

An Evaluation of the Relationship between Quality Control Techniques and Product Quality in Selected Manufacturing Firms in South East Nigeria

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Article History

Received: 02.07.2018

Accepted: 12.07.2018

Published: 30.07.2018

DOI:

10.36347/sjebm.2018.v05i07.009



Abstract: This study an evaluation of the relationship between quality control techniques and product quality in selected manufacturing firms in south east Nigeria. The study specifically aimed to assess the effect of follow-up technique on production control and ascertain relationship between quality control technique and process designing. The descriptive survey research design was used in this study. The total population used for this study is two hundred and eighty five (9,285) personnel, but utilized a total sample size of five hundred and sixty four (564) which constitute the actual number of staff that issued questionnaire. Data collected were presented in tables and the statistical tools used for data analysis is the pearson correlation, with the aid of statistical package for social sciences (SPSS). The result of the study revealed that follow-up techniques had a positive effect on production control and that quality control technique has a significant positive effect on process designing. The research recommended that follow-up technique has to be maintain to facilitate the utilization of best practices, and that total quality management (TQM) being the management focus on the knowing the needs and wants of customers and on being capable of fulfilling those needs and wants must be taken as responsibility of top executives in all aspect of the overall management function that determines and implements the quality policy.

Keywords: Quality Control, Techniques, Product Quality, Manufacturing Firms, South East Nigeria.

INTRODUCTION

Every business firm justifies its existence by producing something of value. This may be done by changing the form of things, as in the case of manufacturing. Matter is created by nature; man changes its form to make it more valuable. Another way of producing is by changing the location of things, such as business enterprises engaged in transportation. Value is created when the sugar and milk one needs are brought close to one's home where you can gain access to them. Production can be accomplished by providing goods and services at certain times and convenient amounts as in the wholesaling and retailing, or by delivery of goods to customer. In a similar manner, a service may be provided either by adding value to goods such as repairing a watch, or serving the convenience needs of customers and clients or by providing personal services of one type or another or at one time or another. For example, a bank produces financial services by accumulating or assembling savings and making them available to those who wish to borrow money.

Production and operations management goes well beyond manufacturing operations - involving the assembly of products, the operation of banks, transportation companies, hospitals and clinics, school systems, insurance companies, and high-level technology from any system that generates tangible products (for instance a ford automobile) or intangible services (for example a flight on Nigeria Airlines, advice on computer programming) part of the domain of production and operations management [1].

Production and operation management is a specific function that affects the behaviour and performance of other major functions like marketing and accounting. The interrelationships of these three main functions of any organization can be better understood by thinking of an organization as a system. The marketing subsystem deals primarily with the demand side of business, the accounting subsystem addresses the control side of business the production and operation management subsystem centers around converting inputs into outputs or the supply side of business. No matter how great the demand is for a product or service, there must be a supply available.

Producing enough goods and services to meet demand is the primary task of organizations, according to the production and operation management viewpoint.

Production management techniques are tools used in improving an organization's goods or services required by the customer. Production management techniques are the processes of determining what should be produced and how it should be realized. Appleby [2] notes that defects are too high and companies should put programmes in place that will move them continuously towards the goal of zero defects. Generally, the main idea behind effective quality is that poor quality is erroneous. The costs of poor quality should include all the costs of not doing the job right at the first time, scrap rework, loss of hours/labour, machine, sales, warranty and hidden customer ill will. Waller [33] strongly believes that, the cost of poor quality is to understand that unlimited amount can be profitably spent on improving quality.

Buffa [4] notes that the great monuments of the ancient world required both technical know-how and a managerial system that organized resources, made grand plans and executed those plans with excellent results. Examples are the Egyptian pyramids and sphinxes at Gizeh in about 2500 BC, the Greek Partenon in about 440 BC, the Great Wall of China in about 214 BC; others are the construction marvels of the Roman world-aqueducts public buildings, roads and temples-which span a periods including at least 400-100 BC and the Ibos who dragged huge logs from far distance to their public square for wooding gung (Ikoru). During and following the period of the building of the ancient monuments, a wide variety of products were produced through the handicraft system production and operations management began to develop with the industrial revolution, since it was during that period that the factory system evolved out of the handicraft system. A series of change in industrial technique, and in economic conditions, made possible the development of larger productive units.

Operations management will continue to progress based on contributions from several other disciplines. The analytical methodologies applied to total quality management (TQM) were initially established by Frederick Taylor to yield what he called scientific management. These have evolved into a field of industrial engineering and management science and these disciplines have contributed substantially to greater productivity. They bring together diverse disciplines such as mathematics, statistics, management and economics to make possible systematic analysis and improvement of operating systems as well as such tools as linear programming, queuing theory simulation, and statistical analysis.

Applications from the biological and physical sciences also have contributed to quality control in a variety of ways. Innovation from biology, anatomy, chemistry, physics and the engineering sciences have brought about a variety of new developments. These include new adhesives, chemical processes for printed circuit boards and gamma rays to sanitize food products. An important contribution to quality control has come from the information sciences which we define as the systematic processing of data to yield information. In a modern business organization, information management implies the use of computers.

Objectives

- To assess the effect of follow-up technique on production control.
- To ascertain relationship between quality control technique and process designing.

Research Questions

The stated objectives of the study give rise to a number of questions; the questions are as follows:

- Does the application of follow-up technique have effect on production control?
- What is the extent of the effect of quality control technique on process designing?

Research Hypotheses

- Follow-up technique has a significant positive effect on production control.
- There is a significant positive relationship between quality control technique and process designing.

CONCEPTUAL FRAMEWORK

Brech [5] defines production as an organized activity transforming raw materials. Raw materials may include anything from rough ore to an electric motor. However, the finished product of one industry may be the raw materials of another. Production therefore includes all manufacturing and extractive industries. The physical features of production vary from industry to industry and are usually specific to each one, or even to particular companies. Production management then becomes the process of effectively planning and supervisory roles responsible for the actual transformation of materials into finished products. Continuous cost reduction, high productivity and product quality have proved essential for all organizations to stay in operation [6]. That is what production management is all about. Crosby [7] notes that production management is far wider in its application than assuring product or service quality. It is a way of managing business processes to ensure complete customers satisfaction at every stage, internally and externally.

Imaga [8] holds the view that production management provides direction, reduces the overall impact of change, increases productivity and allows

managers to organize, lead, control, and direct the activities necessary to accomplish organizational objectives. By implication, production management is what to manage, where to manage, when to manage, and how productive system and operations are carried out. The terms manufacturing management, production management and operations management are sometimes used interchangeably to refer to the functional field of production and operations management [9].

Production Planning and Control

Cole and Kelly [10] noted that planning and control is about matching customer demand to the operations capacity. As we know, demand is not always easily predicted however. There are a number of ways of dealing with unstable demand. One way is to produce the product or service in advance (see make-to-stock, a push strategy). A different way is referred to as make-to-order (a pull strategy). Make-to-stock (MTS) products require no customization. They are typically generic products and are produced in large enough volumes to justify keeping a finished goods inventory. Products customized only at the very end of the manufacturing process are termed assemble- or finish-to-order (ATO) products. Make-to-order (MTO) products are products that use standard components, but the final configuration of those components is customer-specific example, a Dell computer. Finally, products that are designed and produced from the start to meet unusual customer needs or requirements are called engineer-to-order (ETO) products. They represented the highest level of customization. When customization occurs early in the supply chain, flexibility to respond to customer needs but costs increase and lead times lengthen. When customization occurs late in the supply chain, flexibility is limited but lead times and cost may be less

Importance Production Planning and Control System

- The Plans referred to are short-term plans for periods of from one week to one month. At the start of a new production process, these plans may be altered at frequent intervals.
- Production schedules are basically timetables, usually of a detailed nature. They specify the timetabled requirements for precise operations and jobs, and set out the sequence of priorities, including the setting up of appropriate software programs. The major aims of scheduling are to ensure, so far as possible, that the work is completed on time and within budgeted costs. Wide use is made of Gantt chart in production scheduling. These are particularly useful for the scheduling of relatively straightforward, routine projects.
- Plans for machines include the availability, capacity and loading of machines.

- Labour requirements are a vital part of the production process or numbers and types of employees required, pay and incentives, training and safety.
- All plans should set targets and will take into account considerations such as planned maintenance, product quality control and machine breakdowns.
- The progressing of orders through the production process is essentially a monitoring and reporting task, which also involves some 'chasing-Lip' of progress in situations where orders have fallen behind schedule. The main role of a progress chaser is to identify and report any deviations from schedule, and provide help in sorting out delays in production.
- Liaison with the marketing department is important to ensure that the productive effort is meeting the customer's needs, or where there are difficulties in production, ensuring that the customer is informed and/or is prepared to accept a slightly different standard or quality of product, for example.
- Finally, the outputs of the production system need to be accounted for, invoiced and delivered, to the customer or into stock. Thus the final step is to ensure the appropriate information systems are updated.

The organization's Quality standard

To turn out products which are satisfactory to the customer (quality, reliability, variety, etc.)

To turn out products in a safe and socially responsible manner and

To attain the above within agreed levels of inspection and quality control costs.

Greasley [11] noted that there are three main reasons for inspection.

- To accept or reject items
- To control the process of producing the items
- To improve the process itself, if necessary

There are two main methods of dealing with these issues, and these are Process Control and Acceptance Sampling, which are examples of what has been called 'Statistical Quality Control'; Process Control consists of checking items as they progress through the production process, comparing them with the relevant standards, and taking any immediate corrective action to prevent further faults. Process Control may be expedited by the use of control charts, which can show, in graph form, actual performance against standard performance, and the amount of any deviation. Another form of process control is automatic process control, where sensing and other measuring devices are built into the machine concerned - to provide immediate information and immediate corrective action. Automatic inspection of this kind is

more feasible than human inspection in cases where (a) accurate measurement is possible, (b) where continuous inspection is highly desirable and (c) where reliability of inspection is important. Objective measurement in inspection is called checking by variables, which contrasts with checking by attributes, which is a subjective method. Acceptance sampling consists of taking a random sample from a larger batch or lot of material to be inspected. The quality of the sample is assumed to reflect the overall quality of the lot [11].

Quality Control as a Production Management Technique in Manufacturing Organizations

Ricardo and Wade [12] argue that the role of quality control is primarily concerned with eliminating from production line those products that do not conform to specification and to inspect and test finished goods to get rid of defective ones. To achieve this, every phase of product lifecycle has to be thoroughly examined. They noted that product quality control could be improved by undertaking the following activities:

- Product planning
- Product designing
- Process designing
- Production and
- After sales services

Product planning entails deciding in advance organization's objectives regarding its product and what members ought to do to attain these objectives. Product design is a framework of the product in place.

Process design is spelling out the stages at which production would take place. During production, outputs are checked against standard to ensure conformity.

After product has been sold to vendors, firms in a bid to preserve the quality of such products also provide after sales services like delivery. These activities embrace all the technical and management aspects of product quality and safety during the specifications development/manufacturing and usage of the product [12].

Types of Quality Control

Ricardo and Wade opine that quality control could be carried out in process or on finished goods.

In-Process quality control

This control measure is undertaken while producing the product. It ensures timely identification of defective product and prevents further production of defectives.

Finished goods control

Here, quality check is performed after all operations have been performed. The aim is to prevent

defective products from getting to the users of such products.

However, Iyayi [13] argues that quality control is not without its problems. He stresses that the bad effects of quality control are:

- Encourages corrosion and thus loss of production equipment/facilities
- High cost of maintenance
- Potential health and environmental hazards through pollution
- Attract community problems (hostilities)
- Loss of international reputation
- Reduction of workforce by way of redundancy and consequent instantaneous increase in staff overhead cost etc.

On the other hand, Segev [14] disagrees. His work focused more on the benefits to be derived from sound quality control mechanisms. He outlined the following as gains resulting from embarking on quality control:

- Builds an information system for improving quality and reducing cost
- Increased production under the optimum conditions
- Quality consciousness and reduction on rejected product
- Reliability and increased confidence in the product. This in essence increases their trust on the firms offering
- Reduction on waste/scrap
- Increase in production volume
- Fewer customer complaint

Empirical studies show that superior business results are usually associated with sound production management techniques as a business strategy to implement quality improvement.

Forbes [15] posits that over 22 companies won the Malcolm Baldrige National Quality Award in the United States. According to the report, a company that adopts quality management practices experiences an overall improvement in corporate performance. This is consistent with a work conducted earlier by Stahl [16]. His findings suggests that in nearly all cases, companies that employ quality management practices achieve better employee relations, higher productivity, greater customer satisfaction, increased market share and improved profitability [16]. Deming [17] pointed out that improved quality can reduce overall costs, dispelling the popular belief that high quality means higher total cost for the organization. He balances his view by stating that with fewer parts reworked, fewer materials will be wasted and leading to actual cost decline.

Waller [18] observes that a high proportion of quality problem in manufacturing organizations can be treated to poor management. He suggests that top management must be the imitator of TQM. It has to provide leadership direction, motivation and support. If assembly line workers are conscious of quality in their work they will soon lose enthusiasm if top management is not supportive. Managers who do not respect meeting schedules who are sloppy in organizations or who do not pay attention to detail will have difficulty in running a quality organization. Furthermore some managers that are afraid and anxious to defend their own position create a barrier to collaboration, communication, creativity and employee advancement. This demotivates employees and has a consequent adverse impact on quality. For TQM to function Top management as the leaders of the organization needs to provide an appropriate work environment for employees [7].

Nicholas [19], stated that TQM must start at the top and have organization management's full commitment and backing. It must be understood that quality is premonition on the organization's hierarchy of values. Quality must be part of the organization's vision and mission and quality initiatives must be included in its strategic plans. Also, TQM must originate and be spread from the top down and its actual implementation is best achieved at the local or departmental level by way of numerous small efforts undertaken by teams of managers and employees [20]. He equally suggests that the overall organizations wide effort should be coordinated by a steering committee comprising representatives from all functional areas and top management.

Employee Involvement

In general, involvement of line and shop floor workers is fundamental to TQM and quality at the source [21]. For this reason, companies should:

- Give ownership of quality to the workers, elicit and listen to workers' ideas about improvement and empower them to make more decision and perform tasks that are quality related.
- Organize workers for greater gross functionality and greater customer consciousness.
- Train and educate workers in quality related skills and about importance of TQM to company competitiveness to their own advancement prospects and to job security.

Employee ownership of Quality

Quality is not something that management can mandate or dictate [22]. To gain employee commitment to the quality process, companies must modify their systems of management control and rewards to give employees greater responsibility and opportunity to become customer and quality oriented and motivate them to strive for continuous improvement. Many

companies tell employees that quality comes first then send a mixed message by paying them on a quota basis and pressing them to get the product out the door.

Furthermore, adversarial relationship between management and labour will present workers from taking a quality oriented program seriously and will eventually kill the program [6]. In many cases managers' attitudes about labour and about the way they supervise workers will have to change, too. Specifically, middle and low level managers and supervisors must relinquish control, give workers more responsibility for running their own jobs and provide them with opportunity to use their own judgment to solve problems. One sure sign that workers on the shop floor are being afforded greater ownership of quality initiatives is an abundance of charts on the shop floor created and updated by workers to reflect their own plans organization and control activities.

Organization for Quality

Workers in TQM organizations must be process oriented and customer conscious [9]. To that end companies restructure jobs to put workers in contact with whoever their customers and suppliers are, whether internal or external to the company. As a result probably the most pervasive organizational feature about TQM organization is the prevalence of teams [19].

Factors that Affect Quality

According to Juran [23], quality depends on a number of factors and an integrate quality control system must focus on these factors. The factors outlined are:

Policy

Management establishes concerning product quality. These policies specify the standards or levels of quality to be achieved in a product or services they can be an important precontrol and concurrent control means for ensuring quality.

Dubiety *et al.* [23] note that management considers three factors in determining its policy for quality the product or service's market, its competition and image. An evaluation of the market provides an indication of customers is willing to pay for the product or services. Quality expatiations and prince for example widely differ in the luxury car (Mercedes) and economy car (Golf) markets within the auto industry. Quality levels provided by the competitive also affect policy because the competitive company's product or service must be competitive to succeed in the market place besides considering the market and competitive management must also consider the organization image. Long term interest may be damaged by making a product of quality inconsistent with the firm's image.

Information

Information plays a vital role in setting policy and ensuring that quality standards are achieved. Concerning policy accurate information must be obtained about customer preference and expectations and about competitor quality standard and costs. Competitive beheading is one effective approach to obtaining valuable information about a competitor's quality standard and costs about competitor's quality standards and costs. Also new computer technology is enabling organization to quickly obtain and evaluate information about the quality of products while they are being produced.

Engineering and design

Once management has formulated a policy concerning quality it is taken to designer who must translate the policy into the organization or designer must create a product that will appeal to customers and that can be produced at a reasonable cost and provide competitive quality.

Materials

A growing number of organizations are realized that a finished product is only as good as the materials used to produce it. In this regard many manufacturing companies are implementing a new pre-control strategy with material suppliers. They are reducing their number of suppliers, weeding out the lower-quality vendors and focusing on developing effective long term relationships with the better ones. Ford General Motors and Chrysler use this approach.

Equipment

The ability of equipment tools and machinery to accurately and reliably produce desired outputs is important especially in manufacturing industries. If the equipment can meet acceptable tolerances at competitive costs and quality an organization will have the opportunity to competitive in the marketplace.

People

Materials design and equipment are important ingredients in quality products but people are the vital contributors. Working individually or in teams, employees take the ingredients and process them into the final product or service. Managers must therefore not only provide the proper training to produce quality but also enable people to develop attitudes that value quality.

Field support

Often the field support provided by the supplier determines a products quality image (perceived quality). This is not to say that the products of these firms are necessarily the best in their industries, an excellent field support reputation, however, can have a positive impact on a product quality image.

Customer Focused Quality Management

Dean and Brown's [24] review of total quality management suggests that its key concept is customer focus. It is the customer who defines quality, and companies should get to know their customers so well that they can anticipate their future needs.

This involves collecting customer information and analyzing the process supported by the use of specific management techniques - such as continuous improvement, and teamwork. In the views of Strangard and Fitzgibon [25], effective quality management is a set of techniques and procedures used to reduce or eliminate variations from a production process, or service delivery systems in order to improve efficiency, reliability and quality. However, as Wilkinson [26] notes that far from being viewed as a difficulty for the coherence and credibility of total quality management, this is embraced by some as its principal virtue.

Riffio [7] adds that employee involvement and senior management commitment to these as the basic principle of TQM. Whilsthart and Brogan [7] view quality management destructive features as a strong and pervasive customer orientation and approach of managing quality for competitive advantage.

Quality Management Implementation Methodologies

Quality management implementation procedure is based upon the organization's development methodology [27]. This means that the process of introducing effective quality management is one that requires changing various elements of the existing culture in the organization. According to Gimenez [21], culture reflects the shared values, beliefs and attitudes towards work of the employees as a whole in a collective endeavour. Combination of attitudes, relationships, developed capabilities, habits and other behavioural patterns that characterize the dynamics of an organization. Resultant effect of information on organizational and organisms factors which are reflected in established roles, norms and values pertaining to work [28]. The process therefore must be planned and managed from the top using behavioral science techniques with the support of an outside consultant. The quality management methodologies include

The Planning Phase

During this phase, the decision to introduce total quality management is taken and TQM Planning, Implementing and Monitoring (PIM) structure is established. This structure consists of a detailed description of:

The procedure

The organizational structure to be used in implementing TQM

Organization Change Phase

In this phase, the organization revisits and reviews various processes, structures and beliefs system. On the basis of this review called organization diagnosis, develops and implements various action plans suggested by the diagnosis. Such action plan results in:

- The articulation and dissemination of a value system
- The clarification and popularization of the mission statement
- Attitude change through such techniques as confrontational meeting and educational courses.
- Improved collaboration and communication between family and inter-group teams through such techniques as team building, the organizational mirror, role negotiation, etc.
- Change in leadership and delegation styles and practices through such techniques as feedback, counseling and educational course.
- The introduction of recognition ceremonies, redesign of the reward and performance appraisal system etc.
- Changes in the time management practice of key managers and officers.

The Company-Wide Quality Management Education Phase

The company's employees are taught in this phase:

- Total quality
- Problem solving
- Report writing and Presentation
- Total customer service
- Statistical tools and techniques

All employees will become proficient in the practical application of the various concepts, tools and techniques are usually able to identify and work on projects aimed at reducing costs and improving the quality of activities, processes and results.

Quality Management Installation Phase

Following the company-wide quality management education, the various quality system, procedure, and techniques are introduced. The systems that are introduced usually depend upon the type of organization, nature of the quality problems confronting it and the expectations of management regarding priority areas for immediate effective quality management application. The organization usually is able to establish or use one or more of the following techniques and systems which include:

- Quality task forces
- Quality circles
- Quality improvement teams
- Total quality standard
- Total production maintenance
- Customer-supplier development programme

Quality Management Renewal Phase

Excellence through effective quality management is a never ending process. The renewal phase is designed to ensure that employee and management committee to the process is sustained on a continuing basis. Achieving these objectives means that the organization must continuously invest in renewal processes and activities which make excellence through effective quality management a fire that burns day and night in the imagination and lives of all employees.

Total Quality Management principles

While each TQM initiative is unique, there are some common features. TQM vides a direction and a framework for morality in business. It considers rewards the effort of those directly involved, both inside and outside organization. It is no coincidence that successful TQM models all tend body concepts of integrity, honesty, commitment, participation and internship. They value and respect the individual within the TQM organization. Indeed, the contribution from each individual is both the driving force and an additional resource to achieve change in the organisation. According to Choppins [29], the principles of TQM include:

Highest priority

Total quality must overtly be the highest priority of the organisation, company or individual.

Quality definition

Any definition of quality must include meeting, satisfying or conforming to agree or negotiated customer needs, requirements, wants and/or expectations.

Customer definition

The concept of customer' includes investors, employees, stakeholders, suppliers, the community and every interpersonal relationship.

Customer satisfaction

Long-term satisfaction of customers' needs will be an aim of any total quality organization.

Aim

A total quality organization will have a clearly stated, widely understood and generally accepted direction or aim.

Communication

A total quality organization will communicate openly and clearly its principles/beliefs/values/mission statement/policy for quality.

Ethos

Total quality management embodies the values and beliefs or ethos of the organization and thus total quality is intrinsic to every activity, decision and action.

Values

The highest levels of integrity, honesty, trust and openness are essential ingredients of total quality management.

Mutual respect and benefit

There is implicit mutual respect of all stakeholders involved with a total quality organization, which assumes that long-term business is intended to be mutually beneficial to all concerned.

Health and safety

Health, safety and environmental issues have a high priority within a total quality organization since the welfare of all investors, employees, suppliers and the community, as stakeholders in the enterprise, is intrinsic to the future well-being of the organization.

Commitment

Leadership of total quality management stems from the top of the organization and enlists individual and team commitment throughout.

Participation and ownership

Total quality offers each individual the opportunity to participate in, and to feel ownership of, his/her activities, and, jointly, to share a sense of ownership for the success of the entire company.

Continuous improvement

TQM involves continuous and measurable improvement at all levels of the organization, ranging from organizational performance to individual staff performance, such that continuous process improvement becomes a salient aspect of success.

Performance

TQM requires consistent, predictable, accurate and precise performance to high standards in all areas of the organisation. Therefore, measurement, assessment and auditing are common TQM activities.

Resources

One major aim of every total quality organisation is to use resources better, and to achieve greater success (financial or otherwise).

Investment

TQM will always require sufficient or appropriate investment to ensure that planned activities can occur.

Major objectives of Total Quality Management in the Nigeria Context

A brief look will be taken by the study on the works of Imaga [30] who notes that the major objectives of Total Quality Management in the Nigeria context are as follows:

- To encourage good products and service quality consistency in both production and service industries of the economy.
- To orientate employees attitude through total quality management training and on the job work study improvement in the areas of corporate management and corporate planning.
- To reduce drastically production material cost staff, time losses over lap of job description inefficient control and inefficient supervisory quality technique.

Joseph Juran's Theory

Joseph Juran is responsible for what has become known as the "Quality Trilogy." The quality trilogy is made up of quality planning, quality improvement, and quality control. If a quality improvement project is to be successful, then all quality improvement actions must be carefully planned out and controlled. Juran believed there were ten steps to quality improvement. These steps are: An awareness of the opportunities and needs for improvement must be created, Improvement goals must be determined, Organization is required for reaching the goals, Training needs to be provided, Initialize projects, Monitor progress, Recognize performance, Report on results, Track achievement of improvements and Repeat

METHODOLOGY

The method used in this study is the descriptive survey research design because used both quantitative and qualitative data at the same time, by merging the data and using the results to understand a research problem. The data for this study were obtained majorly from primary source of data and some relevant materials from secondary source. The primary data used for analysis in this study were collected through the use of structured questionnaire.

Population of the Study

The population targeted for this study comprised all registered manufacturing organizations in the south eastern Nigeria. Record from Gold Star Directories [31] for the major 5000 companies in Nigeria shows that manufacturing companies in south eastern Nigeria with complete data of employees, location, and year of incorporation are thirty nine (39) while their numerical strength is nine thousand, two hundred and eighty five (9,285) personnel. Table.1 is a distribution of these companies according to state, total manufacturing firms per state, and numerical staff strength per state respectively.

Sample Size Determination

The total firm’s population size of 39 is manageable hence; it becomes the firm’s sample size as well. However, the overall staff population of 9,285 employees is much and will be difficult to manage considering the fact that each of the employees must be accessed individually. Hence, a total sample size of five hundred and sixty four (564) staff determined using the Godden [32] formula which was deemed appropriate for the study. They constitute the actual number of staff that issued questionnaire.

Method of Data Analysis

Data collected were presented in tables and the statistical tools used for data analysis is the pearson correlation, with the aid of statistical package for social sciences (SPSS). The contingency analysis is the test of independence and the chi-square distribution was used.

The test of independence used to test the null hypothesis that there is no relationship between the attributes in the vertical and horizontal cross tabulation as against the alternative hypothesis that is otherwise at a select level of significance. A contingency table is constructed to enable the researcher carryout easy computation of the test data using the chi-square distribution test (χ^2)

DATA AND RESULT PRESENTATION

Hypothesis One

Ho: Follow-up technique does not have a significant positive effect on production control.

H_A: Follow-up technique has a significant positive effect on production control.

Table-1: Pearson Product Moment Correlation Statistic for Hypothesis Four

		Equip. Std	Equip. Maint. & Replt.	Nature of Effect	Significance of Effect
Follow-up Technique	Pearson Correlation	1	.825**	.708**	.723**
	Sig. (2-tailed)		.000	.000	.000
	Sum of Squares and Cross-products	409.966	231.935	213.760	227.092
	Covariance	.741	.419	.387	.411
	N	554	554	554	554
Ensure. Std	Pearson Correlation	.825**	1	.732**	.757**
	Sig. (2-tailed)	.000		.000	.000
	Sum of Squares and Cross-products	231.935	192.614	151.545	162.964
	Covariance	.419	.348	.274	.295
	N	554	554	554	554
Nature of Effect	Pearson Correlation	.708**	.732**	1	.963**
	Sig. (2-tailed)	.000	.000		.000
	Sum of Squares and Cross-products	213.760	151.545	222.319	222.644
	Covariance	.387	.274	.402	.403
	N	554	554	554	554
Significance of Effect	Pearson Correlation	.723**	.757**	.963**	1
	Sig. (2-tailed)	.000	.000	.000	
	Sum of Squares and Cross-products	227.092	162.964	222.644	240.384
	Covariance	.411	.295	.403	.435
	N	554	554	554	554

** . Correlation is significant at the 0.01 level (2-tailed).

Decision Rule

The decision rule governing Pearson product moment. Correlation coefficient statistic is to reject the null hypothesis (Ho) when corrupted Pearson product moment. Correlation coefficient (r) is greater than tabulated Pearson (r) and not to reject it if otherwise. The tabulated Pearson product moment correlation Coefficient for hypothesis four at four critical region $0.05 \geq 0.95$. Because H of all values of $Z \geq 82$ and $Z \leq -95$ in table 1. Hence Ho again rejected. The researcher

thus concludes that, follow-up technique has a significant positive effect on production control

Hypothesis Two

Ho: There is no significant positive relationship between quality control technique and process designing.

H_A: There is a significant positive relationship between quality control technique and process designing.

Table-2: Spearman’s Ranking Order Correlation Statistic for Hypothesis Five

			Pdtn. Mgt. Technique (PMT)	Customer Value (CV)	Firm Productivity (PV)	Firm Growth (FG)
Spearman's rho	Quality.Cntrl. Tech (QCT)	Correlation Coefficient	1.000	.818**	.763**	.848**
		Sig. (2-tailed)	.	.000	.000	.000
		N	554	554	554	554
	Customer Value (CV)	Correlation Coefficient	.818**	1.000	.613**	.960**
		Sig. (2-tailed)	.000	.	.000	.000
		N	554	554	554	554
	Firm Productivity (PV)	Correlation Coefficient	.763**	.613**	1.000	.639**
		Sig. (2-tailed)	.000	.000	.	.000
		N	554	554	554	554
	Firm Growth (FG)	Correlation Coefficient	.848**	.960**	.639**	1.000
		Sig. (2-tailed)	.000	.000	.000	.
		N	554	554	554	554

Source: IBM SPSS Processed (2015) **. Correlation is significant at the 0.05 level (2-tailed).

Decision Rule

As earlier stated Spearman’s rank order correlation coefficient assumes that data are normally distributed with the coefficient values ranging between -1 to 1. The sign of the coefficient which could either be negative or positive determine the direction of the positive influence.

Hence, from the coefficient table 2 for hypothesis five outputs, the sign of the coefficient of correlation between quality control technique (QCT) process designing showed high positive correlation coefficient of approximately 0.818. This result again is not only positive but also significant at 96% confidence level implying the rejection of the null (Ho) hypothesis. Similarly, the study concludes that, there is a significant positive relationship between quality control technique and process designing.

DISCUSSION OF FINDINGS

Follow-up technique has a positive effect on production control. The finding show that the Pearson product moment correlation coefficient in table 1 for testing hypothesis four shows a higher positive effect on production control and application of standard equipment, maintenance and repairs nature of effect and significant effect of equipment to be positively high as follow, standard equipment 0.83 equipment maintenance and repairs 0.73, nature of effect 0.71 and significant of effect 0.95. A further direct test using compressed result of four outcome show a higher positive effect on production plan equally shows a higher positive correlation coefficient of 0.95.

Pignaelli and csillag [31] disclose in an empirical survey administered under chain reaction presented originally in japan in 1950 advocates against

the common sense of that time, that improving quality would result in direct impact on the productivity and profitability of the firm.

Deming’s view points out mainly the improvement of product quality and service by reducing uncertainties and variations involved in the project and in the production processes. It was first model that involves quality Deming [33] presented his famous 14 points; a set of principle has aimed of changing the American management style. After rewards, Deming [25] refined this philosophy with his system of profound knowledge especially in the part called appreciation for a system, which may be interpreted as an extension of the chain reaction concept throughout the whole organization as a system formed by many inter-related components that have to work conjointly in order to optimize the system and not each component individually. The fundamental objective of all managers would be to optimize the system which would bring according to Deming greater long term benefits to all the stakeholders. Customer shareholder employee and the society the conclusion show that follow-up technique has a significant positive effect on production control.

Quality control techniques have a significant positive effect on process designing. The finding show that the correlation coefficient in table 2 for testing hypothesis five shows a higher positive effect on process designing on application of planning, organizing, directing and controlling to be positively high as follow process designing and planning technique is 0.96, process designing and organizing technique 0.82 process designing and directing techniques is 0.76 and process designing technique and controlling technique 0.85. A further direct test using compressed result of four outcome show a higher

positive effect on process designing equally shows a higher positive correlation coefficient of 0.96.

Quality awards or called excellence models are built on a large number of values, similar to the underlying principles in the quality movement [34, 35] the malcom Baldringue National Quality Award [34] established in 1987 has core values; (i) Core value visionary leadership (2) customer driven excellence (3) organization and personal learning (4) valuing work force members and partners. Total quality management (T Q M) is a firm wide management philosophy of continuously improving the quality of the products service processes by focusing on the customers need and expectation to enhance customer satisfaction and firm performance. There are mixed results about the relationship between total quality management practices and performance , severer attempts have been made to defined and identify the building blocks of quality management total quality control and similar terms.

Hellsten and Klefsjo [34] noted that total quality management (TQM) is a management system in continuous change, consisting of values methodology and tools arming to increase external and internal customer satisfaction with a reduction amount of resources. Both of these models can be used to describe what quality management really is but they do not fully capture the whole range of activities present in quality management is better viewed as a combination of principle practices and techniques. A principle is implemented through a set of practices which are simply organizational routines or activities. The practice are in turn, supported by a wide array of techniques to make the practices effective therefore, concludes that there was a significant positive relationship between quality control technique and process designing.

Summary of Findings

Follow-up techniques had a positive effect on production control.
Quality control technique has a significant positive effect on process designing.

CONCLUSION

Quality begins and ends with marketing. Quality production is not independent of itself but positively in relation with control which refers to the process of measuring the actual result of the operation of an organization in relation to the result which was planned for the organisation either as a whole of direction and action accordingly. Once customer requirement are defined, a quick reporting process is needed which should be maintained throughout design specification, manufacture and inspection. Quality control refers to an activity in manufacturing industries which aim to establish quality standards check that they are being adhered to take corrective action where

necessary and set improved standard where possible. This research concludes that for organisations to achieve quality productions, properly managed quality control techniques are of essence.

RECOMMENDATION

- Follow-up technique has to be maintain to facilitate the utilization of best practices because of globalization quality control technique has to gain way for best practices in global manufacturing.
- Total quality management (TQM) being the management focus on the knowing the needs and wants of customers and on being capable of fulfilling those needs and wants must be taken as responsibility of top executives in all aspect of the overall management function that determines and implements the quality policy.

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