ASSESSMENT OF STUDENT'S PERFORMANCE IN TERTIARY EDUCATION IN NIGERIA USING STATISTICAL QUALITY CONTROL

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ABSTRACT: This paper focuses on monitoring the performance process in tertiary education in Nigeria using The Polytechnic, Ibadan as a case study to examine if the institution, students and lecturers meet set academic standard or not. The number of students taken each of the eighteen 100 level courses with their corresponding number of failure were extracted from the concerned department and the proportions of defectives (failures) were obtained. P-chart is used to monitor the failure rate using excel. The analysis was carried out using SPSS software with Control Limit (CL), Upper Control Limit (UCL) and Lower Control Limit (LCL) of 0.0802, 0.1562 and 0.0042, respectively. The chart revealed that the failure rate is out of statistical control. Based on these findings, it was noticed that the contents of some of these courses are School certificate syllabus which students must have done in secondary school but despite this; the failure rate in some courses are high. This indicates that the performances of student are not encouraging in some of the courses offered which might be caused by series of reasons.

KEYWORDS: Control limit, failure rate, non-conformable, proportion, quality control.

1. INTRODUCTION

Statistical quality control came into limelight since manufacturing of product began and competition set in. It is experienced by all at one time or the other that we purchase a product only to discover that it is defective in some ways or does not function the way it was designed to; drinks in bottles or cans not properly filled up as specified. As customers, one expects the products purchased to satisfy consumers needs. However, manufacturers of products know that it is not always possible to inspect every product and every aspect of the production process at all times. The challenge is to design ways to maximize the ability to monitor the quality of the products being produced and eliminate defects, one way to ensure a quality product is built-in quality into the production process ([Aki09]).

Montgomery ([Mon09]) says, quality is not just of concern in manufactured products, it is important in banking, hospital care, education, aviation, food industries, auto repairs, postal delivery service and a host of other firms in the service industry. Quality Management (QM) is commonly used term for stressing quality within an organization, quality management uses a system perspective because, it is not a program for one department, but a responsibility of everyone in the organization. To keep quality at desirable levels, all firms employ the concept of quality control. Quality control is important not just in the production or transformation process, but earlier at the design stage and later at the service stage as well. One of the major roles of the Operations manager is to make sure his or her firm can deliver a quality product to the right place at the right time and with a reasonable price ([Mon09]).

Controlling and improving quality has become an important business strategy for many organization, manufacturers, distributors, transportation, companies, financial services organization, health care providers, and government agencies. Quality is a competitive advantage. A business that can delight customers by improving and controlling quality can dominate its competitors.

Education system has always had some kinds of checks and balances. These are put in place to maintain quality of standards in education institutions and systems, and try to improve them only recently. However, these have been referred to as quality assurance. In some ways, quality assurance in education can be seen as building on the traditional checks and balances in the systems. In other ways, quality assurance in education is something rather different, and is new to education.

This study considers the teaching learning process of ND1 Statistics student of The Polytechnic, Ibadan in 2015/2016 academic year by looking into failure rate to see if there is shift in the process means.

A lot of scholars have written different papers on statistical quality control of which some are as briefly discussed as follows.

Walter A. Shewart of Bell telephone industries in 1920s developed the statistical control chart concept. This is considered as the beginning of the statistical quality control (SQC). In 1924 he proposed the concept of charts ([Mon09]). Shewart ([She31]) published "Economic Control Quality of

Manufactured Product", a book that outlines statistical methods for use in production and control statistical method. A summary of the historical backward of statistical quality control is found in "Quality control and industrial statistics" ([Dun74]).
Deming ([Dem86]) built upon Shewart's work and took the concept to the following World War II (WWII). There, Japanese industry adopted the concept wholeheartedly, and the resulting high quality of Japanese product is rewarded. Deming is famous throughout Japan as a "god of quality", today statistical quality control issued in manufacturing or production facility around the world in other to improve the quality service delivery to the consumers ([Mon09]).
Akinola ([Aki09]) studied the characteristics of good quality service and method used in controlling quality of service in the Nigerian Banking industry using the technique of quality control. She found out that most banks do not use the quality control technique to improve their service to the populace. Based on her finding, she recommended that banks should improve their service delivery system using statistical quality process control mechanism.
Obadare and Alaka ([OA13]) investigated the impact of accreditation on quality assurance in Nigerian universities using Statistical Quality Assurance (SQA) technique of quality control. The study revealed that there is significant relationship between accreditation and resource input in Nigeria universities, quality of output, quality of process and no significant relationship between accreditation and quality academic content. Furthermore, they noted that quality of education could be measured in terms of quality of input, quality of output quality of content and quality of process. Therefore these parameters were used by the study to assess quality control assurance.
Reza and Payam ([RP09]) employed the application of Statistical Process Control techniques to examine the Quality Control (QC) in cable industry, a case study of copper consumption reduction in Nexans IKOSweden. The study found out that the quality cable product being produced can still be better enhanced. Furthermore, the study recommended that management must make a commitment to understand and reduce all process variation as much as possible in order to improve the quality of the product hence, management must allow the local work force the time to understand process variation and make correction when necessary in order to restore stability not to just make adjustment to compensate for the lack of stability. These review indicated that quality is a concern to everyone, be it an organization (private or public) individual, corporate body, Hence, it is worth to look upon quality in order to remain in a competitive market.
Kis ([Kis05]) points out that the key indicator of quality higher education is the success of graduates in joining the labour market. However, the quality of tertiary education in Nigeria seems to continue to deteriorate as years passed by despite the intervention of major stake holders. Tunde and Issa ([TI13]) attributed this to poor funding of education in Nigeria which makes university administrators unable to provide adequate and quality infrastructural facilities and equipment for effective teaching and learning. Akomolafe and Ibijola ([AI14]) in their study reported low status of infrastructure in our institutions; they attributed this to funding challenges. The academic personnel used in some of our institutions also determine the performance of student. The instructional delivery effectiveness depends on the quality of the teachers, their qualifications, experiences, professional exposure and morale ([Akp11]).
The study intends to investigate the performance of students in Tertiary Educational system in Nigeria using quality control approach.

2. MATERIALS AND METHODS

When an inspected unit does not meet the desired criteria, it is said to be nonconforming (or defective). Conversely, when an inspected unit meets the desired criteria, it is said to be conforming. In the context of the grading process we will address conformance and nonconformance according to the failure rates was appropriate for this study considering the nature of the data is called a p-chart. To construct this chart, we observe subgroups of n units over time. We inspect (test) the n units in each subgroup and determine the number d of these units that are nonconforming. We then calculate for each subgroup $\boldsymbol{P_i = \frac{d_i}{n_i}}$, the fraction of nonconforming units in the subgroup

P – CHART

Procedure for P - Chart
Suppose m samples are given, each of size n.

(i) Compute the proportion of defectives $P_1, P_2, \cdots, P_k$.

(ii) Compute

$$\bar{P} = \frac{1}{k}\sum_{i=1}^{k} P_i$$

(iii) Determine the control limits values which are:
For equal sample size,

$$\text{UCL} = \bar{P} + 3\sqrt{\frac{\bar{P}(1-P)}{n}}$$

$$LCL = \bar{P} - 3\sqrt{\frac{\bar{P}(1-P)}{n}}$$

For unequal sample size,

$$UCL = \bar{P} + 3\sqrt{\frac{\bar{P}(1-P)}{\bar{n}}}$$

$$LCL = \bar{P} - 3\sqrt{\frac{\bar{P}(1-P)}{\bar{n}}}$$

(iv) On the graph sheet, the sample numbers are to be plotted on the X – axis and the P_i's on the Y – axis

(v) The P – Chart is constructed by:
- (a) Drawing three lines - $\bar{P}$, UCL and LCL
- (b) Plot the points whose coordinates are $(1,P_1)$, $(2, P_2)$, …, (k, P_k)
- (c) Join the adjacent points by line segments

NP – CHART

Procedure for NP - Chart

Suppose m samples are given, each of size, n.

(i) Compute Pi's i = 1,2, …, k, where Pi is computed is the proportion of defective as in P – Chart

(ii) Compute

$$\bar{P} = \frac{1}{k}\sum_{i=1}^{k} P_i$$

(iii) Determine the control limits values which are:

$n\bar{P}$ = Central line

$$LCL = n\bar{P} - 3\sqrt{n\bar{P}(1-\bar{P})}$$

$$UCL = n\bar{P} + 3\sqrt{n\bar{P}(1-\bar{P})}$$

(iv) On the graph sheet, the sample number are on the X – axis and the number of defectives, d_1, d_2, …,d_k on the y – axis.

(v) The NP – Chart is drawn by:
- (a) Draw three lines – central line, UCL and LCL lines.
- (b) Plot the points whose coordinates are (1, d_1), (2, d_2), …, (k, d_k)
- (c) Join the adjacent points by line segments

3. DATA ANALYSIS

In this research, the proportion of non-conforming units is the proportion of failure who sat for that course. The data used in this research is an extract of the result of all students in a Department, The Polytechnic, Ibadan which comprises of eighteen (18) courses in 2015/2016 academic session.

The P-chart was constructed using statistical software (SPSS).

Table 1: Data on Performance of NDI Full-Time Student for First and Second Semester 2015/2016 Session

S/N	Code	Sample size	No failed
1	STA 111	123	19
2	STA 112	123	18
3	COM 111	123	4
4	MTH 112	123	8
5	GNS 101	123	3
6	GNS 111	123	9
7	LIB 111	123	3
8	GNS 112	123	6
9	MTH 111	123	8
10	COM 123	106	9
11	EED 126	106	7
12	GNS 102	106	14
13	GNS 121	106	2
14	MTH 121	106	7
15	MTH 122	106	11
16	STA 121	106	15
17	STA 122	106	9
18	STA 123	106	14

Table 2: Fractions of defective

S/N	Code	Sample size	No failed	Fraction of defective
1	STA 111	123	19	0.1545
2	STA 112	123	18	0.1463
3	COM 111	123	4	0.0325
4	MTH 112	123	8	0.065
5	GNS 101	123	3	0.0244
6	GNS 111	123	9	0.0732
7	LIB 111	123	3	0.0244
8	GNS 112	123	6	0.0488
9	MTH 111	123	8	0.065
10	COM 123	106	9	0.0849
11	EED 126	106	7	0.066
12	GNS 102	106	14	0.1321
13	GNS 121	106	2	0.0189
14	MTH 121	106	7	0.066
15	MTH 122	106	11	0.1038
16	STA 121	106	15	0.1415
17	STA 122	106	9	0.0849
18	STA 123	106	14	0.1321
TOTAL				1.4643

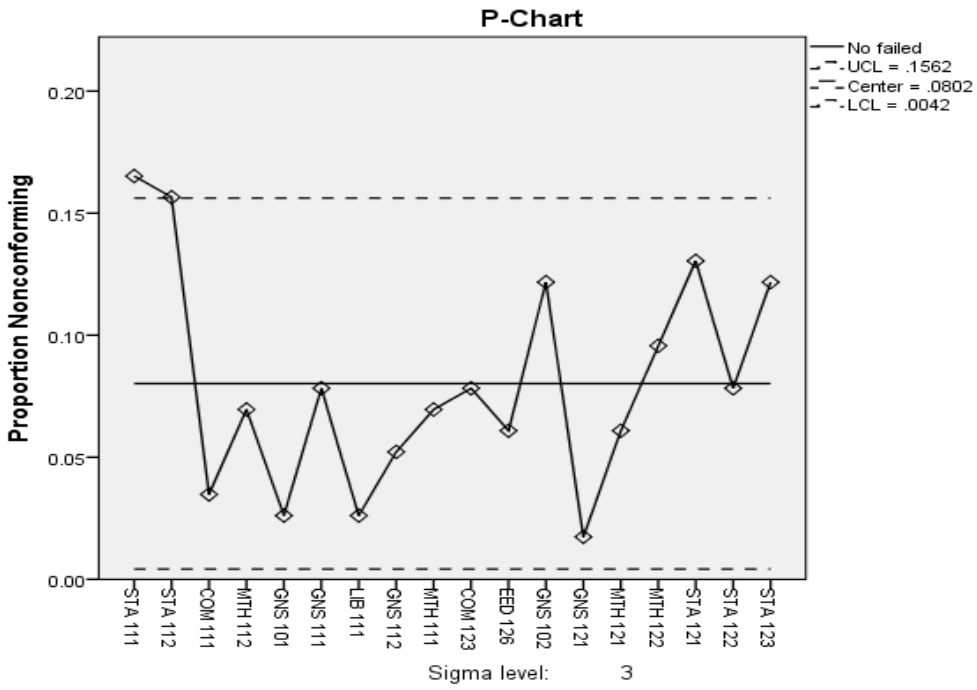

Figure 1: P-chart

4. DISCUSSION OF RESULT

The number of students who sat for in the first and second semester examination 2015/2016 session and those who failed these courses were displayed in Table 1 while Table 2 gives the summary of the proportion of defective (proportion of failure). The result of analysis indicates that the CL, UCL and LCL are 0.0802, 0.1562 and 0.0042, respectively. It was found out that a point lie above UCL, an indication that the failure rates is on the increase. This chart show that the teaching and learning environment process is out of control. The high failure rate could be traced to the class size, assessment and evaluation process and lack of seriousness on the part of the students resulted from misuse of telephone handsets and other vices (assignable variation).

5. CONCLUSION

Over the years; proportion of defective chart (P-Chart) has been found to detect shift in the process; hence its use in this paper to monitor failure rate in one of the Departments in The Polytechnic, Ibadan. Based on this fact finding; it is thereby suggested that all other tertiary institutions can imbibe it use.
As earlier stated in the discussion of results; that points lie outside the UCL, indicating that the teaching learning process is statistically out of control. The course(s) outside the UCL are not conforming to the failure level of conformance of the institution and should be adequately monitored. Also, proper orientation must be given to fresh student as soon as they resume for academic program.

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