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Effect of Technological Change Management on Product Quality of Selected Textile Manufacturing Firms in Lagos State, Nigeria

AMOSA, JIMOH RAFIU; OMOLABI, ISSA AND SULEIMAN,
AHMED AREMU*

Abstract

Technology is a competitive resource in any organization and as such it has made organizations to consistently rethink how they do their business. If properly managed, technology has the capacity to guarantee the production of quality output. Unfortunately, many business managers failed to properly monitor, manage and cope with the constant change in technology. This has brought serious setback to the competitive ability of the textile firms in Nigeria compared to their foreign counterparts in terms of product quality. Thus, this paper sought to examine the effect of managing technological change on product quality of the selected textile manufacturing firms in Lagos state. The specific objectives are to: (i) examine the extent to which training influences organization's product performance and; ii) determine the extent to which technology institutionalization influences organization's product conformance. To achieve these objectives, a cross sectional survey design was employed. A study population of 4115 with a sample size of 365 employees gotten through taro Yamani sample size determination formula made up the respondents for the study. Two hypotheses were formulated and tested. The statistical technique used was multiple regression analysis. The results showed that a statistically strong and positive relationship exists between training and product performance ($R^2 = 0.662$, $p < 0.05$) and that technology institutionalization has positive and significance influence on product conformance ($R^2 = 0.585$, $p < 0.05$). This indicated that managing technological change as it evolves has a positive and significant impact on product quality. The paper recommended that organizational managers should take the issue of technology change management seriously through training and the institutionalization of the new technology to upgrade employees' skills and competence that leads to the production of high-quality product at low cost.

Keywords: Change, Training, Technology Institutionalization, Product Performance, Product Conformance.

Introduction

Globally, firms have invested largely on improving competitiveness by looking at ways of sustaining performance through drastic improvement in quality of their product and services driven by technological change and its prompt management to yield desired result. Besides, globalization and

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competitive drive led to the creation of World Trade Organisation and subsequently the signing of various trade treaties and agreements between the trade blocks of the world. Ironically, this has succeeded in helping the economically advanced countries at the detriment of the developing countries to increasingly extend their outreach to the less developed, less technologically inclined and developing economies through various means under the disguise of free trade agreement and globalization. This however, has turned African countries including Nigeria to a dumping ground for all sorts of finished high quality goods at a cheaper price compared to the locally produced ones. This is so because firms in advanced countries were able to produce cheap and high-quality products due to their ability to, monitor the trend, acquired and manage the changes in the technological environment, develop their human resource through training and institutionalization of the technology as they evolved (Ogunsola, 2005).

In order to move in line with the challenges posed by globalization and remain competitive in the global economy quality wise, organizations in Africa across sectors and industries have gone through series of changes through restructuring, re-culturing, leadership, re-engineering and rethinking on how they do business in an effort to keep pace with changes in technology and other economic conditions in the world. In addition to this, countries in Africa have also responded to the evil effect of globalization and trade liberalization with the intension of protecting African industries by liaising more with Africa Development bank and other financial institutions to make funds available to business organisations in Africa through the government of various countries. This however is to allow them have access to funds for the technology upgrade of their organisations so that they can also produce high quality products that has the capacity to perform and conform to the expectations of the consumers at low cost and ultimately sell at a competitive price just as the ones in advanced and advancing countries of Europe and Asia (Abbas & Asghar, 2010).

Locally, the integration of the world economy and the influx of cheap products and textile materials, especially from Asian markets, had not helped manufacturing sector and textile subsector in particular. This has ushered in Capacity underutilization, crumbled installed operational efficiency, create sudden unemployment etc. thereby making Nigeria more vulnerable to security threats and criminality. Aside, the Nigerian manufacturing textile subsector is still very small and remains heavily import dependent in terms of raw material and operation technology compared to their peers in developing countries like China, Indonesia, and Malaysia where the performance of the manufacturing sector appeared very impressive.

Therefore, in order to solve these lasting problems, the government of Nigeria has formulated series of policies and programs targeted at improving the technological base of the textile manufacturing sub sector of the economy through the empowerment and creation of some special intervention loan scheme such as the central bank of Nigeria (CBN) textile survival intervention fund and the strengthening of the Bank of industry(BOI) targeted at the manufacturing sector most especially the ailing textile manufacturing companies. The aim of this is to enable textile companies have access to loan facilities at the lowest interest rate to enable them acquire needed technology, train and educate employees on its usage and benefits as well as institutionalize the acquired technology in the system so that it stick in to the processes, structure and operating procedures of the organizations. Consequently, all these efforts are targeted at aiding the financial base of the textile companies to enable them have the capacity to produce big volume of products with high quality at low cost to boast their competitive strength within Africa and by extension their competitiveness in the global economy.

However, the manufacturing sector most especially the textile subsector is strategic to the overall industrialization efforts in Nigeria. It is also very imperative to the advancement of social, economic and industrial activity of any nation. Textile manufacturing involves the use of heavy technology to make textile products for human, industrial and household consumption. This technology requires that it is well managed so that the effort directed towards the production of quality goods that meets or even surpass the standard of those products from advanced nations is easily achieved. It is on the basis of the above that this study examined the effects of managing technological change on product quality of selected textile manufacturing firms in Lagos state Nigeria (Uddin, 2019).

In Nigeria, many organizational managers erroneously attribute good product quality to the adoption and use of modern or up-to-date technology, thereby overlooking the contribution of the knowledge required to effectively and efficiently handle the new technology to take care of the competitive fear that necessitate the purchase of the new technology. Therefore, for new technology to lead to achieving qualitative product with excellent performance, handlers need knowledge updating which could be done through effective training.

The introduction of new process and technology poses a dilemma to many manufacturing managers. The new technology seldom fits neatly into existing production processes while the successful utilization may require ongoing adaptation of the new technology to the existing process, procedures, culture and structure. New process introductions, therefore, present the need to adopt

technology integration strategies that help align the new process into ongoing operations seamlessly so that organisation output conform to the required quality as prescribed. Consequently, while new manufacturing technologies offer the opportunity to improve product offerings and factory productivity, these benefits are often elusive due to the inability of business managers to institutionalize the new technology into the operational stream of the organization. Unfortunately, this has caused many avoidable losses that could come with the introduction of new technology or equipment which are often equal or exceed the original cost of the equipment itself (Tyre & Hauptman, 1989). However, this paper examines the impact of managing technological change on product quality of selected textile manufacturing firms in Lagos State Nigeria. To achieve this objective,

Literature Review

Managing Technology Change

Managing Technology change needs a proactive change management approach to ensure that the journey from the old status quo (old state) to the new status quo (future state) is completed in the most optimal way with minimal disruption and that the new status quo is institutionalized and sustained over time. Adoption and acceptance of new technology, processes and behavior is impacted by the following factors: organizational readiness, stakeholder alignment and buy-in, communication, Training and education and institutionalization of the new 'status quo. Failure to communicate this to users may cause the implementation effort to fail despite considerable time and effort spent on the roll out. Technology change management required backing from employees' for the change that is going to be made (Edmonds, 2011). In summary, this study considered two out of the numerous approaches to the management of technological change as discussed below:

Training

Training and education provide an understanding regarding the change initiative to acquire new knowledge, skills, capabilities or behaviors (Alvesson, 2002). Employees learn new technology, work processes, routines and behaviors which represent the change vision. Mainly, training and education is linked with developing understanding and necessary skills, values or frameworks related to the change initiative (Whelan-Berry & Somerville, 2010).

If organizational change involves technology, training and educating its users is imperative in spite of its high costs, because if people do not know how to use the new technology to their own advantage, they cannot benefit from it (Jarrar, Al-Mudimigh & Zairi, 2000). Moreover, Self and Schraeder(2009) maintained that if managers were not successful at arranging effective training programs through good platform, it can result in lack of self-confidence both for managers and users, and can create a barrier to successful implementation and management of the new technology. Therefore, training employees on the use and importance of the new technology may be a solution to demolish the barriers.

MacKenzie and Wajcman (1985) define technology as the integration of the physical objects or artifacts, the process of making the objects and the meaning associated with the physical objects. These elements are not distinctive and separable factors but form a 'seamless web' that constitutes technology (Woolgar, 1987). In defining the term technology, all the three elements must be understood as being interconnected to each other and a change in one element will affect the other two elements. The latest definition given by Mascus (2003) has broadened the concept of technology where technology is defined as 'the information necessary to achieve a certain production outcome from a particular means of combining or processing selected inputs which include production processes, intra-firm organizational structures, management techniques, and means of finance, marketing methods or any of its combination'. Other scholars such as Tepstra and David (1985) suggest that technology as a cultural system concerned with the relationships between humans and their environment. From the systems perspective Afriyie (1988) defines technology as encompassing: 1) the basic knowledge subsystem; 2) the technical support system (software); and 3) the capital-embodied technology (hardware). This perspective views that technology recognizes the need to identify the different elements of a particular country's technology that are complementary and mutually reinforcing. The previous studies done by the researchers have offered various definitions and concepts of technology from different disciplines, contexts and perspectives. Table 1 below shows a list

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In managing technology change in any organization, training and educating employees, who will use the new technology is central to its acceptance and adoption. Training and education has an impact on employee's ability to successfully absorb new technology and adapt to change. Training employee on the use and relevance of the new technology can be done through coaching and mentoring (Zerzan, Hess, Schur, & Phillips, 2009), hands on training (Anwar, & Shukur, 2015), instructor led classroom training (Gary, Kiraly & Maureen, 2019), and video training (Giannakos, 2013) among others.

Technology institutionalization

This is the process of embedding learning that has occurred by individuals and groups into the institutions of the organization including systems, structures, procedures, and strategy (Crossan & Bedrow, 2003). Institutionalization is the

process of ensuring that routinized actions occurs, which implies that there is a deliberate effort to embed knowledge at the organizational level so that it may persist and be repeated in the future with sufficient regularity so that it can be recognized as an institution of the organization. It equally distinguishes organizational learning from individual and group as it is through this process that ideas are transformed into institutions of the organization, which are available to all employees (Lawrence, Mauws, Kleysen & Dyck, 2005).

Technology implementation in contemporary business organizations should not be viewed as simple installation and one-off endorsement of technology; instead the organization should engage in the process of technology assimilation/ institutionalization to maintain its legitimacy, technical cohesion, and economic fitness on an on-going basis. Hence, it remains the fact that when technology is institutionalized, its usage within the organization becomes a routine activity, where organizational actors could not think about doing their day-to-day job responsibilities without using it. Technology institutionalization can be done in an organization through the following approaches: aligning new technology with organizational Structure and strategy (Nnabuife, 2009), customized training (Teixeira, 2014), aligning technology with work process and build team work (Nnabuife, 2009), and entrench consistent communication (Cameron & Green, 2004; Dauda, 2009).

Concept of Product Quality

Quality has been an elusive concept in manufacturing sector. It is the totality of features and characteristics of a product or service that bears on its ability to satisfy given needs (Chavan, 2003). It is one of the various competitive strategic instruments in businesses. Thus, companies have noticed that quality is an important and major factor for developing products and services to encourage sustained achievement (Boateng-Okrah & Fening, 2012).

Product quality is the compatibility of product use (fitness for use) to meet the needs and satisfaction of consumers, Juran in Nasution (2005). According to Kotler and Armstrong (2001), product quality is the ability of a product to carry out its functions, including durability, reliability, ease of operation and repair, and value attributes.

If a product fulfills the customer's expectations, the customer will be pleased and consider that the product is of acceptable or even of high quality. Chalotra, Golder, Mitra, and Moorman (2012) posited that product quality is attained by improving total management or production processes to produce uniform output of products, reduce mistakes and rework to assure customer

satisfaction and market share. Additionally, minimizing waste of manpower, machine-time, and materials to enhance or boost output with less effort to assure consumers' satisfaction and consumer product loyalty.

Product quality also means to incorporate features that have a capacity to meet consumer needs (wants) and gives customer satisfaction by improving products (goods) and making them free from any deficiencies or defects (Aggogeri & Gentili, 2008; Eckert & Hughes, 2010; Huehn-Brown & Murray, 2010; Juran, 2010; Hill, Zhang, & Gilbreath, 2011).

The quality of a product is linked with the product's reputation such as conformance: The finished products must conform (match) to the product design specifications. Reliability: The products must be reliable or dependable. They must not easily breakdown or become non-functional. They must also not require frequent repairs. They must remain operational for a satisfactory longer-time to be called a reliable one. Safety: The finished product must be safe for use and/or handling. It must not harm consumers in any way. Storage: The product must be packed and stored properly. Its quality must be maintained until its expiry date. Product quality is the life-support of quality control and it ensures that customer can buy high quality products or services with long-lasting reliability (Rosenfeld, 2009).

Product Quality Dimensions

Product quality can be determined by product features which matched the 8 (eight) dimensions namely, performance, features, conformance, reliability, durability, serviceability, aesthetics, and customer-perceived quality as stated by Garvin (1988) out of which two that are categorized as Product-based approach are considered (i.e. product Performance and product conformance).

Product Performance

This has to do with guaranteeing the expected Performance capability of a product which is the characteristic of operation fundamentals from product nucleus (core product). This dimension is related to product which is easy to operate, maintained and easy to conduct, product's ability to give benefits for everyday life and products have consumption efficient energy (Gavin, Kevin, & Jane, 2001; Juran, & De Feo, 2010).

Product Conformance

This feature mean that the product meets the predetermined specification set by the customer and regulatory authorities (i.e. Conformance to specification), by ensuring that the product or device characteristic and operation system fulfill specified standard. This dimension is related to standard which have been specified by the customer and the product regulators, like product which must fulfill SON standard as specified (Sebastianelli & Tamimi, 2002).

Theoretical review

Everett Rogers was well known for his book called "Diffusion of Innovation" (1962) in which he explains the theory of how innovations and ideas spread across the populations. He acknowledged that innovation is communicated by the process of diffusion in a social system. According to Rogers, Innovation Diffusion Theory seems to be the most popular theory for studying adoption of information technologies. Going by this theory, innovation connotes idea, process, or a technology that is perceived as new or not so familiar to individuals within a specific area or social system. Diffusion on the other hand is the process by which information about innovation moves from one individual to another over a period of time in a social system. Generally, there are four main determinants of success of an IT innovation. That is communication channels, the attributes of the innovation, the characteristics or the features of the adopters and the social system itself. The communication channels refer to the medium through which people obtain the information about the innovation and perceived usefulness. It consists of both mass media and interpersonal communication. The features of an innovation include five user-perceived qualities: relative advantage, compatibility, complexity, trial ability and observability. Relative advantage implies the levels at which the user perceives usefulness or improvements upon the current technology by adopting an innovation. Compatibility includes the level at which an innovation is consistent with the existing technical and social environment. Therefore, the more an innovation can integrate or coexist with existing values, past experience and the needs of potential adopters, the greater its prospects for diffusion and adoption.

The theory of Technology Acceptance Model developed by Davis (1986) is traceable to the theory of reasoned action. Technological Acceptance Model deals much more specifically with prediction of the acceptability of an information system. The cruise of this model is to predict the acceptability of a tool and to identify the modifications which must be brought to the system in order to make it acceptable to users. This model suggests that the acceptability

of any information or technology system is determined by two main factors, that is perceived usefulness and perceived ease of use. Perceived usefulness implies the extent to which a person believes that the use of a system will improve his performance. Perceived ease of use therefore signifies the degree to which a person believes that the use of a system will be effortless.

Conclusively, the study will make use of the two theories as they both address the main issues relating to the theme of this study which has to do with the general belief, trust in and wholesome agreement in the ability of Technology change management in enhancing organization's product quality and competitive advantage.

Empirical Review

Lucy and Janet (2016) investigated the effects of change management on the performance of employees in relation to technological changes, organizational leadership, structure and culture. The target population was 403 employees of the University of Eldoret, Kenya out of which a sample size of 121 employees were selected using simple random sampling technique. Data obtained were analyzed with the use of descriptive statistics and presented in graphs and tables. Findings from the study revealed that structural changes and organizational leadership influenced university employees' performance positively and that technological changes have a great impact on employees' performance and quality of output.

Shi, Wang, Sun and Zhen (2016) examined the impact of technological innovation on product quality: the moderating role of firm size, Total Quality Management & Business Excellence. The study empirically investigate the impact of technology innovation performance on product quality, considering the moderating effect of firm size. A conceptual model linking product innovation practice, process innovation practice, normal quality (NQ), attractive quality (AQ) and product market performance is proposed. The model is tested using survey data from 201 innovative Chinese manufacturing companies. The study made use of inferential statistical tools to analyze the data obtained. The results reveal that Technological innovation positively influence product Quality. Besides, Firm size moderates the relationship between TIP and AQ. The study contributes to a better understanding of how different-sized Chinese firms exploit technology innovation practice to improve product quality.

Gulin Idil, Sitki, Lutfihak and Selim (2016), sought to determine whether the relationship between technology transfer performance and quality

performance is mediated by total quality management in manufacturing firms. In this study, questionnaire was used to collect the needed data from manufacturing managers of two hundred organizations selected randomly from the largest and successful 1000 companies according to the classification of Istanbul Chamber of Industry in Turkey. The data collected were analyzed through the use of regression analysis. In the end, the findings revealed that technology transfer performance leads to superior product quality performance in the presence of total quality management. In other words, technology transfer performance has a positive and strong effect on the quality performance, considering the indirect route through total quality management. David and Zhao (2004) considers the issue of product quality and reliability when technology is transferred between countries with different levels of development. The study population consist 100 manufacturers and users of new tech machines in UK and China. Case studies and questionnaire surveys were undertaken among three company groups: UK manufacturers; Chinese manufacturers; Chinese users. The data obtained were analyzed through the use of descriptive statistic (simple percentages) Results showed that all the three groups, that is, UK and Chinese manufacturers and Chinese users of machine tools recognized product quality and reliability as key factors that best explain the commercial success of technology transfer.

However, experience from the past studies reviewed indicated that there exists as very scanty literature on management of technological change and its effect on organizations' product quality. This study enriches the existing work on the subject matter. In fact, few studies conducted on the management of technological change were conducted outside the shore of this country. In addition, the ones conducted in Nigeria were done on change management with little discussion on technology change management without consideration for textile manufacturing subsector.

Methodology

The paper examined the effect of technological change management on organisations' product quality of selected textile manufacturing firms in Lagos state, Nigeria through the use of a cross sectional survey design. The research instruments reliability test gave a Cronbach Alpha coefficient result of 0.82 which was above the threshold of 0.70 suggested by Nunnally (1978). Needed data was obtained with the use of a well-structured questionnaire distributed to 365 respondents out of the total population of 4115 employees of the five selected firms obtained with the application of Taro Yamane (1967) sample size determination formula. Out of the 365 questionnaire distributed to the respondents, 293 were filled and returned representing 80.3% response rate. A

multi stage sampling techniques (purposive sampling as the study target Textile firms, stratified as the questionnaire was distributed to respondents from each levels of management and simple random for selecting respondents from each strata) were adopted for the distribution of the questionnaire. The hypotheses stated for the study were tested using multiple regression analysis with the aid of statistical package for social science (SPSS) version 16.0 software.

Discussion of Results

H₀₁: Training has no significant influence on organization product performance

Table 1: Model summary of the regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.814 ^a	.662	.658	.83052

Predictors: (Constant), Video Training, Instructor Led Classroom Training, Hands on Training, Coaching and Mentoring

Dependent variable: Product Performance

Source: Researchers Printout (2020)

Table 1 above is the model summary of the effect of training on organizations' product performance, where correlation coefficient (R) and R² are 0.814 and 0.662 respectively. This explains that training of employee is highly and positively related with the performance of organizations' product. And that employee training variables explained for about 66.2% of the variation in the performance of the product of the selected textile manufacturing companies while the remaining 33.8% was explained by other factors not included in the model.

Table 2: Coefficients of the multiple regression

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.286	.164		-1.746	.002
Coaching and Mentoring	.503	.056	.412	8.967	.000
Hands -On-Training	.196	.054	.166	3.639	.000
Instructor Led Classroom Training	.099	.046	.073	2.150	.001
Video Training	.404	.046	.338	8.803	.000

a. Dependent Variable: Product Performance

Source: Researchers Printout (2020)

Table 2 above is a multiple regression coefficients where, Coaching and Mentoring, Video Training, Hands-on-training and Instructor led Classroom training were statistically significant at P value less than 0.05., thus affect organization's product performance. Besides, the beta values against each variable shows a positive and corresponding movement in the dependent variable. With this, the null hypothesis which states that training has no significant impact on organization's product performance is hereby rejected while the alternative hypothesis is accepted.

H₀₂: Technological institutionalization has no significant influence on organizations' product conformance

Table 3: Model summary of the regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.765 ^a	.585	.581	.67933
Predictors: (Constant), Aligning Technology with Work process and Build Teamwork, Consistent Communication, Align Technology with Organisational Strategy, Customized Training.				
Source: Researchers Printout (2020)				

Table 3 above is the model summary of the effect of technology institutionalization on organizations' product conformance. It shows correlation coefficient (R) and R² to be 0.765 and 0.585 respectively. This explains that technology institutionalization is highly and positively related with the conformance of organization's product. And that technology institutionalization variables explained for about 58.5% of the variation in the conformance of the product of the selected manufacturing companies while the remaining 41.5% was explained by other factors not included in the model.

Table 4: Coefficients of multiple regression

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.437	.127		11.272	.000
Align Tech with Organizational Strategy	.084	.038	.111	2.213	.002
Consistent Communication	.113	.040	.106	2.822	.003
Customized Training	-.086	.048	-.101	-1.797	.073
Aligning Tech with Work-process & build Teamwork	.529	.043	.718	12.428	.000

a. Dependent Variable: Product Conformance
Source: Researchers Printout (2020)

As shown in the regression coefficient table 6 above, align technology with organisational strategy and structure, consistent communication, and align technology with work process and build teamwork were statistically significant and thus affect conformance of the organisational product with probability value less than 0.05 while customized training was statistically insignificant to conformance of organization's product with probability value greater than 0.05. Moreover, customized training in addition to not being statistically significant also has a negative influence on organization's product conformance looking at its beta value. With this, it is suffice to say that technological institutionalization variables have significant influence on organization's product conformance. Therefore, the Null hypothesis is rejected while the alternative hypothesis is accepted.

Conclusion and Recommendations

Based on the findings as discussed above, the effect of technological change management in achieving the organisation competitive advantage of product quality is very obvious. This means that for easy accomplishment of product quality objectives, good management of technology change through training of employees and institutionalization of the new technology is inevitable. That is, it has become so imperative for managers to learn the way of achieving competitive advantage through product quality by managing technological change in the organisation as the world of business is getting increasingly volatile where only the fittest survives. By implication, this study concludes that managing technological change has significant effect on the product quality of the organizations studied.

Based on the outcome of findings, the following recommendations were made thus;

Since change is a fact of life, owners and managers of business organisation should endeavor to make employees' training and education a top priority most especially when new technology is introduced. This is very central to the attainment of competitive advantage through consistent production of products that have great potential to perform as expected.

Business managers should ensure that the new technology so acquired are institutionalized by incorporating it in to the structure, operation processes and procedures of the organisation to allow for a seamless operation that guarantees the stress less use of the technology and thus ensure product conformance to specified criteria by the organisation and regulatory authorities.

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