIII contains the mean, standard deviation, and $t$ for the number of hours of participation for the subjects working in the public sector. The mean number of hours of participation in the development programs was about twice the mean number of hours for the academic credit programs. The value of $t$ and the one-tail probability of 0.003 indicate that there is a significant difference between the mean number of hours of participation in the development programs and the academic credit programs at a 0.05 level of significance. This means that within the 12 month period preceding November 1984, the mean number of hours of participation in development programs was significantly greater than the mean number of hours of participation in academic credit programs for the licensed engineers in the public sector.

The difference between the mean number of hours of participation remained significant at 0.05 level of significance after removing the outliers. The removal of extreme values reduced the number of subjects to 42, reduced the $t$-value to 2.63, reduced the degrees of freedom to 41 and increased the one-tail probability to 0.005. The mean number of hours for the development and academic credit programs were 147.3 and 51.0, respectively. Hypothesis 5b is accepted at 0.05 level of significance. The mean number of hours of participation in the developmental programs is, statistically, significantly greater than the mean number
TABLE XXXVIII

MEAN, STANDARD DEVIATION AND $t$ FOR THE NUMBER OF HOURS OF PARTICIPATION IN DEVELOPMENT AND ACADEMIC CREDIT PROGRAMS FOR SUBJECTS EMPLOYED IN THE PUBLIC SECTOR

<table>
<thead>
<tr>
<th>Type of prog.</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>$t$</th>
<th>Deg. of freedom</th>
<th>One-tail prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>44</td>
<td>146.9</td>
<td>174.3</td>
<td>26.3</td>
<td>2.88</td>
<td>43</td>
<td>0.003</td>
</tr>
<tr>
<td>Acad. credit</td>
<td></td>
<td>76.6</td>
<td>131.6</td>
<td>19.8</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Standard Deviation (SD)**

**Standard Error (SE)**

of hours of participation in the academic credit programs. Among the Nigerian licensed engineers working in the public sector, the mean number of hours of participation in the development non-credit programs are greater than the mean number of hours for the academic credit programs.

The t-test results for the subjects working specifically for the state or federal government of Nigeria are shown in Table XXXIX. The mean number of hours of participation in the development non-credit programs is about twice the mean number of hours for the academic credit programs. The one-tail probability shown in Table XXXIX is 0.02, indicating that it can be stated with 98 percent confidence that the mean number of hours of participation in the development
programs is significantly greater than the mean number of hours of participation in the academic credit programs. Hypothesis 5c is therefore accepted at the 0.05 level of significance.

**TABLE XXXIX**

**MEAN, STANDARD DEVIATION AND t FOR THE NUMBER OF HOURS OF PARTICIPATION IN DEVELOPMENT AND ACADEMIC CREDIT PROGRAMS FOR SUBJECTS EMPLOYED IN THE GOVERNMENT DEPARTMENTS**

<table>
<thead>
<tr>
<th>Type of prog.</th>
<th>No. of subj.</th>
<th>Mean</th>
<th>SD**</th>
<th>SE**</th>
<th>t</th>
<th>Deg. of freedom</th>
<th>One-tail prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>28</td>
<td>135.9</td>
<td>138.6</td>
<td>26.2</td>
<td>2.18</td>
<td>27</td>
<td>0.02</td>
</tr>
<tr>
<td>Academic credit</td>
<td></td>
<td>69.3</td>
<td>123.9</td>
<td>23.4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Standard Deviation (SD)**

**Standard Error (SE)**

The subjects who worked for the state or federal government departments did not have total number of hours of participation less than or equal to 8 hours or greater than or equal to 1000 hours. A second test of the hypothesis was therefore not necessary for the subjects working for government departments.
Research Hypothesis 6

Hypothesis 6 stated that the majority (51 percent) of the Nigerian licensed engineers who participate in both the non-credit management development programs and the management development programs for academic credit will report that the non-credit development programs rather than the programs for academic credit (a) are more pertinent to their needs and interest, (b) help them do a better job for their organization, and (c) provide a more desired educational experience. The Z test of proportions was used in testing hypothesis 6.

The results of the frequency procedure from the SAS computer programs indicated that 46 subjects participated in both the development and academic credit programs. The results also showed that the number of subjects who gave a higher rating to the development programs in terms of their pertinence to the subject's needs and interest, help in doing a better job for the subject's employer, and providing a more desired educational experience were 23, 31, and 22, respectively.

Table XL contains the results of the calculation for proportion of subjects who gave a higher rating to the development programs, the calculated values of Z, and the Z values obtained from Hopkins (2, p. 401-405) tables for unit normal Z distribution.
Data in the first row pertain to the results of the calculations testing the significance of the difference between the hypothesized and observed proportion of the licensed engineers who report that the development programs are more pertinent to their needs and interests than the.

TABLE XL
RESULT OF Z TEST OF PROPORTION FOR THE PERTINENCE, ON-THE-JOB HELP AND EDUCATIONAL EXPERIENCE DERIVED FROM THE PROGRAMS

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>f</th>
<th>f/n</th>
<th>( \sigma_p )</th>
<th>( Z_c )</th>
<th>( Z_t^* )</th>
<th>NS or S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pertinence</td>
<td>46</td>
<td>23</td>
<td>0.50</td>
<td>0.07</td>
<td>-0.14</td>
<td>1.645*</td>
<td>NS 0.05</td>
</tr>
<tr>
<td>Job help</td>
<td>46</td>
<td>31</td>
<td>0.67</td>
<td>0.07</td>
<td>2.28</td>
<td>1.645*</td>
<td>S 0.05</td>
</tr>
<tr>
<td>Educational experience</td>
<td>46</td>
<td>22</td>
<td>0.48</td>
<td>0.07</td>
<td>-0.43</td>
<td>1.645*</td>
<td>NS 0.05</td>
</tr>
</tbody>
</table>

*Value of \( Z_t \) at 0.05 level of significance.

academic credit programs. The results of the calculation and hypothesis testing for the subjects who report that the development programs help them do a better job for their organizations are shown in the second row. The third row contains the results of the calculation for the subjects' perception of the programs in terms of providing a more desired educational experience.

In Table XL,

\( n \) = number of subjects who participated in both the non-academic development programs and the academic credit programs.
f = the number of subjects who gave a higher rating to the development programs.

\( f/n \) = the proportion of subjects who gave a higher rating to the development programs or the observed proportion.

\( \hat{p} \) = the sampling distribution of the hypothesized proportion.

\( Z_c \) = the calculated values of Z.

\( Z_t \) = the value of Z obtained from tables at 0.05 level of significance.

NS represents no significant difference.

S represents significant difference.

As shown in Table XL, the observed proportion (\( f/n \)) of subjects who reported that the non-credit development of programs were more pertinent to their needs and interest was 0.50. Based on a sample size of 46 and a hypothesized proportion as 0.51, the sampling distribution of the hypothesized proportion and the calculated value of Z (\( Z_c \)) were 0.07 and -0.14, respectively. At the 0.05 level of significance, the value of Z (\( Z_t \)) from the unit normal Z distribution table is 1.645 or 1.65. As shown in Table XL, \( Z_c \) is less than \( Z_t \), indicating that at the 0.05 level of significance, there is no significant difference between the hypothesized (51 percent) and observed proportions (50 percent) of subjects who reported that the development programs were more
pertinent to their needs and interest. This means that the majority (51 percent) of the Nigerian licensed engineers who participate in both the non-credit development programs and the academic credit management programs will not report that the development programs rather than the academic credit programs are more pertinent to their needs and interests.

Data in Table XL also show that 31 of the 46 or 67 percent of the subjects reported that the development program helped them to do a better job for their organizations. The sampling distribution of the hypothesized proportion (51 percent) and the calculated value of Z ($Z_c$) were 0.07 and 2.28, respectively. The $Z_c$ (2.28) is greater than the value of the $Z_t$ (1.65). This means that at 0.05 significance level, there is a significant difference between the hypothesized proportion and the observed proportion. It can therefore be stated that the majority of the Nigerian licensed engineers will report that the non-credit management development programs help them do a better job for their organization than the academic credit management programs.

Data concerning the type of program that provides a more desired educational experience is shown in the third row of Table XL. The table shows that 22 out of the 46, or 48 percent of the licensed engineers who participated in both the development and academic credit programs, gave
a higher rating to the development programs in terms of the program which provides a more desired educational experience. The sampling distribution of the hypothesized proportion was 0.07, the $Z_c$ was -0.43, while $Z_t$ at 0.05 significance level remained at 1.65. $Z_c$ is less than $Z_t$, indicating that statistically, there is no significant difference between the hypothesized proportion (51 percent) and the observed proportion (48 percent). The majority (51 percent) of the Nigerian licensed engineers who participated in both the academic credit management programs and the development programs did not report that the non-credit development programs rather than the programs for academic credit provide a more desired educational experience. Hypothesis 6a and 6c are therefore rejected at the 0.05 level of significance, while hypothesis 6b is accepted.
CHAPTER BIBLIOGRAPHY


CHAPTER V

SUMMARY, DISCUSSION, CONCLUSION, IMPLICATIONS AND RECOMMENDATIONS

The study reported in this paper aimed at determining if in fact Nigerian registered (licensed) engineers participate in management education and training, determining the management development programs in which the engineers participate, evaluating the value of the programs based on the perception of the engineers and then testing selected hypotheses concerning the age, years of experience in a management role, level in management, level of academic preparation and the engineers' participation in management development activities. The engineers' participation was primarily measured by the number of hours spent in the program(s) in which they participated.

This chapter summarizes the findings of the study, discusses the results of data analyses, discusses the issues related to the results and draws conclusions based on the findings and the descriptive data presented throughout Chapter V. In this chapter, the implications for the licensed engineers, employers of engineers and the organizations which contribute to the professional development of engineers are discussed. Finally, the chapter contains some recommendations for further research.
Summary

Engineers perform management roles but lack training in management and administration. The lack of information on the participation of engineers in professional development activities related to management prompted this study. The problem of this study is the participation of Nigerian licensed engineers in professional development activities related to management.

The study provided descriptive data on Nigerian licensed engineers. Sixty-five percent of the 200 randomly selected subjects returned their questionnaires. The largest percentage (41.2) of the respondents were at middle management level, while 31.3 percent and 22.1 percent were at supervisory and top management levels, respectively. Two out of the 131 respondents held the MBA degree. The largest percentage (45.8) of the respondents received all their engineering education overseas, while 35.9 percent received all their education in Nigeria.

Nigerian licensed engineers were found to be involved in managerial work and consequently devoted some of their professional development time to learning management. The largest percentage (62.6) of the engineers indicated management and administration as their primary job responsibility. Smaller percentages (20.6, 6.9, and 9.9) of the licensed engineers stated that design, research and development, and teaching/training and development,
respectively, were their primary job responsibilities. Within the 12 months preceding November 1984, when data for the study were collected, 91.6 percent of the subjects participated in at least one management program. The highest number of programs in which two subjects participated was 6, while 11 subjects (or 8.4 percent) participated in zero programs. At least 51 percent of the professional development activities was devoted to management by 61.8 percent of the subjects, while only 17.5 percent of the licensed engineers devoted at least 51 percent of their professional development activities to engineering.

There were 220 instances when the subjects participated in development programs, while there were 62 instances when the licensed engineers participated in academic credit programs. Among the subjects who were Nigerian citizens, 51.1 percent of the participation in the management development activities was voluntary, while 48.9 percent was required. These percentages were 62.5 and 37.5 respectively, for the non-Nigerian citizens in the research sample. Among the Nigerian subjects, 87.3 percent of their participation took place in Nigeria, while 12.7 percent took place overseas. The non-Nigerian subjects had 85.7 percent of their participation in Nigeria and 14.3 percent overseas.

The total number of hours of participation in professional development activities related to management
was 39,594 for the subjects who are Nigerian citizens. The total number of hours for the non-credit development programs and the academic credit programs were 23,741 and 15,853, respectively. The mean number of hours of participation in the non-credit development programs and the academic credit programs were 255.7 and 107.91, respectively. The mean number of hours of participation in the non-credit development programs ranged from 18.3 hours, for managerial coaching and counseling organized by superior/supervisor, to 300.0 hours for the correspondent non-credit management courses taken by only one subject. The range for the mean number of hours of participation in the academic credit programs was from 164.8 for correspondence courses in management to 356.0 for post-graduate management courses in business administration. The range of hours of participation was from 4.0 hours to 1600.0 hours (see Table XIX).

A comparison of the mean number of hours of participation in development and academic credit management program by industry revealed that the mean number of hours were consistently greater in the development programs than in the academic credit programs for all the industries involved in the study. The subjects participated in programs offered by seven types of providers of management education and training. Universities, business and industry
(company based training programs), professional societies and polytechnics or community colleges offered programs attended by 54, 93, 33 and 11 participants (subjects), respectively. The majority (50) of the subjects participating in programs offered by universities were involved in academic credit programs.

The 35 programs offered overseas were provided by universities (19 instances), business and industry (11), professional societies (3) and training firms/consultants. The countries involved in offering the programs were U.S.A., India, Germany, Britain and U.S.S.R. The number of subjects who participated in programs offered in these countries were 20, 8, 2, 4 and 1, respectively.

The mean response scores shown in Table XXI indicate that the subjects felt that the development programs help them do a better job for their organization. The mean response scores for all the programs also indicate that the subjects benefited from the programs in terms of knowledge, skills and techniques they gained. The participants found the programs pertinent to their needs and interest. The subjects rated their participation in the programs as a very good educational experience and expressed a strong desire to attend future programs of similar nature. In all the programs the subjects gave a rating of at least 3.0 on a five-point Likert scale for all the evaluative questions (see Table XXI).
The mean response scores for the managerial coaching and counseling by the superior/supervisor indicated that the subjects did not value their participation in managerial coaching very much. Generally, the mean response scores for the self-directed learning were approximately 5.0, indicating that the self-directed learning pursuits of the 36 subjects who participated in this type of program were very pertinent to their needs and interests. The score of 5.0 also indicated that the self-directed learning pursuits were of great benefit in terms of knowledge, skills and techniques, helped the subjects do a better job for their organization to a large extent, excellent educational experience, and were such that the 36 subjects would greatly desire to attend future programs of similar nature.

Hypotheses one through five were tested twice; the first time with extreme unrepresentative data included, and the second time without the extreme unrepresentative (outliers) data. All tests were done at the 0.05 level of significance.

Hypothesis 1 stated that the mean number of hours of participation in management development activities would be greater among Nigerian licensed engineers aged 25 to 45 than among the licensed engineers aged 46 and over, participating in (a) development programs, and (b) academic
credit programs. No significant difference was found between the mean number of hours of participation among the Nigerian licensed engineers aged 25 to 45 and those aged 46 and over, participating in (a) development programs and (b) academic credit programs. Hypothesis 1 was rejected at the 0.05 level of significance.

Hypothesis 2 stated that the mean number of hours of participation in management development activities will be greater for Nigerian licensed engineer managers having 0 to 3 years' experience in a managerial role than for those having 4 or more years in a managerial role and participating in (a) development programs and (b) academic credit programs. No significant difference was found to exist at the 0.05 level of significance, between the mean number of hours of participation for the two groups of engineer managers participating in the (a) development programs, and (b) academic credit programs. All parts of hypothesis 2 were rejected at the 0.05 level of significance.

Hypothesis 3 stated that the mean number of hours of participation in management development activities will be greater for Nigerian licensed engineers holding graduate degree(s) in engineering (but not in management) than for the Nigerian licensed engineers holding undergraduate degrees and participating in (a) development programs and (b) academic credit programs. The difference between the
means was not significant at the 0.05 level for either the development or the academic credit programs. Before removing the outliers, all parts of hypothesis 3 were rejected at the 0.05 level of significance. However, after removing the outliers, it was found that the mean number of hours of participation in the academic credit programs was significantly greater for the engineers with undergraduate degrees than for the engineers with graduate degrees. Hypothesis 3b was accepted at the 0.05 level of significance.

Hypothesis 4 stated that the mean number of hours of participation in management development activities will be greater for Nigerian licensed engineer managers at top management level than for supervisory and middle (combined) management level licensed engineer managers participating in (a) development programs, (b) academic credit programs. There was no significant difference between the mean number of hours of participation in development programs for the engineer managers at top management level and the mean for the supervisory and middle (combined) management levels. Hypothesis 4a was rejected at the 0.05 level of significance. Hypothesis 4b was thrown out of the analysis due to the limited number (one) of engineer managers at top management level.

Hypothesis 5 stated that the mean number of hours of participation in management development activities will
be greater in the development programs than in the academic credit programs for the Nigerian licensed engineers working in the (a) private sector, (b) public sector, (c) government. The hypothesis was accepted at the 0.05 level of significance for the Nigerian licensed engineers working in the (a) private sector, (b) public sector, and (c) government. The removal of the outliers did not change the conclusion in any of the sectors.

Hypothesis 6 stated that the majority (51 percent) of the Nigerian licensed engineers who participate in both the non-credit management development programs and the management development programs for academic credit will report that the non-credit development programs, rather than the programs for academic credit, (a) are more pertinent to their needs and interest, (b) help them do a better job for their organization, and (c) provide a more desired educational experience. The Z test of proportions was used to test the difference between the hypothesized (51 percent) and observed proportion of the subjects who gave a higher rating to the development programs in terms of the pertinence, help in job performance, and desired educational experience as expressed above.

Fifty percent of the 46 subjects who participated in both the development and academic credit programs gave a higher rating to the development programs, indicating that the development programs were more pertinent to their needs
and interest. This observed percentage is not significantly different from the hypothesized 51 percent at the 0.05 level of significance.

In terms of the types of program which provided more help for the subjects to do a better job for their organizations, 67 percent of the 46 subjects gave a higher rating to the development programs. This observed percentage (67) is significantly different from the hypothesized 51 percent at the 0.05 significant level. Therefore, the majority of the Nigerian licensed engineers will report that the development programs rather than the academic credit management programs will help them do a better job for their organizations.

Among the 46 subjects who participated in both the development and academic credit programs, 48 percent gave a higher rating to the development programs, for providing a more desired educational experience than the academic credit management programs. There is no significant difference between the hypothesized 51 percent and the observed 48 percent of the subjects who rated the development programs higher than the academic credit programs. The majority of the Nigerian licensed engineers will not report that the non-credit development programs provide a more desired educational experience than the academic credit management programs.
Table XLI summarizes the decision on each of the six hypotheses tested in this study. All parts of hypotheses 1, 2 and 4 were rejected. Hypothesis 3b was accepted after the removal of outliers. All parts of hypothesis 5 and hypothesis 6b were accepted.

<table>
<thead>
<tr>
<th>Hypothesis:</th>
<th>Decision:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before removing outliers</td>
</tr>
<tr>
<td>1. The mean number of hours of participation in management development activities will be greater among Nigerian licensed engineers aged 25 to 45 than among the Nigerian licensed engineers aged 46 and over, participating in (a) development programs</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>(b) academic credit programs</td>
</tr>
<tr>
<td>2. The mean number of hours of participation in management development activities will be greater for Nigerian licensed engineer managers having 0 to 3 years' experience in a managerial role than for those having 4 or more years in a managerial role and participating in</td>
<td></td>
</tr>
<tr>
<td>Hypothesis:</td>
<td>Decision:</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>Before removing outliers</td>
</tr>
<tr>
<td>programs categorized under</td>
<td></td>
</tr>
<tr>
<td>(a) development,</td>
<td>Rejected</td>
</tr>
<tr>
<td>(b) academic credit.</td>
<td>Rejected</td>
</tr>
<tr>
<td>3. The mean number of hours of participation in management development activities will be greater for Nigerian licensed engineers holding graduate (post-graduate) degree(s) in engineering (but not in management) than for the Nigerian licensed engineers holding undergraduate degree(s) participating in programs categorized as</td>
<td></td>
</tr>
<tr>
<td>(a) development,</td>
<td>Rejected</td>
</tr>
<tr>
<td>(b) academic credit.</td>
<td>Rejected</td>
</tr>
<tr>
<td>4. The mean number of hours of participation in management development activities will be greater for Nigerian licensed engineer managers at top management level than for supervisory and middle (combined) management level licensed engineer managers participating in</td>
<td></td>
</tr>
<tr>
<td>(a) development</td>
<td>Rejected</td>
</tr>
<tr>
<td>(b) academic credit programs</td>
<td>Removed from analysis</td>
</tr>
</tbody>
</table>
TABLE XLI—Continued

<table>
<thead>
<tr>
<th>Hypothesis:</th>
<th>Decision: Before removing outliers</th>
<th>After removing outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. The mean number of hours of participation in management development activities is greater in the development non-credit programs than in the academic credit programs for the Nigerian licensed engineers working in the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) private sector,</td>
<td>Accepted</td>
<td>Accepted</td>
</tr>
<tr>
<td>(b) public sector,</td>
<td>Accepted</td>
<td>Accepted</td>
</tr>
<tr>
<td>(c) government</td>
<td>Accepted</td>
<td>Accepted (no outliers)</td>
</tr>
</tbody>
</table>

| 6. The majority of the Nigerian licensed engineers who participate in both the non-credit management development programs and the management development programs for academic credit will report that the non-credit development programs rather than the programs for academic credit | | |
| (a) are more pertinent to their needs and interest, | Rejected | |
| (b) help them do a better job for their organization, and | | Accepted |
TABLE XLI--Continued

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Decision:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before removing outliers</td>
<td>After removing outliers</td>
</tr>
<tr>
<td>(c) provide a more desired educational</td>
<td>Rejected</td>
</tr>
<tr>
<td>experience.</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

The adult education literature provides mainly descriptive data on the participation of adults in learning. The available descriptive data are mainly based on the United States population. However, the studies conducted in the United States have not attempted to test any hypotheses concerning the rate of participation and age, job experience, academic level, level in management and the sector in which the adults work. This study tested five hypotheses concerning the age, number of years in a managerial role, level in management, level of academic preparation, sector in which employed, and the Nigerian licensed engineers' participation in professional development activities related to management. This study also tested a sixth hypothesis concerning the licensed engineers' perception about the management development activities they attended. This section discusses the demographic variables used in this study and
relates the findings related to each variable to other studies.

Age

This study found that the mean number of hours of participation is lower for the Nigerian licensed engineers aged 46 and over than for those aged 25 to 45. However, the difference between the mean number of hours was of no significance. The results of participation studies (1) based on age indicate that learners of one group tend to have similar characteristics in participating in learning. Such studies suggest that adult degreed engineers aged 25 to 30 spend an average of 1702.1 hours in learning projects (11), adults aged 17 to 34 have a participation rate of 15.7, those aged 35 to 54 have a participation rate of 13.0, while adults aged 55 and over have a 4.5 participation rate (10).

The studies cited above did not compare participants in one age group with those of another age group. Life span psychology suggests that characteristics of learners at specific age groups are similar. However, the characteristics have not been statistically compared between age groups. This study made such a statistical comparison between adult licensed engineers aged 25 to 45, and those aged 46 and over.
The results of this study are in agreement with the studies of the National Center for Educational Statistics (10). In that study, participation was measured in rate (number of programs per participant); the rate of participation decreased with age. In this study, participation is measured by the mean number of hours. The mean number of hours of participation is lower for the licensed engineers aged 46 and over than for those aged 25 to 45.

This study supports Cross (7) who noted that while younger adults tend to be pursuing credentials and laying the groundwork for later career specialization, those in the age ranges of 25 to 45 are concentrating largely on occupational and professional training for career advancement; and those 50 and older are beginning to prepare for the use of leisure time (p. 57).

Cross (7) also noted that the motivation for learning job skills continues to decrease as a professional worker approaches retirement. The Nigerian licensed engineers aged 46 and over are certainly closer to retirement than those aged 25 to 45; hence their mean number of hours of participation in learning management, which is very relevant to the practice of their profession, is lower.

The difference between the mean number of hours of participation was not statistically significant at the 0.01 or 0.05 level of significance. A possible explanation for the lack of significance is that age is a poor discriminator.
and like other socio-demographic variables, it is weak in predicting participation. Anderson and Darkenwald (1) found that age and other socio-demographic variables account for only 10 percent of the variance associated with adult participation in organized learning activities.

Number of Years of Experience
In Managerial Role

This study revealed that the mean number of hours of participation, in both the development and academic credit programs, for the licensed engineers with 0 to 3 years of experience in a managerial role is greater (222.5 for development programs and 333.0 for academic credit programs) than the mean number of hours for the subjects with 4 or more years of experience (207.0 for developmental programs and 264.0 for academic credit programs) in a managerial role. However, statistically, the difference in the mean number of hours is not significant at 0.01 or 0.05 level of significance.

The number of years of experience in a managerial role, like other demographic variables, appears not to be a good predictor of participation. While experience may be a poor discriminator, the results of this study are in agreement with Aplin's findings. Aplin (2) found that the managers in his study consistently noted the need for more training in the "trial stage" (0 to 3 years of managerial experience)
and less during the "productive stage." Although the level of participation, as measured by the mean number of hours, is not significantly different for the engineer managers with 0 to 3 years managerial experience and those with 4 or more years experience, the former participate more in professional development activities related to management. This finding is consistent with the finding of Aslanian and Brickell (3) in their study of Americans in transition. They found that a person has the need to gain additional relevant knowledge and learn skills which will enable him or her to function effectively in a new career or new stage whenever a change occurs in his or her status, relationship, career or responsibility. The managerial role is not as new to the engineer manager with 4 or more years of experience as it is to those with 0 to 3 years.

Level of Academic Preparation

Hypothesis 3 found that there was no significant difference between the mean number of hours of participation in both the development and academic credit programs among the Nigerian licensed engineers holding undergraduate degrees and those holding graduate degree(s) in areas other than management. However, the removal of outliers made the difference between the mean number of hours of participation in the academic credit programs, for the holders of undergraduate degrees and the holders of graduate degree(s),
statistically significant at the 0.07 level of significance. Despite the lack of significance, the mean number of hour of participation are consistently higher for holders of undergraduate degrees than for holders of graduate degrees.

Other studies (1, 7) found that for the general population, educational attainment is closely related to educational participation. The findings of this study appear contrary to the findings of other studies. The discrepancy is explained by the fact that this study focused on a highly specialized group of professionals with more than average formal education who may be developing themselves more in the new area of knowledge. The licensed engineers with graduate degrees in engineering are possibly more attached to the engineering profession than those with only undergraduate degrees.

Cultural differences may contribute to the disagreement between the findings of this study and the findings of other studies. Lifelong learning is more of a reality in the United States than in Nigeria. In the Nigerian culture, people who have attained their goals tend to be more relaxed, leaving "further struggle" to the younger people and those who have not achieved their goals. This tendency extends to all areas of the lives of Nigerians, especially where the new knowledge to be gained (management) is different from the established knowledge (engineering). Professionally, there is a basic difference between the
job requirement of engineers in the developing countries such as Nigeria and the developed countries such as the U.S.A. In the developed countries, the engineer's job is highly specialized, whereas the engineer in a developing country performs less specialized jobs ranging from engineering to administration.

Sector of Employment

This study found that there was a significant difference between the mean number of hours of participation in the development programs and the mean number of hours of participation in the academic credit programs. The mean number of hours in the development programs were consistently greater for the development programs than for the academic credit programs. The level of significance at which the differences in the mean were significant for the private sector, public sector, and government were 0.05, 0.003, and 0.01, respectively.

A majority of the developmental programs attracted required participation from all the sectors, whereas participation in the academic credit programs was mostly voluntary. The post-graduate management courses in business administration and the correspondence credit courses in management attracted the highest participation (15 and 16, respectively) among the programs for academic credit.

Participation in these programs was 100 percent voluntary in all cases. These results indicate that the private,
public, and government sectors are not giving incentives or requiring participation by the Nigerian licensed engineers in management programs for which the engineers will gain academic credit towards a degree. The private sector, public sector, and the government seem to support Fubara’s assertion that Nigerian managers should be exposed to continual symposia, conferences, workshops, in-plant courses, and research (9).

Evaluation of Management Programs

In terms of pertinence to the subject's needs and interests, the non-credit development programs were rated higher than the academic programs by 50 percent of the Nigerian licensed engineers who participated in both types of programs. This percentage of licensed engineers was not statistically significant at the 0.05 level of significance. The prevalent voluntary participation in the academic credit programs and the required participation in the development programs (and their required participation) were not pertinent. The development programs were pertinent to the needs and interests of the organizations as the evaluation question concerning "job help" reveals.

Sixty-seven percent of the Nigerian licensed engineers involved in this study gave a higher rating to the development programs which helped them do a better job for their organizations. This proportion of the licensed engineers was statistically significant at the 0.02 level of
significance. The majority of the development programs were offered by business and industry. This class of provider tried to provide the knowledge, skills, and techniques which will prove useful in working towards the organizational goals, rather than meeting the personal needs of the engineers.

Research Methodology and Instrument

This study did not aim at exploring the reasons why the Nigerian engineers participate in management education and training and did not aim at identifying the needs and interests of the engineers. However, the study would have provided additional information if the probing interview method was used and the instrument helped the subjects to define their needs and interests in relation to doing a better job for the subjects' organizations.

Question number 14 in the instrument asked the subjects to indicate the total amount of time spent in each management program. The total number of hours of participation in the various programs were reported by the respondents. The instrument should contain questions to differentiate between the number of hours of participation while

(1) involved in a fulltime off-the-job training, as in the case of the engineers who are enrolled as full-time students and are not on any organization's payroll;
(2) involved in the normal work activities as engineers but enroll as part-time students;
(3) on leave of absence for training and for professional development in areas related to management sponsored by their employers;
(4) involved in inservice training programs which last for several months;
(5) using their own unpaid time (evenings and weekends) to study the material that was taught or will be taught in an organized class.

It is possible that the respondents in this study did not differentiate between semester hours and clock hours of participation. Clarification of the type of hours sought in question 14 is necessary.

**Reported Hours of Participation**

The high level of involvement in professional development activities related to management (measured in hours) could be partially attributed to the indigenization or "Nigerianization" policy. Indigenization involves the replacement of expatriate personnel and ownership with Nigerians from the public or private sector. In effect, the indigenization decree promulgated in 1977 encouraged the expansion of the existing industries and the creation of new enterprises. The total or partial transfer of the management of the multinational corporations to the hands of Nigerians triggered the learning of new (management) skills among the Nigerian engineers.
Engineers who were selected for managerial and supervisory positions were released from their normal engineering duties and sent for extended periods of training. The duration of such training amounts to, at times, six to 12 months. Sending the engineers for several months of training may be an attempt to sabotage the Nigerianization policy. The policy allows the federal government of Nigeria to reimburse the companies who spend money training Nigerian citizens. Thus, the longer the period of training the greater the amount of money which the multinational corporation can take out of Nigeria in the disguise of training. Moreover, the expatriate is retained in Nigeria for the duration of the training. Considering the practice of involving the Nigerian engineers in long periods of training, the mean number of hours reported in this study is reasonable.

The reported number of hours of participation in management development activities ranges from 4 to 1600 hours. The four hours of participation was in workshops or seminars on managerial topics. The subjects who reported four as the total number of hours of participation in the non-credit management program possibly attended a half day workshop or seminar for which they did not need any outside reading before or after the workshop or seminar. It is also possible that the respondents did not include the
time spent reading, in preparation for the workshop or seminar, and did not account for the time spent reviewing the material taught in the workshop or seminar. The four hours of participation is quite unrepresentative of the data collected in this study.

One subject reported 1600 hours of participation in post-graduate management courses in business administration. The number of hours of participation reported in this study are similar to the findings reported by Rymell (11) in his study of learning projects pursued by adult degreed engineers. He found that an engineer spends an average of 1702.1 hours each year on learning projects. Rymell also found that the largest percentage (30.7) of the learning projects (or about 522.5 hours) were job-related. Although Rymell's study did not identify the percentage of the 522.5 hours that was related to management, the mean number of hours reported in Table XIX reflect the ranges identified in earlier studies (11, p. 90).

Findings

The findings of this study are summarized below:

(1) The Nigerian licensed engineers participate in management education and training. Their participation in the non-credit development programs is greater than in the academic credit programs.
(2) There is no significant difference between the mean number of hours of participation of the Nigerian licensed engineers aged 25 to 45 and those over 46 in both the academic credit and non-credit development programs.

(3) In both the academic credit programs and the non-academic credit development programs, there is no significant difference between the mean number of hours of participation of the Nigerian licensed engineers having 0 to 3 years experience in a managerial role and those having 4 or more years in a managerial role.

(4) Among the Nigerian licensed engineers, with no degrees in management, the mean number of hours of participation in the academic credit management programs is greater for holders of undergraduate degrees in engineering than for those with graduate degrees in engineering. The difference between the mean number of hours of participation for the two groups is significant for the academic credit programs, but not significant for the non-credit development programs.

(5) The Nigerian engineer managers at the top management level do not participate in management related professional development activities for which they will gain academic credit.

(6) There is no significant difference between the mean number of hours of participation in the non-credit
development management programs for the Nigerian licensed engineer managers at supervisory and middle management (combined) and the top management level.

(7) Nigerian licensed engineers working in the private sector, public sector, and specifically in the state or federal government ministries participate more in the non-credit development programs than in the academic credit programs. The mean number of hours of participation in the non-credit development programs is significantly greater than the mean number of hours of participation in the academic credit programs for all the sectors of employment.

(8) A majority (67 percent) of the Nigerian licensed engineers report that the non-credit development programs help them do a better job for their organization than the academic credit programs.

(9) The non-credit development programs and the academic credit programs are both pertinent to the needs and interests of the majority of Nigerian licensed engineers. Although 50 percent of the engineers participating in both types of programs gave a higher rating to the non-credit development programs than academic programs, the difference between the observed 50 percent and the hypothesized majority (51 percent) is not statistically significant.

(10) The non-credit development programs and the academic credit programs equally provide a desired educational experience for the Nigerian engineers.
(11) Ulrich's International Periodicals Directory and the International Literary Market Place list no journals or periodicals published in Nigeria that deal with the training and development of Nigerian engineers.

Conclusions

The findings of this study lead to the following conclusions:

(1) Nigerian engineers participate in management education and training.

(2) Age, years of experience in a managerial role, academic level and level in management are not factors that influence Nigerian licensed engineers to participate in non-credit management development programs.

(3) Age and years of experience in a managerial role are not factors influencing the participation of Nigerian licensed engineers in academic credit management programs.

(4) Academic level and the level in management are factors that influence the participation of Nigerian licensed engineers in the academic credit management programs.

(5) Whether the management development program is for credit or non-credit is a factor in participation in Management Development Activities among Nigerian licensed engineers working in the (a) private sector, (b) public sector, and (c) government.
In terms of the type of management program that improves the engineer's job performance, Nigerian engineers prefer the non-credit development programs to the academic credit programs.

Implications

This study has implications for employers of engineers, educators and the professional societies/consulting firms who provide and aid the professional development of Nigerian engineers.

Employers of Engineers: The Nigerian engineers who work in the private and public sectors, and specifically for the state and federal government ministries, indicated that they participate more in the non-credit development programs than in the academic credit programs. This is shown in Tables XXXVII to XXXIX. As shown in Table XX, the mean number of hours of participation in the development programs is consistently greater in the non-credit development programs than in the academic credit programs. Data in these tables reveal that the employers of engineers may be encouraging the Nigerian engineers to participate more in the non-credit management development programs. Such encouragement may be aimed at helping the engineers do a better job for their organizations.

This study revealed that only 18.6 percent of the engineers are involved in self-directed learning. Outside
the programs required by employers, self-directed learning and correspondence courses attracted the highest number of subjects. Employers should be aware of the fact that the engineers voluntarily invest their time and money in gaining managerial knowledge and skills. To the employers, self-directed learning is a less expensive way for the engineers to gain management knowledge and skills. Although employers may save some management education and training Naira (Nigerian money) by encouraging their engineers to start learning projects in management, the value of such learning projects is unknown.

This study revealed that managerial coaching and counseling programs organized by superior/supervisor were used by only 1.4 percent of the engineers in the study. Employers need to get more engineers involved in this type of program which can reduce training costs.

Educators: Educators of engineers (both in engineering and management) should be aware that the primary job responsibility of 62.6 percent of the Nigerian licensed engineers is management/administration. Consequently, there is the need for them to receive management/administration education and training. The engineers in the study reported that the non-credit development programs and the academic credit management programs equally provided a desired educational experience. Although the academic credit programs may tend to reduce the time spent on the job,
educators in universities and polytechnics can see such information as a basis for providing more academic credit management programs designed for engineers.

Consulting firms/Professional Societies: The Nigerian engineers realize the need for management education and training. Participation in the non-credit programs helps the engineers do a better job for their organizations. The Nigerian Society of Engineers, COREN and other management consulting firms can increase the productivity of the Nigerian engineers by providing non-credit development programs that will meet the engineers' professional development needs and interests and the managerial job requirements in the workplace.

Programmatic Recommendations

Based on the findings of this study, it is recommended that

(1) Credit and non-credit management programs should be designed for supervisory and middle management level engineers, while non-credit programs should be designed for top level engineer managers.

(2) Because self-directed learning on managerial topics was very pertinent to the needs and interest of all the engineers who participated in self-directed learning, employers of engineers and engineering societies/organizations should consider self-directed learning as a method
of professional development in management and should help
the engineers to determine the content of such learning.

(3) The Nigerian Society of Engineers (NSE), the
Council of Registered Engineers, and other professional
engineering organizations/societies should review the need
to incorporate management training and development in
their professional development activities.

(4) Evaluation is needed to determine the outcomes
of various types of management development programs for
engineers.

Recommendations for Study

There is a lack of data on the participation of engi-
neers and engineer managers in professional development
activities related to management. Research is needed to
establish more data on the participation of engineers in
management development activities. Such needed research
should test hypotheses concerning the relationship between
participation and the age, level in management, years of
experience, and the educational attainment of engineers
in order to verify the findings of this study. The
hypotheses tested in this study were derived from the
literature which did not specifically address engineers.

This study has concentrated on the Nigerian licensed
engineers participating in management development activities.
A comparable study of the participation of licensed
engineers in other countries in management development activities is needed. Engineers who have not been licensed but hold managerial jobs might also be studied.

In this study, only engineers were investigated. Other studies which might reasonably extend the relevance of these findings would concentrate on other professionals doing managerial work. For example, the professional development activities (related to management) of social workers, teachers, doctors, etc. might be studied.

The content of the programs in which the licensed engineers participate was not investigated in this study. Another study which might be undertaken is to study the content of the programs. Such research would identify the specific topics studied by the licensed engineers.

The survey method was used in collecting the data in this study. This study should be replicated using the probing interview method to verify the findings of this study. A study using the interview method should explore the reasons why the subjects participate in the programs. A probing interview will also reveal the reasons why the licensed engineers participate voluntarily and involuntarily, and why the programs were attended in Nigeria or overseas.

Comish (6) studied the criteria for promoting engineers to managerial positions. That study revealed that "special management training," "MBA degree," and "human relations skills," among other criteria, enhanced the
promotion of engineers to managerial positions. This study concentrated on the participation of the engineers in management education and training. Other studies which might reasonably extend the relevance of the findings of these studies would determine the relationship between the actual level of participation and the on-the-job mobility among licensed engineers.

This study considered the participation in management development activities within a 12-month period. A longitudinal study might be undertaken to determine the effect of changes in age, managerial level, managerial responsibility and other demographic variables, on the level of participation of engineers in management development activities. Such a study could also examine the possible changes in the content of the programs attended by the engineers.

This study should be replicated using a modified form of the instrument used for this study. The modified instrument should seek definitive responses. Replication of this study will help to establish the reliability of the instrument which was specifically developed for this study.


APPENDIX A

LETTER OF TRANSMITTAL TO PARTICIPANTS IN
THE PILOT STUDY CONDUCTED IN DENTON
Dear Mr.

Licensed engineers perform managerial roles in their organizations. The literature and authorities in the development of professional engineers have indicated that a human resource development need of engineers is their professional development in areas related to management.

As part of the requirement for the Ph.D. degree at North Texas State University, I am studying the participation of licensed engineers in professional development activities related to management. My intent is to collect some demographic data on the Nigerian licensed engineers, ask them to report the number of hours they spent studying management within the past 12 months and, based on their perception, evaluate the management programs they attended.

I will appreciate your help in completing the attached questionnaire, specifically designed for the study. Please write your comments and suggestions regarding the validity and clarity of this instrument. I will come back to your office to collect the completed questionnaire. All your responses will be kept confidential.

Yours sincerely,

Nwike Saale
Ph.D. Candidate
North Texas State University
APPENDIX B

LETTER OF TRANSMITTAL TO PARTICIPANTS IN

THE PILOT STUDY CONDUCTED IN NIGERIA
P.O. Box 10111  
Denton, Texas  76203  
November 20, 1984

Dear Engineer,

Registered engineers perform managerial roles in their organizations. The literature and authorities in the development of professional engineers have indicated that a human resource development need of engineers is their professional development in areas related to management.

As part of the requirement for the Ph.D. degree at North Texas State University, I am studying the participation of registered engineers in professional development activities related to management. My intent is to collect some demographic data on the Nigerian registered engineers, ask them to report the number of hours they spent studying management within the past 12 months and, based on their perception, evaluate the management programs they attended.

I will appreciate your help in completing the attached questionnaire, specifically designed for the study. Please write your comments and suggestions regarding the validity and clarity of this instrument. The completed questionnaire should be sent to Mr. Nwike Saale, c/o The Nigerian Society of Engineers, 360 Herbert MaCaulay Street, PMB 1041, Yaba, Lagos. All your responses will be kept confidential.

Yours sincerely,

Nwike Saale  
Ph.D. Candidate  
North Texas State University
APPENDIX C

LETTER OF TRANSMITTAL TO PARTICIPANTS
IN THE STUDY
November 20, 1984

Dear Engineer,

Registered engineers perform managerial roles in their organizations. The literature and authorities on the development of professional engineers have indicated that a human resource development need of engineers is their professional development in areas related to management.

As part of the requirement for the Ph.D. degree at North Texas State University, I am studying the participation of Nigerian registered engineers in professional development activities related to management. I will appreciate your help in completing the questionnaire designed for the study.

The questionnaire seeks some demographic information, asks you to report the number of hours you spent studying management during the past 12 months, and to evaluate the management programs you attended. Please mail the completed questionnaire to Mr. Nwike Saale, c/o the Nigerian Society of Engineers, 360 Herbert Macaulay Street, P.M.B. 1041, Yaba Logos. If you will attend the National Engineering Conference Meeting in Kano, bring the completed questionnaire to the conference and leave it with the secretary at the registration table before the end of the conference. All your responses will be kept confidential.

Yours sincerely,

Nwike B. Saale
Ph.D. Candidate
North Texas State University
Dear Engineer,

Registered engineers perform managerial roles in their organizations. The literature and authorities on the development of professional engineers have indicated that a human resource development need of engineers is their professional development in areas related to management.

As part of the requirement for the Ph.D. degree at North Texas State University, I am studying the participation of Nigerian registered engineers in professional development activities related to management. I will appreciate your help in completing the questionnaire designed for the study.

The questionnaire seeks some demographic information, asks you to report the number of hours you spent studying management during the past 12 months, and to evaluate the management programs you attended. Please leave the completed questionnaire at the registration table before the end of the conference. All your responses will be kept confidential.

Yours sincerely,

Nwike B. Saale
Ph.D. Candidate
North Texas State University
APPENDIX D

LETTER FROM THE SECRETARY-GENERAL

OF THE SOCIETY OF ENGINEERS
Mr. Nwike Saale
Box 10111, NT Station
Denton, TX 76203
USA.

Dear Mr. Saale,

RE: YOUR QUESTION ON PARTICIPATION OF NIGERIAN PROFESSIONAL ENGINEERS IN PROFESSIONAL DEVELOPMENT ACTIVITIES RELATED TO MANAGEMENT

Further to our discussions during the Annual General Conference of the Nigerian Society of Engineers in Kano, I wish to state that the Nigerian Society of Engineers is the Society that promotes the development of Engineering in all its ramifications in Nigeria.

COREN is a statutory body that regulates the practice of Engineering in the country. I also certify that the data for your studies was collected during the 1981 Annual General Conference in Kano.

The questionnaire was clear in what it looked out for.

I wish you success in your studies.

Yours sincerely,

[Signature]

ENGR. (PROF.) R. I. SALAWU
Secretary - General.
APPENDIX E

GUIDE TO MEMBERSHIP OF THE NIGERIAN SOCIETY OF ENGINEERS
1. The following are guidelines for people who are aspiring to become members of the Nigerian Society of Engineers. There are six grades of membership namely:—Fellow, Honorary Fellow, Corporate Member, Graduate Member, Associate and Student Member. The education and training required for each grade of membership are listed hereunder.

2. STUDENT MEMBER
A Student Member shall be a person who is undertaking an approved engineering course of training leading to a degree or diploma in an institution recognised by the Council of the Society for the purpose of training professional engineers.

3. GRADUATE MEMBER
A person seeking admission to Graduate Membership shall possess an academic qualification acceptable to the Council of the Society and registrable by the Council of Registered Engineers of Nigeria under the provisions of the Engineers Registration Decree (No. 55) of 1970 or such amendments thereof. Post-qualification practical experience shall not be a requirement for entry into this class.

4. CORPORATE MEMBER
A person seeking transfer or direct election to Corporate Membership of the Society shall:

   (i) possess the academic qualification required for Graduate Membership as defined in paragraph 3 above.

   (ii) have undergone post graduate practical training in a field relevant to his qualification and acquired varied engineering experience for at least two years.

   (iii) be engaged in the practice of engineering in a field relevant to his education and training.

   (iv) Pass a Professional Interview of the Society.

5. ASSOCIATE
A person seeking election as an Associate of the Society shall possess an academic qualification at the level of a university degree in the sciences allied to engineering science, or other qualifications approved by the Council of the Society. In addition, he shall have been engaged on work related to the practice of engineering for a minimum period of five years.
6. **FELLOW**

There are two ways of becoming a Fellow of the Society—either by the invitation of the Executive Council of the Society or by direct application by a member.

(a) A person to be invited to become a Fellow of the Society shall have been a Corporate Member of the Society, have had not less than fifteen years experience in the practice of engineering science, meet one or both of the following conditions:

(i) have rendered valuable and selfless service to the Society over a period of time.

(ii) be outstanding in his field of engineering.

(b) A person applying for election to Fellow of the Society shall:

have been a Corporate Member of the Society,

have had not less than ten years experience in the practice of engineering science,

shall meet one or all of the following conditions:

(i) submit a dissertation containing valuable statistics on engineering practice in Nigeria.

(ii) submit a dissertation or thesis on an original solution to a particular engineering problem in Nigeria.

(iii) submit a dissertation adjudged by Council to be a worthwhile contribution to engineering knowledge in the country.

7. **HONORARY FELLOW**

The Council of the Society may at its discretion elect distinguished persons to Honorary Fellowship. Such persons, through not necessarily engineers, would normally have used their positions to render notable assistance to the practice of engineering science.

8. Only Corporate Members and Fellows are entitled to vote and be voted for at properly constituted meetings of the Society.

9. A person seeking to join the Nigerian Society of Engineers shall fill the application form obtainable from either the Society headquarters (360 Herbert Macaulay Street, Yaba, Lagos State) or from any of the branches. An application must normally be sponsored by two financial members who must be Corporate Members or Fellows.
LIST OF PROVIDERS REPORTED BY THE SUBJECTS

Administrative Staff College of Nigeria (ASCON)
Ahmadu Bello University
    Institute of Continuing Education
Ajoukuta Steel Authority
Alexander Hamilton Institute, 1509 Broadway, New York
Bokaro Steel Plant, India
Brisdale Company, England
British Council
C.C. Patton and Associates of Oklahoma City, U.S.A.
Delta Steel
Federal Department of Water Resources
Federal Polytechnic, Bida
German Metallurgical Society
Institute of Management Technology, Enugu
Institute of Polytechnics Bucharest, Rumania
International Loss Control Institute, Atlanta, Georgia
Interlog Systems
IRI, Rome
Lagos State Government
Madec Management Education Center
Mobil Producing Nigeria (MPN)
Nigerian Electrical Power Authority (NEPA)
Nigerian Institute of Management (NIM)
Nigerian Institute of Social and Economic Research (NISER)
LIST OF PROVIDERS--Continued

Nigerian Metallurgical Society

Nigerian National Petroleum Corporation (NNPC)

Nigerian Petroleum Refinery Corporation (NPRC)
    Staff Development Authority

Nigerian Ports Authority (NPA)

Nigerian Society of Engineers (NSE)

Nigerian Soil and Road Research Council

Petroleum Training Institute (PTI)

PRASKILLS Consultancy

Shell Hagues

Shell Petroleum Development Company, Nigeria

Shell U.K.

Society of Petroleum Engineers (SPE)

Staff College, Bristol England

Steel Development Authority

University of Manchester, U.K.

University of Lagos
    Continuing Education Center

University of Nigeria, Nsukka

University of Port Harcourt

University of Texas at Austin

University of Science and Technology, Port Harcourt

University of Wisconsin
APPENDIX G

REGISTERED ENGINEER MANAGEMENT

DEVELOPMENT QUESTIONNAIRE
Instruction for Completing the Questionnaire:

1. This questionnaire has been designed to measure the licensed engineer's participation in professional development activities related to management.

2. Please use check (✓) marks and fill in the information requested wherever necessary.

3. Do not write your name on the questionnaire.

4. Please respond to each of the 17 items. Refer to the definitions below when necessary.

Definitions:

Engineer Manager—An engineer whose education and training were in engineering but who presently functions as a leader of a team, concentrating efforts on getting things done through others.

Participation—Participation in learning is taking course(s) for credit or non-credit, or taking part in a seminar/workshop or engaging in self-directed learning.
REGISTERED ENGINEER MANAGEMENT DEVELOPMENT
QUESTIONNAIRE

PART ONE -- GENERAL INFORMATION

1. Nationality (citizenship):
   1. Citizen of Nigeria ______
   2. Citizen of another country ______

2. Sex:
   1. Male ______
   2. Female ______

3. Age:
   1. Under 25 ______
   2. 25-45 ______
   3. 45-55 ______
   4. Over 55 ______

4. Job Title __________________________

5. Type of Industry in Which Employed:
   1. Education ______
   2. Manufacturing ______
   3. Government ______
   4. Chemical Processing ______
   5. Petroleum/ Mining ______
   6. Agriculture ______
   7. Construction ______
   8. Electrical ______
   9. Other (specify):

(a) is this ____ private sector or ____ public sector?

6. Years of Experience in Administrative/Managerial Role:
   1. Less than 3 years ______
   2. 4-10 years ______
   3. Over 10 years ______

7. Level in Management/Administration:
   1. Supervisory (first-level) ______
   2. Middle (intermediate) ______
   3. Top (highest level) ______
   4. Not applicable ______
8. Highest Level of Academic Attainment:

1. Undergraduate degree BSC ___ HND ___
2. Graduate degree(s) MSC/M. Engr. ___; MBA ___
   Ph.D. ___
3. Other (specify) ______________

9. Academic Major(s) while in College/University (check and complete as many as apply to you):

<table>
<thead>
<tr>
<th>Major in Engineering</th>
<th>Undergraduate</th>
<th>Postgraduate</th>
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<tbody>
<tr>
<td>1. Chemical ___</td>
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<td>2. Civil ___</td>
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<td>7. Metallurgical ___</td>
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<td>10. Textile Technology</td>
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<td>11. Transport ___</td>
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<tr>
<td>12. Water Resources ___</td>
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</tbody>
</table>
| 13. Other (specify) ___ | ___ | ___          

10. Where engineering education obtained:

1. Nigeria only (list institution) _____________
2. Overseas only (specify country) _____________
3. Nigeria and overseas ______________
11. Which of the following classifications apply to you? Check only one:

1. Engineer manager  ____  3. Manager/Administrator  ____
2. Engineer  ____  4. Other (specify)  ____

PART TWO—JOB RESPONSIBILITY AND MANAGEMENT DEVELOPMENT PROGRAM PARTICIPATION

12. My primary job responsibility is in: (Check one)

1. Management/Administration  ____
2. Design  ____
3. Research and Development  ____
4. Teaching/training and Development  ____

13. In a typical 8-hour work day, I do

1. Managerial work ____% of the time
2. Engineering work ____% of the time
3. Other (specify) _______________ ____% of the time
   (e.g., education/training ____% of the time)

14. Following is a list of programs in which you may have participated during the past 12 months, or are currently involved in. Place a check (✓) beside the program(s) that apply to you and indicate the total amount of time you spent in the program(s). For each program checked, write N if the program was attended in Nigeria and O if attendance was overseas. In the space provided, write the name of the agency that offered the program and indicate if you attended the program voluntarily or attendance was required by your organization. Please use V for Voluntary and R for Required.
PART TWO -- MANAGEMENT DEVELOPMENT PROGRAM
PARTICIPATION

<table>
<thead>
<tr>
<th>PROGRAMS:</th>
<th>Check (✓)</th>
<th>Total duration in hrs.</th>
<th>Offered in Nigeria or overseas (N or O)</th>
<th>Voluntary or Required (V or R)</th>
<th>Agency who offered the program</th>
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</thead>
<tbody>
<tr>
<td>Development:</td>
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<tr>
<td>1. Workshops or seminars on managerial topics</td>
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<tr>
<td>2. Company inservice management training courses</td>
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<tr>
<td>3. Short refresher courses at colleges and universities</td>
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<td>4. Regional or national meetings of professional management societies</td>
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<tr>
<td>5. Management course(s) taken for self-development</td>
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<tr>
<td>6. Self-planned or self-directed learning on management topics</td>
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<tr>
<td>7. Correspondent, non-credit management course(s)</td>
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<tr>
<td>8. Managerial coaching and counseling program organized by superior/supervisor</td>
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<tr>
<td>PROGRAMS:</td>
<td>Check (✓)</td>
<td>Total duration in hrs.</td>
<td>Offered in Nigeria or overseas (N or O)</td>
<td>Voluntary or Required (Y or N)</td>
<td>Agency who offered the program</td>
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<tr>
<td>Academic Credit</td>
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<td>9. Management courses taken in engineering management degree program</td>
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<td>10. Undergraduate management courses in business administration</td>
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<td>11. Post-graduate management courses in business administration</td>
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<tr>
<td>12. Other business courses (e.g., accounting, finance, marketing, etc.)</td>
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<tr>
<td>13. Correspondent courses in management</td>
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</table>
### Part D: Evaluation of Development Programs

Please circle the number between the range of 5 to 1 which best describes your response to each of the evaluation questions, considering each program you checked (✓) in part 2. Also circle the number between the range of 5 to 1 which best describes your overall evaluation of development programs and academic credit programs.

<table>
<thead>
<tr>
<th>1. Workshops or seminars on managerial topics</th>
<th>2. Company inservice management training courses</th>
<th>3. Short refresher courses at colleges and universities</th>
<th>4. Regional or national meetings of professional management societies</th>
<th>5. Management courses taken for self development</th>
<th>6. Self-planned or self-directed learning on managerial topics</th>
<th>7. Correspondent, non-credit management course(s)</th>
<th>8. Managerial coaching and counseling program organized by superior/supervisor</th>
<th>Development</th>
<th>Academic Credit</th>
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<tr>
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</table>
16. Considering all the professional development activities (management and engineering) you were involved in within the past 12 months, what proportion of the activities is related to:

1. management _________ %
2. engineering _________ %
3. other (specify) _________ %

17. Pause and think for a moment. Considering the management programs you participated in within the past 12 months, circle the number between the range of 5 to 1 which best describes your overall evaluation of (1) development programs and (2) academic credit programs.

<table>
<thead>
<tr>
<th></th>
<th>Very pertinent</th>
<th>Not pertinent</th>
<th>Great benefit</th>
<th>No benefit</th>
<th>Very large extent</th>
<th>Very little</th>
<th>Excellent</th>
<th>Poor</th>
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