

EFFECTS OF RESEARCH AND DEVELOPMENT ON ORGANISATIONAL PRODUCT QUALITY

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Abstract

The purpose of the study was to evaluate the effects of research and development on product quality. The specific objectives include to: ascertain the impact of quality planning on the product development of selected manufacturing firms and evaluate the effect of training on the quality assurance of manufacturing chosen firms. The population consists of 4830 personnel of selected manufacturing industries from South-East, Nigeria. The research used the survey approach. The primary sources used were the administration of a questionnaire to staff and distributors. The sample size of 352 was determined using Ferund and Williams's formula. 339 copies of the survey were returned and accurately filled. The validity of the instrument was tested using content analysis, and the findings were good. The reliability was tested using the Pearson correlation coefficient (r). It gave a reliability coefficient of 0.82 which was also good. The hypotheses were analyzed using f -statistics (ANOVA) tool. The findings indicate that Quality planning has a positive effect on product development of the manufacturing firms. Hence $F(95, n = 339) = 3357.821, p < 0.05$ and training has a positive impact on the quality assurance of the selected manufacturing firms. Thus $F(95, n = 339) = 5353.582, p < 0.0$. The study concluded that Quality planning and training is essential for manufacturing firms and therefore, put in more effort for adequate training of their employees. The study recommended that Organizations should create a budget for research and development in the annual budget for effective implementation of quality product and services and training should be made possible at various point in time to enable employees to be educated and to assist the management staff of the organization on how they could respond to today's dynamic work environment.

Keywords: Research and Development, Product Quality.

1.1 Introduction

Research describes as the creation of new knowledge or the use of existing knowledge in a new and a creative way to generate new concepts, methodologies, and understandings. This could include the synthesis and analysis of previous research to the extent that it leads to new and creative outcomes. Also research is consistent with a broad notion of research and experimental development (R&D) as comprising of creative work undertaken on a systematic basis in order to improve the stock of knowledge, including knowledge of humanity, culture, and society, and the use of this stock of knowledge to devise new applications, research encompasses pure and strategic basic research, applied research and experimental development. Applied research is original investigation undertaken to acquire fresh knowledge but directed towards a specific, practical aim or objective (including a client-driven purpose). (Jonathan, 2012). Research and development (R&D) also known in Europe as study and technological development (RTD), refers to innovative activities undertaken by corporations or governments in developing new services or products, or enhancing existing services or products. Research and development constitute the first stage of development of a potential fresh service or the production process. R&D activities differ from institution to institution, with two basic models of an R&D department either staffed by engineers and tasked with directly developing new goods, or staffed with industrial scientists and tasked with applied research in scientific or technological fields, which may hasten future product development. R&D differs from the wide majority of corporate activities in that it is not intended to yield immediate profit, and generally carries greater risk and an uncertain return on investment. However, R&D is crucial for acquiring larger shares of the market through the marketization of new products. Encyclopedia (2013).

Product quality means to incorporate features that can meet consumer needs wants and gives customer satisfaction by improving products goods and making them free from any deficiencies or defects. Product quality mainly depends on important factors like the type of raw materials used for making a product. How well are various production-technologies implemented? Skill and experience of the workforce that is involved in the production process. Availability of production-related overheads like power and water supply, transport, etc. (Gaurav, 2013). Product quality means fitness for use, properties of the product once the product is in exchange and use, quality is inversely proportional to variability work on using statistical methods for quality control and improvement justifies this definition is looking for

consistency. Modern production methods are mainly to enhance productivity; they often have the effect of reducing the variability of the products. For example, in the late nineteenth century, Frederick Taylor divided work in mass production into tasks so that not only the products could be manufactured and assembled more easily and more efficiently, but also the standardized production and assembly methods reduced the variability of the product-a positive impact on quality. (Shewhart 2015)

Research involves the use of formal and informal processes to impart knowledge and help people acquire the skills vital for them to perform their jobs satisfactorily, while development prepares employees for other positions in the organization and increases their ability to move into jobs that may not yet exist. Development is about preparing for a change in the form of new jobs, new responsibilities, or new requirements. Therefore, research and development is a necessary effort of a company to improve quality and to meet the difficulty of global competition and social change. (Drummond 2000). Development is, therefore, for the most part, long-term in focus; Education contributes to each's development by facilitating the attainment of mental powers, character, and socialization, as well as specific knowledge and skills. Providing formal and informal training experiences, such as major skills training, on-the-job experience, coaching, mentoring and management development can further influence employees' development and hence, their performance. Research when well done, will reflect in productivity, that is, productivity will increase, there will be a reduction in accidents on the job and the end profits of the organization would be maximized; the ultimate goal of every employer. Dessler (2003) and Mondy (2008).

The problems of poor product- quality indicates the lack of focus on quality services which led to a downward spiral in many organizations it can get worse over time. (Pradip, 2013). The effect of low quality can lead to exponential costs, both internally and externally, and can hinder your long-term growth if not addressed. In addition to the direct cost of the defective product, you must consider the internal processes that directly or indirectly led to those errors, and how low quality ultimately affects your consumer relationships and your brand's name. For instance, if you don't have the proper systems and procedures in place for detecting a defect early in the production cycle, a product could get rejected once it reaches your customer. This result in a chargeback, or worse, it could be put on the shelf only to end in a return or bad review by a consumer. The poor quality product can cost company money regarding productivity problems. If a company uses low-quality parts, systems break down,

regardless of any high-quality parts also used. Low-quality parts can cause mechanical breakdowns, as well as work slowdowns or even stoppages. (Richard, 2013).

1.2 Statement of the Problem

Research and Development is a type of systematic activity conducted by a company, which combines essential and applied research in an attempt to discover solutions to challenges or to create or update goods and services. The act of a company conducting its R&D often results in the ownership of intellectual property in the form of patents or copyrights. Quality also needs to be managed at various lower levels, e.g., group, team or section. This may involve individuals having particular quality-related responsibilities as part of their duties, and each member of staff should be aware of what role they have in the delivery of quality within the laboratory. The management of condition in an R&D environment can be a delicate issue. A balance requires to be struck between maintaining a suitable level of control while at the same time not inhibiting creativity.

The challenges of poor quality planning, innovativeness, lack of training and quality controlled *lack of confidence, lack of interaction, lack of a code of conduct, etc.* This discourages research of all types. Governments, institutions/organizations don't value the contributions of research findings to economic development and for that reason do not offer adequate amounts for research of all types. This narrows down the volume and quality of literature accessible to a researcher. Put simply; not much research findings have been collected from where a researcher can take aid.

The consequence of poor planning and poor control is a loss of financial reward. A product being produced in mass quantity and there is a lack of planning about whether the outcome will be purchased, there can be a great chance that the cost of building the product will not be matched and exceeded with the sale of the product. The consequences of such an attitude are lost customers and opportunities for competitors to take advantage of the market need. Successful companies understand the powerful impact customer-defined quality can have on business.

1.3 The Objective of the Study

The main objectives of the study were to evaluate the effects of research and development on product quality. The specific goals include to:

- i. Ascertain the impact of quality planning on the product development of selected manufacturing firms.

- ii. Determine the effect of innovativeness on the quality control of selected manufacturing firms.
- iii. Evaluate the effect of training on the quality assurance of selected manufacturing firms.

1.4 Research questions

The following research questions guided the study.

- i. What is the effect of quality planning on the product development of selected manufacturing firms?
- ii. What is the effect of training on the quality assurance of selected manufacturing firms?

1.5 Statement of hypotheses

Alternate hypotheses guided the study.

- i. Quality planning has a positive impact on the product development of selected manufacturing firms.
- ii. Training has a positive effect on the quality assurance of selected manufacturing firms.

2.0 Literature Review

2.1 Conceptual Frame Work

2.1.1 Concept of Research and Development

The concept of research is discovering things for oneself (or as part of a defined group or team or joint project), evaluating what one discovers and writing up the findings and evaluation systematically, coherently and logically. In doing so, one must provide all the information necessary to enable others to check the accuracy of the results and the quality of the evaluation. Basic research is also called pure or fundamental analysis. It is a kind of research that has a practical end goal, products in mind or specific applications because it is directed towards the greater knowledge and comprehension. The concept of development states that something moves forward. This could mean the growth of a company or the building of new structures. In economics, development reveals an average increase in per capita income (average income per person) with a commensurate decrease in the Gini coefficient (a reduction of economic inequality) so that an ordinary citizen enjoys a quality life (including comforts) with healthy prospects (intellectual, economic and social) for a secure future. A decrease in the Gini coefficient is not essential to measuring development,

however. A developed country is one in which the average standards of living are high. (Edward Mosher 2016)

2.1.2 Concept of product quality

"Product quality means to incorporate features that can meet consumer needs (wants) and gives customer satisfaction by improving products (goods) and making them free from any deficiencies or defects." Product quality is a significant element of a thorough marketing plan and strategy. It involves developing and communicating the distinct attributes your product provides to targeted customers. Without an effective positioning strategy and execution, the chances customers buy from you are mostly arbitrary at best. (Gaurav Akrani, 2013)

2.1.3 Concept of product development

Product development also refers to new product management, is a series of steps that includes the conceptualization, design, development, and marketing of newly created or newly rebranded goods or services. The objective of product development is to cultivate, maintain and improve a company's market share by satisfying consumer demand. Not every product will appeal to every customer or client base, so defining the target market for a product is a critical component that must take place early in the product development process. (Margaret 2013) **Product development** is the **creation of a new or different good** that offers innovative new benefits to the consumers. This includes both the production of an entirely new product and modifications to an existing product. These or new introductions may be targeting a newly defined customer requirement or a niche category in the market. A product can be described as a collection of profits that can be either tangible such as a physical item or intangible such as a service or experience. The new product development process involves two simultaneous activity paths. One of these focuses on extensive market research and analysis while the other deals with generating ideas, the design of the product and detail engineering.

2.1.4 Concept of quality planning

Quality Planning is a systematic process that translates quality policy into measurable objectives and requirements and lays down a sequence of steps for realizing them within a specified time-frame. A quality management plan is an essential component of a project management plan, as it defines how quality policies of the said organization must be implemented. The quality of a given product is usually shaped by the expectations made by an average consumer, which then describes how the project or plan shall guarantee this level

of quality through its work processes and deliverables. This ensures that the products are developed to fulfill the set standards and requirements, the work processes involved are performed as documented, and the non-conformances found are resolved with corrective action. (Bayne and Adrienne 2013).

2.1.5 Concept of Quality Control

Quality control is a procedure or set of procedures intended to ensure that a manufactured product or performed service corresponds to a defined set of quality criteria or meets the requirements of the client or customer. is similar to, but not identical with, quality assurance is defined as a procedure or set of procedures intended to ensure that a product or service under development (before work is complete, as opposed to afterward) meets specified requirements. is sometimes expressed together with as a single expression, quality assurance and control To implement an effective, program, an enterprise must first decide which specific standards the product or service must meet. Then the extent of QC actions must be determined (for example, the percentage of units to be tested for each lot). Next, real-world data must be collected (for example, the percentage of units that fail) and the results reported to management personnel. After this, corrective action must be decided upon and taken (for example, defective units must be repaired or rejected and poor service repeated at no charge until the customer is satisfied). If too many unit failures or instances of poor service occur, a plan must be devised to improve the production or service process and then that plan must be put into action. Finally, the QC process must be ongoing to ensure that remedial efforts, if required, have produced satisfactory results and to detect recurrences or new instances of trouble immediately. (Margaret 2013)

2.1.6 Concept of Quality Assurance

Quality Assurance is provided by organization management; it means giving a positive declaration on a product which obtains confidence for the outcome. It gives security that the product will work without any glitches as per the expectations or requests. It is also known as QA and focuses on preventing defect. Quality Assurance ensures that the approaches, techniques, methods, and processes are designed for the projects and implemented correctly. Quality assurance activities monitor and verify that the processes used to manage and create the deliverables have been followed and are operative. Quality Assurance is a proactive process and is Prevention in nature. It recognizes flaws in the process. Quality Assurance has to complete before Quality Control. Many people think QA and QC are the same and

interchangeable, but this is not true. Both are tightly linked, and sometimes it is challenging to identify the differences. Fact is both are related to each other, but they are different in origins. QA and QC both are part of Quality Management. However, QA is focusing on preventing defect while QC is focusing on identifying the defect (Joseph, 2013).

2.1.7 Concept of Training

Training is a development program to teach an individual or group of people, a set of skills or a specific type of behavior. Training essentially means teaching. Trainees should extract maximum learning out of any training program.(Adam 2013) Training can also be given to self. Training is given to increase competency, knowledge or sharpen skills that may already be present in a person. A training program usually has specific aims. The goal might be to improvise upon someone's performance, capacity, productivity, etc. No task can be accomplished with perfection without proper training and practice. Initial few days are dedicated to job-specific training in any job. From manual labor to intelligence, every aspect of a task requires relevant training. (Lyndsey 2012)Also, training is not only for initial qualifications, but it is also required to sustain any skill. Throughout our professional lives, we need to be trained to upgrade as well as maintain our skill sets from time to time. After all, human beings are not coded machines; they require training in every sphere of their work life. The latter part of the training for sustenance may also be termed as "professional development." On the job training provided prove to be more useful than academic qualifications. When professionals are provided with proper training, they will be ready to tackle any situations that might arise during their daily work. (Jeffrey2011) Glen Training makes an individual aware, and every challenge seems easy to handle after that. Successful corporate firms put their employees through rigorous training to prepare them for facing diverse situations.

2.1.8 Product Development on the Quality Planning of Firms

Product development is the on-going process of identifying and articulating market requirements that define a product's feature set. Product planning serves as the basis for decisions about price, distribution, and promotion. Product planning is the process of creating a product idea and following through on it until the goods are introduced to the market. Additionally, a small company must have an exit strategy for its product in case the product does not sell. Product planning entails managing the product throughout its life using various

marketing strategies, including product extensions or improvements, increased distribution, price changes, and promotions.(Wikipedia 2013).

Product development planning and development organization often have difficulties in maintaining a balance of emphasis between existing products in various stages of development. Why does the preoccupation of operating personnel with products already on the market cause difficulty in generating interest in new product plans? (Amadi, 2008) Staffs in the planning development stage do not always participate in the product commercialization. Once commercialization is reached, the planning personnel continue to plan and develop new products. The problems of transferring knowledge from planning to the operation are frequently encountered but may be resolved by allowing development personnel to move into services. This problem is not as high in the product manager of the organization because the product once it achieves commercialization, Robert (1978 P 43)

2.1.10 The effect of training and the quality assurance of the Firms

Armstrong, (2001) defines training as the formal and systematic modification of behavior through learning, which occurs as a result of education, instructions and development and planned experience. Training is the process of equipping the workforce with the necessary knowledge, skills, and attitude to tackle the job responsibilities. Staff development, on the other hand, is an improvement of the employee's competencies for future environmental demands and adaptability. Beardwell and Hidden (1994) consider training and development as a planned process to modify attitude, knowledge or skill behavior through learning experiences to achieve adequate performance in an activity or range of activities. Corporations are offering a variety of training programs to meet their organizational needs. These include content on IT and systems, processes, procedures and business practices, industry-specific training, managerial or supervisory training, interpersonal skills, compliance, sales, executive development, basic skills, new employee orientation, customer service, and quality. As Reynolds (2004) points out, training has a complementary role to play in accelerating learning. It should be reserved for situations that justify a more focused conventional approach rather than viewing it as a comprehensive and all-pervasive people development solution. He also commented that the traditional model of training tends to emphasize subject-specific knowledge rather than trying to build core learning abilities. Development is a long-term education process utilizing a systematic and organized procedure

by which managerial personnel learns conceptual and theoretical knowledge for general purpose.

2.3 Empirical Review

Rachel, (2012) conducted an empirical study on quality management practices, organization performance and suppliers' selection in southern Minnesota manufacturing firms in Minnesota. The major objective of the study is to develop and propose the conceptual framework and research model of quality product practices implementation about organization performance, particularly in Southern Minnesota manufacturing firms. And also to identify the most important factors considered in suppliers' selection in the companies. A survey was conducted involving Southern Minnesota manufacturing companies. The survey aims to investigate the current quality product practices in manufacturing industries in Southern Minnesota. In this study, the focus was on the relationship between quality product practices and organizational performance. The results of the survey conducted on the companies found that implementation of the quality practices affect organizations' performance positively. Also, that the three most important factors considered in supplier selection by the companies are quality, on-time delivery, and commitment. This is contrary to much research that has established that three most important factors in supplier's selection by manufacturing companies are quality, cost, and on-time delivery. The study provides useful information for further improvement of quality production practices and the current situation of quality production practices in Southern Minnesota manufacturing industry.

Louis, (2013) conducted an empirical study on the Research and Development and marketing cooperation across new product development stages Chiao Tung University North-Holland. The study extends the new product development process research to a new environmental context and anew business type original design manufacturing. Taiwan's industry has achieved a very outstanding performance during the last two decades. The island's experience is quite valuable for those emerging countries that are struggling to transform themselves from producing low-value goods to making high-technology products. After analyzing the data collected from 153 research and development and marketing managers in Taiwanese IT firms, the study finds that the higher the perceived importance of R&D–marketing cooperation is, the higher the attained level of R&D–marketing cooperation will be. Consequently, a better performance can be achieved. The study additionally reports that an industry that has adopted a Defender innovation strategy attains a lower level of R&D–

marketing cooperation, and has a weaker performance than those firms that took either Prospector or Analyzer innovation strategies. Finally, environmental uncertainty has no vital impacts on the perceived importance and the attained the level of R&D–marketing cooperation.

Il-eok Sun, (2013) conducted an Empirical Study on the Logistics Service Quality Factors influencing Service Satisfaction on Supplying the Industrial Goods in the Tourism and Leisure Industry. The objective of the study aimed to find out which logistic service factors affect the field and administrative staff's perception of service quality satisfaction. It also tried to find out if there was a difference in opinion due to job-type. As the result of the analysis, the following implications can be gained. First, independent sample t-test results showed that based on the job types; there is an average difference on economic feasibility, stability, and service satisfaction. Second, the results showed that service quality factors all have a positive influence on service satisfaction. Third, although there was the difference in view between field staff and administrative staff on each variable, there was no moderating effect between service quality including each subordinate factors and service satisfaction.

Hee-jae (2010) conducted a study on the Relationship between innovativeness, quality, growth, profitability, and market value in Australia. The objective of the study tries to evaluate strategic management the relationship between innovativeness, quality, growth, profitability, and market value at the firm level. Building on concepts from a resource-based view of the firm and organizational learning, innovation and quality literature, we propose the innovativeness–quality–performance model, which describes how a firm's capability to balance innovativeness with quality drives growth and profitability, and in turn drives superior market value. The Results of structural equation models indicate that innovativeness relationship between quality and growth, class mediates the relationship between innovativeness and profitability, both innovativeness and quality have mediation effects on market value, and both growth and profitability have mediation effects on market value.

Devra; (2013) conducted a study on why is It Important for Businesses to Practice Quality Control? In the US. The objective of the study evaluates if customers feel that they can count on the consistent quality of your products, they're more likely to give you their repeat business. Consistent quality takes hard work, attention to detail and systems for monitoring and assessing whether your products meet the standards you have set. Quality control is an ongoing process that touches everything from purchasing to manufacturing to distribution.

Quality control is a vital element in producing high-quality products that meet customer expectations. When your products do what they're supposed to do, taste the way they're supposed to taste and behave the same way over time, you earn repeat business. The result of the study is on how the customer loyalty saves money on marketing and advertising by providing a steady revenue stream and gaining you referrals, which cost nothing and can be particularly useful for bringing in new customers. Quality control processes help your business avoid situations that cause harm to customers and lead to expensive liability claims and lawsuits. If your company makes machinery, quality control standards reduce the mistakes and inconsistencies that could make these machines unsafe. If you manufacture a food product, your quality control processes monitor temperature and foreign bodies to decrease the likelihood that you will make someone sick. Ensuring customer safety saves your business money and averts damage to your reputation. It is also just the right thing to do. Eunice (2014) conducted a study on the effect of training and development on employees' performance; at safari com limited University of Nairobi. The research aimed at examining the impact of training and development on employee performance with a case study of Safaricom Call Center. Literature review, based on other scholars contributed to the subject, discussed an overview of training, methods of preparation, benefits of exercise, employee performance, evaluation of training, the relationship between training and development and employee performance which led to gap analysis as a conclusion of the chapter. The study adopted a case study approach where data was collected across a population through a sampling of 340 employees at the Call Center which forms the Customer Care Division of Safaricom. The sample included managers, support/analyst, and customer experience executives. Primary data was collected by use of both structured and unstructured questions across the strata and secondary data was gathered from various sources such as the Safaricom Strategic Plan 2012, Employee Booklet and Call Center Performance Reports. Responses were analyzed using both descriptive and graphical techniques. It was observed that training and development has a positive impact on both motivations of employees as well as performance. This contributed by the variant, relevant and high-quality training. The study concluded that there is a need for continuous training and development taking into consideration the competition, market dynamics, customer satisfaction, and net promoter score among others. The study recommends that training needs at Safaricom should be

considered from overall company objectives. Also, the goals of the company should determine what training programs are to be organized for staff.

Geoffrey, (2012) conducted a study on the Quality Assurance in Education, Quality Assurance and Management in the UK. The objective of the study is to give an overview and critique of Quality Assurance (QA), its role, function, and effectiveness as practiced and researched in education organizations. To place contemporary QA in its historical context, some well-trodden ground will be revisited. There is nothing new about government and other authorities' inspectorial interest (some of it demeaning) in the effectiveness of teaching. Despite this, terms such as 'quality,' 'quality assurance' and 'management' are still hotly contested, particularly in Higher

Education (HE) since the increased focus on 'accountability' over the last three decades. Much antagonism both overt and covert is shown towards those responsible for quality – amply demonstrated by letters and occasional articles published in the educational press. The result is a fact of life in universities, university colleges, further education (FE) colleges, and schools, though to a less extent, perhaps, in schools and FE Colleges. What follows is an attempt to come to grips with some of the reasons, historical, conceptual, methodological and cultural.

3.0 Methodology

The main aim of the study was to evaluate the effects of research and development on organizational product quality. The population consists of 4830 staff of selected manufacturing firms from South-East, Nigeria. The study used the survey approach. The basic sources used were the administration of a questionnaire to staff and distributors. The sample size of 352 was determined using Ferund and Williams formula. 339 copies of the survey were returned and accurately filled. The validity of the instrument was tested using content analysis, and the result was good. The reliability was tested using the Pearson correlation coefficient (r). It gave a reliability coefficient of 0.82 which was also good. The hypotheses were analyzed using f-statistics (ANOVA) tool.

4.0 Data presentation and analysis

Table 4.1 Response to the statement Quality planning has a positive effect on product development of the manufacturing firms.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	137	40.4	40.4
	Agree	96	28.3	68.7
	Neutral	23	6.8	75.5
	Disagree	45	13.3	88.8
	Strongly disagree	38	11.2	100.0
	Total	339	100.0	100.0

Table 4.2.1 shows that 137 respondents out of three hundred and thirty-nine representing 40.4 percent strongly agree, 96 respondents (28.3 percent) agree that Quality planning has positive effect on product development of the manufacturing firms while 23 respondents (6.8 percent) were neutral, 45 respondents (13.3 percent) disagree and 38 respondents (11.2 percent) strongly disagree that Quality planning has a positive effect on product development of the manufacturing firms.

Table 4.2 Response on the statement Training has a positive effect on the quality assurance of the selected manufacturing firms.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	157	46.3	46.3
	Agree	84	24.8	71.1
	Neutral	52	15.3	86.4
	Disagree	20	5.9	92.3
	Strongly disagree	26	7.7	100.0
	Total	339	100.0	100.0

Table 4.2.2 shows that 157 respondents out of three hundred and thirty-nine representing 46.3 percent strongly agree, 84 respondents (24.8 percent) agree that Training has positive effect on the quality assurance of the selected manufacturing firms while 26 respondents (15.3 percent) were neutral, 20 respondents (5.9 percent) disagree and 65 respondents (7.7 percent) strongly disagree that Training has a positive effect on the quality assurance of the selected manufacturing firms.

Test on Hypotheses

Hypothesis One: Quality planning has a positive effect on product development of the manufacturing firms.

Model Summary

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate
1	.988 ^a	.976	.975	.17939

a. Predictors: (Constant), TAT,TEO,TTA, THT

ANOVA^a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	432.229	4	108.057	3357.821	.000 ^b
	Residual	10.748	334	.032		
	Total	442.977	338			

a. Dependent Variable: THEO

b. Predictors: (Constant), TAT,TEO,TTA, THT

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.027	.035		-.765	.445
	TAT	.506	.013	.550	38.964	.000
	TEO	.199	.018	.220	11.208	.000
	TTA	.213	.017	.224	12.217	.000
	THT	.074	.013	.086	5.807	.000

a. Dependent Variable: THEO

Where:

THEO = The effect of quality planning on the product development increases product value

TAT = The ability to enhance quality methods in my organization increases product value,

TEO = The efficiency of applicable procedures improves the quality of our products

TTA = The techniques applied in my organization enhances the product development

THT = The tools used in my organization, provide customer value.

Statistical criteria {first order test}

The coefficient of multiple determinants {r²}

The R² {R-Squared} which measures the overall goodness of fit of the complete regression, shows the value as .976 and adjusted to .975. This means that R² accounts for 97.6 percent approximately 98 percent. This indicates that the independent variables account for about 100 percent of the variation in the dependent variable. Which shows the goodness of fit?

The student’s t-test:

The test is carried out, to check for the special significance of the variables. Statistically, the t-statistics of the variables under consideration is interpreted based on the following statement of the hypothesis.

H₀: The individual parameters are not significant.

H₁: The individual parameters are significant.

Decision Rule:

If t-calculated > t-tabulated, we reject the null hypothesis {H₀} and accept the alternative hypothesis {H₁}, and if otherwise, we select the null hypothesis {H₀} and reject the alternative hypothesis {H₁}.

Level of significance = α at 5percent = $\frac{0.05}{2} = 0.025$

Degree of freedom: n-k

Where n: sample size.

K: Number of the parameter.

339-4 = 335 = 2.326

The calculated value for the t-test:

Table 4.3. The t-test is summarized in the table below

Variables	t-cal	t-tab	Remark
(Constant)	-.027	± 2.326	Significant
TAT	.506	± 2.326	Significant
TEO	.199	± 2.326	Significant
TTA	.213	± 2.326	Significant
THT	.074	± 2.326	Significant

The t-statistics are used to test for personal significance of the estimated parameters. From the table above, we can infer that the following parameters were statistically significant, we now agree that the ability to enhance quality methods in my organization increases product value; the efficiency of applicable procedures improves the quality of our products; The

techniques applied in my organization enhances the product development and the tools used in my organization provide customer value.

F-statistics (ANOVA)

The F-statistics is used to test for simultaneous significance of all the estimated parameters.

The hypothesis is stated;

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4$$

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4$$

Level of significance: α at 5 percent

$$\text{Degree of freedom: } \frac{N-1}{N-K} = \frac{4-1}{339-3} = (335, 3) = 2.7858$$

Decision Rule

If the f-calculated is greater than the f-tabulated {f-cal,> f-tab} reject the null hypothesis {H₀} that the overall estimate is not significant and if otherwise conclude that the overall estimate is statistically significant.

Decision

From the result, f-calculated {3357.821} is greater than the f-tabulated {2.7858}, that is, f-cal > f-tab. Hence, we reject the null hypothesis {H₀} and accept alternate hypothesis which means that the overall estimate has a good fit which also implies that our independent variables are simultaneously significant. We now conclude from the analysis that Quality planning has a positive effect on product development of the manufacturing firms.

Hypothesis Two: Training has a positive effect on the quality assurance of the selected manufacturing firms

Model Summary

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate
1	.994 ^a	.988	.988	.13435

a. Predictors: (Constant), IHA, IHT, TAO, TRP

ANOVA^a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	483.134	5	96.627	5353.582	.000 ^b
	Residual	6.010	333	.018		
	Total	489.144	338			

a. Dependent Variable: TEOT

b. Predictors: (Constant), LHA, IHT,TAO, TRP

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	-.036	.027		-1.349	.178
LHA	.386	.013	.416	29.839	.000
IHT	.301	.013	.319	23.783	.000
TAO	.291	.010	.323	28.633	.000
TRP	.098	.017	.093	5.754	.000

a. Dependent Variable: TEOT

Where:

TEOT = The effect of training on the quality assurance of selected manufacturing firms

LHA = Learning has aided in preventing challenges in my organizations.

IHT = In-house training assists to improve the quality of my organization

TAO = The acquisition of knowledge in my organization, has provided techniques to correct problems

TRP = Training provides a means of maintaining and enhancing care.

Statistical criteria {first order test}

The coefficient of multiple determinants {r²}

The R² {R-Squared} which measures the overall goodness of fit of the complete regression, shows the value as .988 and adjusted to .988. This means that R² accounts for 98 .8 percent approximately 99 percent. This indicates that the independent variables account for about 99 percent of the variation in the dependent variable. Which shows the goodness of fit?

The student's t-test

The test is carried out, to check for the particular significance of the variables. Statistically, the t-statistics of the variables under consideration is interpreted based on the following statement of the hypothesis.

H₀: The individual parameters are not significant.

H₁: The individual parameters are significant.

Decision Rule

If t-calculated > t-tabulated, we reject the null hypothesis {H₀} and accept the alternative hypothesis {H₁}, and if otherwise, we select the null hypothesis {H₀} and reject the alternative hypothesis {H₁}.

Level of significance = α at 5percent = $\frac{0.05}{2} = 0.025$

Degree of freedom: n-k

Where n: sample size.

K: Number of the parameter.

$$339-4 = 335 = 2.326$$

The calculated value for the t-test

Table 4.3. The t-test is summarized in the table below

Variables	t-cal	t-tab	Remark
(Constant)	-1.349	± 2.326	Significant
LHA	29.839	± 2.326	Significant
IHT	23.783	± 2.326	Significant
TAO	28.633	± 2.326	Significant
TRP	5.754	± 2.326	Significant

The t-statistics are used to test for particular significance of the estimated parameters. From the table above, we can infer that the following parameters were statistically significant; we now agree that Learning has aided in preventing challenges in my organizations; In-house training assists to improve the quality of my organization; The acquisition of knowledge in my organization has provided techniques to correct problems and training provides a means of maintaining and enhancing care.

F-statistics (ANOVA)

The F-statistics is used to test for simultaneous significance of all the estimated parameters.

The hypothesis is stated;

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4$$

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4$$

Level of significance: α at 5 percent

$$\text{Degree of freedom: } \frac{N-1}{N-K} = \frac{4-1}{339-3} = (335, 3) = 2.7858$$

Decision Rule

If the f-calculated is greater than the f-tabulated {f-cal,> f-tab} reject the null hypothesis {H0} that the overall estimate is not significant and if otherwise conclude that the overall estimate is statistically significant.

Decision

From the result, f -calculated {5353.582} is greater than the f -tabulated {2.7858}, that is, f -cal $>$ f -tab. Hence, we reject the null hypothesis $\{H_0\}$ and accept alternate hypothesis which means that the overall estimate has a good fit which also implies that our independent variables are simultaneously significant. We now conclude from the analysis that training has a positive effect on the quality assurance of the selected manufacturing firms.

Discussion of findings

From the result of hypothesis one, f -calculated {3357.821} is greater than the f -tabulated {2.7858} that is, f -cal $>$ f -tab. Hence, we now conclude from the analysis that Quality planning has a positive effect on product development of the manufacturing firms. The above result was supported by Bayne and Adrienne (2013) that the quality of a given product is usually shaped by the expectations made by an average consumer, which then describes how the project or plan shall guarantee this level of quality through its work processes and deliverables. This ensures that the products are developed to fulfill the set standards and requirements, the work processes involved are performed as documented, and the non-conformances found are resolved with corrective action.

Form the literature review; Human Capital is the deliberate and continuous process of acquiring the requisite knowledge, skills, and experiences that are applied to produce economic value for driving sustainable national development. Harbison (2013). Human capital refers to the human factor in the production process; and consists of the combined knowledge, skills or competencies, and abilities of the workforce. Of all the elements of production, only human beings are capable of learning, adapting or changing, innovative and creative. Human capital formation or development, following (Ejere 2011). This was supported by the result of hypothesis two, f -calculated {5353.582} is greater than the f -tabulated {2.7858}, that is, f -cal $>$ f -tab. We now concluded from the analysis that training has a positive effect on the quality assurance of the selected manufacturing firms.

Conclusion

Quality planning has a positive effect on product development of the manufacturing firms, and training has a positive impact on the quality assurance of the selected manufacturing firms. The level of research and development in Nigeria is abysmal, and employers are not ready to adequately train their employees. Even the big organizations and multinationals do not invest enough to educate the people who work for them. But it is worse with the small

businesses because many of them claim that they do not have enough money to train their employees. They are concerned about making money and increasing revenues. They always consider research as the last thing they should think about. They see training as an expense and one of the easiest to cut down.

Recommendations

Based on the findings of the study, the following recommendations were made on research and development;

- i. Organizations should create a budget for research and development in the annual budget for effective implementation of quality product and services.
- ii. Training should be made possible at a various point in time to enable employees to be educated and to assist the management staff of the organization on how they could respond to today's dynamic work environment.

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