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Technical Competency Required by Graduates of Electrical Technology in Manufacturing Industries in Kano and Kaduna States

By

MOHAMMAD KABIR UMAR
*Department of Education (Technical),
Kaduna Polytechnic,
Kaduna.*

and

HABIBU ABDULKADIR SARA Ph.D
*Department of Education (Technical),
Kaduna Polytechnic,
Kaduna.*

Abstract

The purpose of the study was to determine the competency required by electrical technologists working in manufacturing industries in Kano and Kaduna states. Two research questions were formulated to guide the study. The study adopted a survey research design. A 22-item questionnaire were developed by the researchers to collect data from 76 electrical technologists and 28 supervisors working in industries in Kano and Kaduna states. The data generated were analyzed using mean and standard deviation. A null hypothesis was tested, using t-test at 0.05 level of significance. The study found out that electrical technologists required competency in hardware circuit troubleshooting and skills in interpreting maintenance flow charts. Based on the finding it was recommended that prospective employers should be consulted through industrial survey for expert advice concerning course development and training facilities.

The desire to achieve technological greatness and attendant industrial gains was one of the primary reasons for adopting the currently used National Policy on Education (Federal Republic of Nigeria (FRN) 1998). Technologists at various levels form the bulk of skilled personnel that will transform policy to reality. Therefore it is expected that each graduating technology students must be armed with appropriate

skills which they must acquire in the course of studies in polytechnics in any of the core-technical areas, one of which is electrical technology.

Polytechnics in Nigeria offer several courses in technical areas among which is electrical electronics technology programme which is designed to produce technicians at National Diploma (ND) and Electrical Technologists at Higher Diploma Level. Okorie (2000) discovered that the training of technologists in polytechnic has been very theoretical, consequently polytechnic graduates shy away from taking up employment where they might be called upon to demonstrate their skills and competencies.

Competency is sometimes used to specify standard. According to Edenborough (1997) competency is underlying characteristic casually related to effective or superior performance on the job why competency is of interest here is that it focuses on the end result. Succinctly competency refers to the proficiency of an individual as regards to knowledge, skills and behavioural disposition in discharging professional responsibilities.

Industries in Nigeria are fast developing and are looking out for technological advances that could increase their profit margin in less time with greater efficiency. This reveals the fact that the industries are changing their demand expectations and needs in relation to technological advances. Olaitan Nwachukwu, Igbo, Onyemachi and Ekong (1999) observed that technological need of the industries appears to grow faster than improvement in training programmes of institutions therefore technology institutions need to improve training programmes to meet the changing needs of industries.

Adequate attention need to be given to personal training especially electrical technology which is the pivot within which all industrial activities revolve.

In view of constantly emerging electrical and electronics technology and increased mismatch or gap between what the industries required and the competencies possessed by graduates of polytechnic, the problem of the study is what competencies do electrical technology graduates employed in manufacturing industries in Kano and Kaduna states need for enhanced productivity.

Purpose of the Study

The major purpose of the study was to ascertain the competency needs of electrical technologists employed in manufacturing industries in Kano and Kaduna states specifically, the study sought to determine:

1. The competencies required of Electrical technologists in fault diagnosis in Electrical/Electronics Installation and equipment.

2. The competencies required by electrical technologists in maintenance and repair of electrical power machines and control systems.

Research Questions

The following questions were formulated to guide the study.

1. What are the competencies required by electrical technologists in fault diagnosis in electrical/electronics installations and equipment?
2. What are the competencies required by electrical technologists in maintenance and repair of electrical power machines and control systems?

Hypothesis

The following null hypothesis was tested at 0.05 level of significance:

There is no significant difference between the mean responses of Electrical industrial supervisors and Electrical Technologists in maintenance and repair of electrical power machines and control systems.

Method

The study adopted a survey research design which is suitable for eliciting pertinent information regarding competency needs required by electrical technologists to perform effectively in manufacturing industries. The study was carried out in 10 industries in Kano State and 8 industries in Kaduna state. The choice of the area of the study was informed by the fact that these two states have the highest concentration of industries in the entire Northern Nigeria. The population of the study was 104 respondents comprising 76 Electrical technologists working in industries and 28 supervisors or senior technical personnel whom electrical technologists are working under their supervision in the industries. The instrument was validated by four experts one each from Education Technical Department and Electrical Engineering Department, Kaduna Polytechnic, two supervisors from industries. The experts made constructive criticisms and their suggestions were used to modify the items before the final draft was produced and administered to the respondents. Out of 76 questionnaires to electrical technologists 72 were returned and out of 28 administered to supervisors 26 were returned representing 94.76 and 92.8% return rate respectively.

The responses were analyzed using means statistic; a five point Likert Scale was used. Any item with a score of 3.50 and above is considered needed whereas any item with a mean score of 3.49 and below is regarded as not needed. A null hypothesis was tested using t-test at 0.05 level of significance. The hypothesis was accepted for all items whose value of calculated "t" were less than table t. For those items whose value of calculated 't' were higher than critical t the hypothesis was rejected.

Research Question 1

What are the competencies required by electrical technologists in fault diagnosis in Electrical/Electronics Installation and Equipment.

Table 1: Mean Rating of Respondents on Fault Diagnosis in Electrical/Electronics Installation and Equipment.

S/No	Items	X	SD	Remarks
1	Determination of malfunction of sub-circuit within a system	*3.46	1.29	Not needed
2	Skills in replacement of circuit components	3.81	1.27	Needed
3	Principle and operation of analytical instrument	3.55	1.55	Needed
4	Use of oscilloscope to monitor signal have form	3.98	1.12	Needed
5	Knowledge and purpose of short circuit test	*3.02	1.23	Not needed
6	Skills and purpose of open circuit test	*3.24	1.33	Not needed
7	Skills and purpose of continuity test	*2.91	1.39	Not needed
8	Knowledge of types of cables for particular jobs	3.74	1.32	Needed
9	Knowledge of the parameter that affect the selection of cables	3.50	1.24	Needed
10	Principle of load estimation of electrical selection of cables	3.85		Needed
11	Skills in hardwire circuit troubleshooting	3.91	1.03	Needed

Data in table 1 indicates that respondents required competencies in items 21, 22, 23, 27, 28, 29, 30 which have mean and standard deviation ranging from 3.50 while items 20, 24, 25 and 26 were not required by the technologists because all have a mean of less than 3.50.

Research Questions 2

What are the competencies required by electrical technologists in maintenance and repair of electrical power machines and control system.

Table 2: Mean Ratings of Respondents on Maintenance and Repair of Electrical Power Machine and Control System

S/No	Items	X	SD	Remarks
12	Proficiency in selection of generators and switch gear for a machine	3.47	1.21	Not needed
13	Skills in selection/replacement of component unit of machine	3.14	1.26	Not Needed
14	Skills in identifying the problems associated with control system e.g. process log transmission lag	3.73	1.31	Needed
15	Knowledge and operation of relays	3.38	1.41	Not Needed
16	Knowledge of electric motor operated activators	3.56	1.38	Needed
17	Skills in the use of control values position	3.38	1.26	Not needed
18	Skills in power factor improvement methods	3.63	1.21	Needed
19	Skills in interpreting maintenance flow chart	4.00	1.17	Needed
20	Skills in selecting right tools and equipment for the right job	4.12	0.97	Needed
21	Skills in troubleshooting control system	3.51	1.25	Needed
22	Skills in troubleshooting protecting system	3.95	1.18	Needed

The result of data analyzed in table 7 show that the electrical technologist and electrical supervisor in industries agreed with items 33, 35, 37, 38, 39, 40, and 41 that there is need for those competencies because those items have the mean of 3.50 and those standard deviation of 0.97 to 1.25. They show less emphasis on items 31, 32, 34, 36 which had a mean of less than 3.50.

Hypothesis

There is no significant difference between the mean response of electrical industrial supervisors and electrical technologists on maintenance and repair of electrical power machine and control.

Table 3: The t-Test Analysis of the Mean Responses of Industrial Supervisors and Electrical Technologists in Maintenance and Repair of Electrical Power Machines and Control Systems.

Item No	Supervisor/Senior Technical Officer In Industry	Electrical Technologist In Industries	T-Calculated		
S/No	X ₁	SD ₁	X ₂	SD ₂	
12	3.24	1.28	3.23	1.15	-0.73
13	2.74	1.37	2.60	1.43	1.50
14	3.68	1.42	3.80	1.09	0.48
15	3.51	1.26	3.55	1.28	1.62
16	3.50	1.24	3.66	1.03	0.71
17	4.05	0.98	3.02	1.33	-1.48
18	3.51	1.25	3.74	1.22	0.30
19	4.08	1.17	3.93	1.09	1.43
20	4.12	0.97	3.98	1.51	0.31
21	3.52	0.98	3.74	1.21	-1.48
22	3.88	1.12	3.83	1.18	0.55

Df = 98; Table 't' = # 1.96; *significant t=critical = 1.96
Significant at point = 0.05; level of significance

The 't' critical at 98 degrees of freedom at 0.05 level of significance has the value of 1.96 which is constant to all the items. Therefore, the calculated 't' compared with the table 't' per item revealed that all the items on table 3 have the calculated 't' less than the critical or table 't' (1.96). Therefore, it can be concluded that there is no significant different between the main response of all items regarding maintenance and repair of electrical power machines and control systems.

Finding of the Study

Based on the data collected and analyzed. The following findings were made:

1. Fault diagnosis techniques in electrical/electronic installation and equipment required by electrical technologists in industries include:
 - a. Knowledge of the parameters that affect selection of cables
 - b. Principles of load estimation on electrical installation
 - c. Skills in hardware circuit troubleshooting
 - d. Use of oscilloscope to monitor signal wave farm

2. Maintenance and repair of electrical power machines and control systems. Techniques that are perceived not needed by electrical technologists in industries are:
 - a. Proficiency in selection of generators and switch gear for a machine.
 - b. Skill in selection/replacement of component unit of machine
 - c. Knowledge of operation of relays
 - d. Skills in the use of control valves position

Discussion of Finding

The study was designed to ascertain the competencies of electrical technologists working in manufacturing industries in Kano and Kaduna states. This led to the formulation of two research questions which the study is seeking to find answers to:

The finding of the study revealed that there are much more competencies required by the manufacturing industries which electrical technologists do not possess due to modernization and digitalization of most of the industrial facilities. The findings of the study are in line with Dikko (1999) that Electrical technologists in manufacturing and service industries used these competencies to be able to perform effectively. The result of data gathered in this part of the study will provide vital information to industries and education policy makers to be aware of competencies that are needed by electrical technologists in the industries.

Research question 1, on fault diagnosis in electrical/electronic installation and equipment tabulated in table 1 reveals that items 1, 5, 6, and 7 with a mean below 3.49 which indicates that the respondents do not need those competencies. This may not be connected with their level of attainment in the polytechnic. It is suggested that the polytechnic curriculum have covered these areas. But items 2,3, 4, 8, 9 10 and 11 all have a mean of over 3.50 which indicated that these competencies contained in these items are needed by Electrical technologists working in industries.

According to Okonkwo (1997), fault diagnosis electrical/electronics equipment is aimed at ensuring smooth operation of the machine, and the enormous capital involved in procuring these equipment makes it imperative that technologists need competencies in fault diagnosis.

An examination of the result in table 2 competencies in maintenance and repair of electrical power machines and control systems revealed that respondents required skills in item 14, 16, 18, 19, 20, 21 and 22 respectively. While, a low mean value was obtained for items 12, 13, 15, 17. This may be due to the fact that the technologists

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having been in the industries for sometimes had already acquired those skills. The finding of the study have stemmed from the current emphasis placed on modern technological equipment. Zargari (1997) had also asserted that in today's changing workplace one of the most valuable lesson an employee can learn is the importance of continuous developing of skills beyond those required for the performance of the specific job role. In addition to development of technical competencies in maintenance repair and control systems, Electrical technologists were aimed to reinforce the basic academic skills that would enable them succeed in their chosen occupation and prepare as well for advanced studies (FGN, 1998).

The relationship between the rating of Supervisors and Electrical technologists on maintenance repair and control system (table 3) indicated that there is no significant difference in their rating on the items because, table "t" was greater than calculated, "t" in those items this implies that the opinion of both Electrical technologists and their supervisors on maintenance repair and control systems have no significant difference.

Conclusion

The study has far reaching implication for polytechnic education in general. The National Board for Technical Education (NBTE) could use the result of this study to establish a degree of appropriate of existing practices in industries as regained to acquisition of relevant technical skills that could assist technical educators to better plan and improve the curriculum so that graduates will be equipped with necessary employability skills in their occupations.

Recommendation

Based on the findings of the study, the following recommendations were made:

- (1) Prospective employers should be consulted through industrial survey for expert advice concerning polytechnic programmes, course development, training facilities and other academic matters to ensure that students are adequately prepared for the type of jobs they will eventually meet on graduation.
- (2) Polytechnic and other technical institutions should review the evaluation procedures with emphasis on competency based approach: where students have to attain a small number of specific and job related competencies. This will ensure that the graduate built confidence as they succeed in mastering specific competencies.

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