.

The Impact of Process Innovation on Organisational Performance

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Abstract: Innovation has been a major driver of economic and social development as the rise of modern industrial powers in North America and Europe as well as the economic success of many developing countries is based on rapid increases on the speed of technological process and managerial innovations. As such, the study endeavours to determine if Process Innovation has significant effect on organisational performance and also to examine if there is a significant relationship between process service modification and sales volume. 114 copies of questionnaire were administered to major telecommunication operator employees in Lagos State, Nigeria to get primary data that treated and tested appropriate research questions and hypotheses accordingly. The study adopted survey method and Cronbach Alpha for test retest reliability. SPSS was also employed in testing the research hypothesis. The study found out that process innovation has a significant effect on organisational performance and there exist a significant relationship between service modification and sales volume. The study recommends that there should be clarified objectives with the process innovation project which helped to visualize a future layout and also a clear linkage between suppliers and uncertainty reduction in the process innovation must be observed which reduced uncertainties in process times for the current state and the future.

Keywords: Innovation; Process Innovation; Process design; Organization

JEL Classification: M10; M19

1. Introduction

The importance of being innovative cannot be overemphasized, thus, (Vankessel et al., 2014) states, “Innovation has become a mantra: Innovate or Die. A company can’t outgrow its competitors unless it can out-innovate them. Surely everyone knows that true corporate growth springs from innovation. Process innovation is a type of process development which is the development of a firm’s manufacturing processes (Raza, 2014), and has been defined as the creation and implementation of

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new concepts and methods in manufacturing companies (Shahzad et al., 2012). This involves a number of heterogeneous activities such as introduction of equipment, new management practices, and changes in the production process (Tejada & Moreno, 2013). Performing a process innovation of a larger scale often causes the involvement of both organizational and technological changes (Cheng, 2014). To complete such a task, Kupper (2012) stresses the high importance of having a formal work method. This implementation sometimes also triggers supportive construction projects (Zakuan et al., 2010). The firm's ability to achieve process innovation depends on a set of parameters. For example on what overall method or strategy the company priorities, their cost focus, and to what extent the management is involved in the process innovation process (Wei, Minglang & Kim, 2014). A growing manufacturing strategy is the sustainability-related, which has been proven to be linked more to plant visibility compared with traditionally competitive strategy priorities such as cost, quality, and flexibility. (Thakur, Hsu & Fontenot, 2012) Plant visibility encompasses a greater international ownership or labour intensity, and being more responsive to stakeholder perceptions and pressure. This fosters managers to develop a strategy that goes beyond customer and suppliers, and nurtures positive environmental practice and outcomes (Sadikogln & Zehir, 2010). There are various sources of uncertainty. In the product context, it could be a matter of uncertainty in technology, durability or reliability. These uncertainties are however deeply tied to a trade-off between life cycle cost and the product specification (Al-Matari, Al-Swidi & Bt fadzil, 2014). Shaharoun et al. (2010) agree with this and stress that technology uncertainty directly affects the cost of the product and its development negatively. Another source is the individual, where uncertainty varies depending on the differences in cognitive processes and behavioural responses and repertoires. In addition, social expectation for the perception of uncertainty and the perceived characteristics of the environment can fuel uncertainty (Becker & Eager, 2013). This mean that the individual who lacks required knowledge, rules, skills, or information necessary to exchange with team members, also can be sources of uncertainty (Zakuan et al., 2010).

1.2. Statement of Research Problem

In the contemporary business environment, organisations experience stiff competition and fierce rivalry in virtually every industry. In order for these companies to remain relevant in the market, they must develop and adopt new strategic plans aimed at developing, implementing and providing Process innovations (Angel, Merorio & Lopez, 2013). The relevance of Process innovation to companies can therefore not be overemphasised as it serves as a vital competitive tool in manufacturing and oriented industries (Bogers, 2009). The following are the basic research questions which this study seeks to answer on whether process innovation have significant effect on organisational performance and to determine if

there exist a significant relationship between process service modification and sales volume?

Hypothesis One

H_{01} : Process Innovation has no significant effect on Organisational Performance.

Hypothesis Two

H_{02} : There is no significant relationship between Process Service Modification and Sales Volume

2.1. Review of Literature on the Concept of Innovation

The concept of innovation is one which can be defined on several bases which includes the essence of innovation, characteristic of innovation, innovation as a process, and so on. In essence, innovation involves intelligence (Alegre, Lapieda & Chiva, 2006). Today, a multitude of global challenges make policy goals centered on technological innovation even more important. Armbruster posit that global growth slowing as a result of the recession and commodity prices increasing due to geopolitical uncertainties, effective innovation can act as the vanguard against poverty resulting from these challenges. In addition, with the threat of climate change increasing, innovation and technology can act as a buffer in protecting the most vulnerable countries (Arshed, Asif & Baloch, 2012) While many governments recognize the importance of technological innovations, they often have a difficult time in clearly defining the concept of innovation and innovation policies. In addition, many misconceptions exist regarding the key constituents of these policies and how government can play a role in fostering innovation (Broad, 2006).

2.1.1. Purpose of Process Innovation

There are different reasons for using process innovation; the most common one is rivalry with the competitive companies that produce similar of the same product (Arshad, Asif & Baloch, 2012). Process innovation can slow down competitors by giving the company advantages from the manufacturing context, such as cost efficiency, production speed, and quality consistency (Chen & Queater, 2006). Caraco and Crifo (2014) agree on the possibility to gain competitive benefits by implementing process innovations, further adding that the innovation is an important source of increased productivity. Having an increased level of process innovation can also enable the evolvement of the company's products, and from this create more innovation project in the form of product innovation (Brettel, Mauer, Engelen & Kupper, 2012). However Doran & Ryan (2014) concluded that there is often focus groups within an organization that identifies areas of improvement for process innovation but introduction of new products could also be a trigger or opportunity to improve the production.

Hatmann (2006) brings up four types of benefits of effective process development efforts:

- First, benefits of the market position, meaning that the company is able to set the standard for the industry that becomes barriers to competitors;
- The second benefit is applying new technologies, which enable the company to overcome past weaknesses, and the process to reach its full potential. This is summarized as resource utilization. Renewal and transformation of the organization;
- The third benefit emphasizes organizational benefits. Positive outcomes associated with the process capture commitment, innovation, and creativity of the whole organization. In addition, it fosters new thinking, and increase the organizational ability to recruit the best people;
- Fourth advantage is the ability to speed up time to market, which provides a competitive edge, or delay development to acquire better information to bring products to the market better suited for the customers.

2.1.2. Challenges in Process Innovation

Process innovation can be a costly and difficult practice if the knowledge and experience is lacking. Letangule & Letting (2012) suggest that companies should invest in both technical and managerial innovations synchronously. Adoption of new technologies cannot be realized unless they work in harmony with new organizational processes and systems, since performance depends on how well innovation of different types advances organizational goals together. Corters et al (2012) also discuss how formalized roles in process innovation projects can have the adverse effect on its success. On the other hand, formalized processes are beneficial for reducing uncertainty. However, Shahzad et al. (2012) see a problem with introducing new process technology, other than all the uncertainties that need clarification, and planning that needs to be applied. The issue being that the company's products could suffer both from stops and quality. With an inflexible process line or a highly specific process solution, new process technology can possibly hinder product innovation. Product innovation and process innovation are considered to be interdependent (Ravichandram, 2007; Zakuan et al., 2010). Uma, Vinod, Danuta & Franck (2009) separates process innovation and product innovation, stating that industrial companies put resources into product innovation instead of process innovation, mainly because process innovation is communicated as a consequence of new developed products. By not having a focus on process innovation, disadvantages such as short time frames, decreased resource availability, increased maintenance demand rises when it is time to develop the production system. Thakur, Hsu & Fontenot (2012) claims that not even half of companies have a set of working methods when it comes to process innovation, accentuating that one important reason for this is the lack of effort and capital put into process innovation

in comparison to product innovation. Prajago and McDermot (2005) and Vankessel et al, (2006) both discuss the implications of using suppliers and external specialists. Raza (2014) argue for the usage of specialists both external and internal, since they bring an expertise to the project and view data in a different manner. Michal (2011) however, see the input from suppliers as something positive as they often strive to innovate, but using an external specialist or customer as a knowledge source could decrease the likelihood of a process innovation. An extreme form of outsourcing operational activities is virtual operations, which is relying on a network of suppliers that last as long as the project itself. The downside is the difficulty for a company to hold onto and develop technical expertise (Pokharel & Choi, 2015). This is also highlighted by Ota, Hazuma and Samson (2013) that barrier such as time, organizational structure, linguistic limitations, and cognitive effort is common. They suggest that this can be reduced by rotating staff in the organization. Although research effort has been spent in understanding the antecedents and consequences of process innovation (Vankessel et al., 2014). Managing uncertainties in this context of high uncertainties is common in current process innovation projects. Thus, it is regarded as one of the bigger issues for larger companies (Slack, Chamber & Johston, 2006). Prohalad & Hamel (2011) posit that process innovation technologies themselves often are unfamiliar to companies, achieving accuracy can be challenging when comparing two alternatives. Adding up with a limited specification of new processes makes it difficult to determine the technologies systematic impact of process ideas. This, together with weighing potential cost versus benefits can mean that a technology for process innovation gets excluded from further investigation (Sadikogln & Zehir, 2010). This is aligned with Galbraith (1973), stating that when engineers create new processes, the line requires rebalancing and more information processing. Lastly, Raymond, Aaron and Bertha (2006) suggests that there is a risk when trying to implement a manufacturing strategy based on sustainability since this is commonly more talk than action.

2.1.3. Forms of Uncertainty in Process Innovation

Galbraith (1973) defines uncertainty as the difference in the amount of information required to be processed among decision makers in order to perform the task at hand, and the amount of information the organization has. According to Zakuan et al. (2010) uncertainty arises in situations that are non-routine based. Thus, when uncertainty is high, the demand of information processing increases (Hung, 2007). Consequently, the presence of uncertainties pressures decision makers to search for additional information to commit to a decision (Maletic, 2014). The uncertainty is used both to express the probability of that defined assumptions during the design phase are incorrect, as well as the presence of unknown fact that can impact the future state of a product or system. Known uncertainties are often related to product properties, while unknown often are linked with an external context, both of them worth attention (Hatmann, 2006). This has led to the identification of numerous types

of uncertainties as pointed out by (Ota, Hazuma & Samson, 2013). Erkutlu (2011) specify bad planning, strategies and decision making can evolve uncertainties in the long term. For example changes in available resources. Fotopoulous & Psomas (2010) identify three factors that get affected by uncertainty; task characteristics, task environment, and inter-unit task interdependence. This was seen by Vankesselet al. (2014) pointed that uncertainties are caused by changes in the understanding of the problem in a task, or in the interaction with others who have a different understanding of the task itself. In addition to uncertainties related to products and people, there is also external uncertainty. External uncertainty can emerge from a market context, meaning that competitors, environment, and suppliers can be the source, or from political and cultural context such as regulations and warfare (Slack, Chamber & Johnston, 2006). Tejada & Moreno (2013) connects market related uncertainty to the ability to forecast, both the demand in resources and utilization, and the financial prospective return of projects. Uncertainty is evoked by equivocality. Bozena, Jens & Jorgen (2003) define uncertainty as the issue of different people or stakeholders experience altered interpretations of the same information. This, if handled poorly, could cause lessened clarity which could lead to even more misinterpretations. Furthermore, equivocality impacts the demand of qualitative information to perform tasks, both in the amount, and its richness (Broad, 2006). Equivocality is also an important factor for understanding the relationship between product development processes, structures, and performance (Shaharoun, et al., 2010).

2.1.4. Reduction of Uncertainty

Firstly, the relevance of knowledge changes quickly, and it is therefore important to address new situations and build an understanding around them (Slack et al., 2006). When it comes to uncertainty reduction tools, many have been suggested. For example checklist for capturing uncertainty depending on its form, resolvability, discreteness, and modeling approach, to reduce uncertainties (Ravichandram, 2007). Matrix that defines current and future uncertainties that can be converted to assumptions and tested (Raza, 2014). Sometimes, it is about using knowledge based behavior through trial and error (Wei, Minglang & Kim, 2014). Earlier research focuses more in the information processing to reduce uncertainty. For example Prajago & McDermot (2005) states that balancing the amount of information processing with the process requirements from uncertainty and equivocality, information processing capabilities and requirements will reach efficiency. Gavrea & Stegrean (2011) suggests two approaches to deal with information processing; either reduce the amount that needs to be processes, or increase the capacity to handle more information. Reduction can be achieved by creating slack resources, meaning increased resources such as time available in production to avoid missing targets, or by creating self-contained tasks, meaning that each group in the organization has all resources they need to perform their tasks. Increase capacity to handle more

information can be done by investing in a vertical information system, which enable to collect and direct information at appropriate time and places so that decision maker in the hierarchy does not get an information overload. The other way is to create lateral relations which are to decentralize decision-making without creating self-contained groups. This strategy has also been presented as a way of building common understanding of both the problem and the core process (Herrmann et al., 2006), and can ensure that the manufacturing process works properly during the product ramp-up (Ota et al., 2013). There are two types of uncertainties, organizational and resource, which especially fit into a process innovation setting. Raymond, Aaron & Bertha (2006) postulates that organizational uncertainty can be found within and between projects in the relationship between units and the transition from radical innovation to operations. Resource uncertainty is more focused on competence gaps. Zakuan et al (2010) conclude that by modeling the relationship between uncertainty levels and design process outcome helps in managing design processes and understand causes of delay. It also helps to show the relationship between the evolution of uncertainty levels and the organizations' ability in making decisions. In settings which are of non-routine character, people cannot rely on skills. Instead, knowledge based behavior through trial and error is used to reduce uncertainty (Maletic, 2014).

2.1.5. Managing Process Innovation

The development of process innovation is deeply connected to external factors, Wheelwright (2010) suggests three external forces that drive this development. Fotopoulous & Psomas (2010) emphasized that technology managers have to deal with more technology innovation, mainly since the innovation in manufacturing companies has increase along with the overall concerns about sustainability. This means that the technology manger's role is to support management and staff in order to understand, develop and implement process innovation technology for the sake of the firm and its surrounding stakeholder. This requires that the technology manager needs to be educated on how to manage teams, data analytics, and development techniques. The competitive market nurtures firms to be responsive to changes in customer expectation and technology. This also requires being fast on identify opportunities and bring products to the market. This development of the competitive market also means that fewer resources are being utilized to each development project which there by puts demand on efficient engineering, design, and development activities (Erkutlu, 2011).

According to Doran & Ryan (2014) point that there exist three different types of innovation with mutually dependent capabilities:

• Process driven: Traditional mature industries, relatively little product innovation, and intense process innovation focused on products at lower costs.

• Product driven: Industries with flourishing product innovation, and stable process technologies.

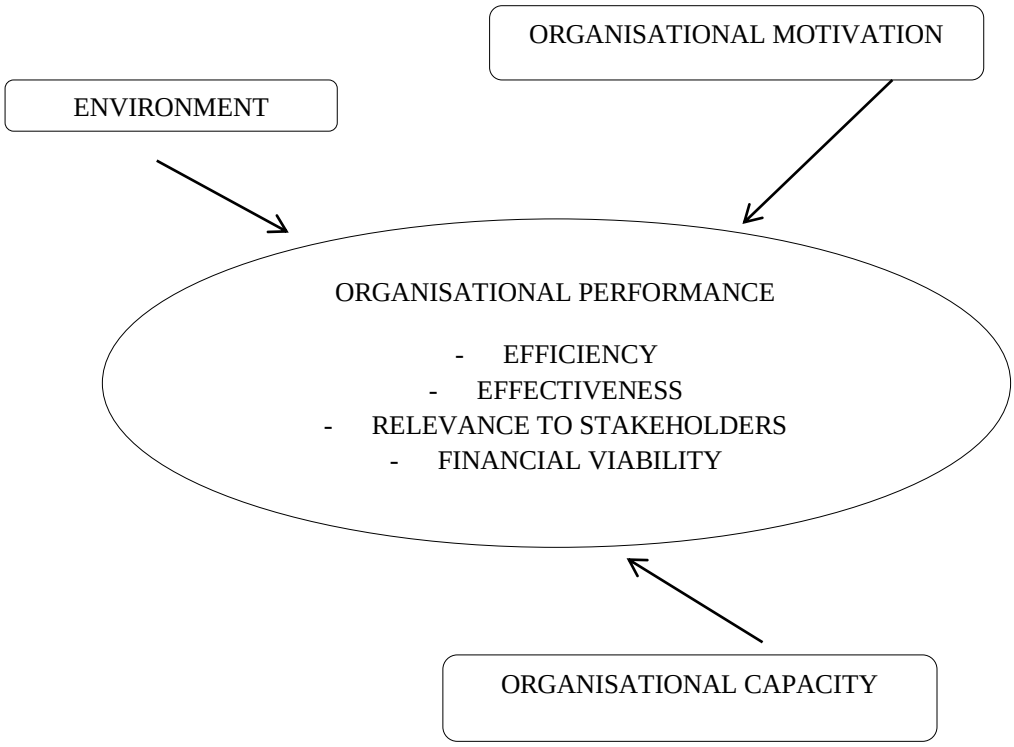
• Process enabling: Product and process technologies evolve rapidly and needs to be synchronized.

2.1.6. Process Design

Process design is more of an activity, where the form gets more detailed with time, with emphasis on understanding design objectives before proceeding. Haneda, Motheb & Thic (2014) also resembles process innovation with a project that consists of defined activity, unique task setup, and constellations of team members. Shaharoun, et al. (2010) postulates that resembles process innovation consists of defined activity, unique task setup, and constellations of team members. Firms that are able to introduce different types of innovations in tandem and have the ability to combine these are more likely to outperform firms that are not able to do so (Michal, 2011). One tool for improving processes design is process maps. By mapping processes, activities can be examined and cut down the unnecessary, which can reduce process time (Slack, Chamber & Johnston, 2006).

2.1.7. Conceptual Framework of Organizational Performance

As sourced from Prajago and McDermott (2005), the diagram below depicts the organisational performance framework



Source: Prajago and McDermott (2005)

Organisational performance is affected by capacity to achieve the performance desired. These capacities may result from internal sources like quality machinery, effective human input, and financial prowess. Capabilities may also result from the relations, partnerships, and alliances that an organisation has established with other firms over time.

2.1.8. Features of an Organization

Vankessel et al (2014) opined that Organisations, whether private business or government entities, profit-oriented or non-profit-oriented essentially have common features:

- It involves a group of people i.e human elements;
- Common interest shared among members of the organisation;
- Set objectives and goals which the organisation sets out to achieve.

Ota, Hazuma & Samson (2013) states other features of an organisation which emerge from the three aforementioned features include:

- **Organisational Structure**: It refers to the planned composition of the various elements that constitute an organisation in an order manner. Organisational structure consists of personnel, resources, communication channel, hierarchy of authority, plans, procedure, and programmes systematically assembled together towards achieving predetermined objectives.

- **Organisational Strategy**: Organisational strategy can be said to be ploys and tactics usually developed by top level management which is geared towards achieving planned goals of an organisation. There are three levels of strategy that exists in organisations. They include;

- Corporate-level strategy: otherwise known as grand strategy. It takes into consideration the organisation as a whole, comprising of several sub-strategies of the different sub-units/organisational divisions.

- **Business-level strategy**: which addresses a single business unit called Strategic Business Unit (SBU). This level of strategy focuses on the best ways of competing within a given business and also complements the corporate strategies

- **Functional-level strategy:** these are strategies that deal with the basic course of action at functional areas of the organization. It comprises of administrative, marketing, production, information technology, and human resources management strategies.

3. Methodology

Primary and secondary data was employed for the study. The population of the study was the staff of Etisalat Telecommunications Company, Nigeria with primary focus on the NNPC-Ikoyi branch. The questionnaires were structures in form of strongly agree (SA), Agree (A) Undecided, (U), Disagree (D) Strongly Disagree (SD). The study employed Yard's formula. This formula is concerned with applying a normal approximation with a confidence level of 95% and a limit of tolerance level (error level) of 5%.

To this extent the sample size is determined by [$n = \frac{N}{1+N_{e^2}}$]

Where: n = the sample size

N = population

e = the limit of tolerance

Therefore, $n = \frac{160}{1+160(0.05)^2}$

$$= \frac{160}{1+160(0.0025)}$$

$$= \frac{160}{1+0.4}$$

$$= \frac{160}{1.4}$$

= 114 respondents

A sample of one hundred and fourteen (114) employees out of the one hundred and sixty (160) employee population of the selected Ikoyi-Lagos Office branch of Etisalat Nigeria as calculated above. Cronbach's Alpha method was also used for measuring questionnaire reliability and SPSS was employed for the research in testing the research hypothesis.

4. Data Presentation

Table 4.1. Distribution of Respondents and Response Rate

Respondents Occupation	Questionnaire administered (sampled)	Percentage of total response (%)
Supervisory	45	50-0
Managerial	42	46.7
Executive	3	3.3
Total	90	100.0
Gender/Category	Questionnaire administered (sampled)	Percentage of total response (%)
Male	57	63.3
Female	33	36.7
No of Returned	90	78.95
No of Not Returned	24	21.05
Total no of Questionnaires	114	100

Source: Field Survey 2017

Table 4.2. Descriptive statistics of Process Innovation on Organisational Performance

Responses	Total (N)	Mean
Process Innovation & Organizational Performance		
Innovation is a key on-going element in your organizational culture	90	4.66
What are the likely outcomes for a company that continuously implements innovation in products/services?	90	3.88
Internet technology is relevant to the day-to-day official operations in your organization	90	3.82
Your organization encourages staff to be creative in discharging their day-to-day responsibilities	90	3.79

New ideas are always welcome by management	90	3.66
Service Modification & Sales Volume	Total (N)	Mean
The organization modifies its product offerings (services) frequently to suit the needs of the customers	90	3.87
With the adoption of automated service delivery tools (like computers and mobile phones), your organisation has been delivering higher quality services	90	3.78
The sales volume of your organisation is relatively small compared to other competing companies	90	3.47
In the last two years, your organisation has experienced steady increase in sales	90	3.58
Your organisation has flexible policies	90	3.73
Automation of service delivery system (i.e replacing human effort with electronic tools in service delivery) is largely adopted your organisation	90	3.42

Source: Field Survey 2017

Test of Hypothesis and Interpretation of Results

Regression analysis was used to measure the effect of the independent variable to the dependent variable of hypothesis 1, while in hypothesis 2 Correlation analysis was used to measure the significance of the relationship between the dependent and independent variables.

Test of Hypothesis One

H_{01} : Process Innovation has no significant effect on Organisational Performance.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.721(a)	.519	.485	.64386

Source: Field Survey 2017

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	37.192	6	6.199	14.952	.000(a)
	Residual	34.408	83	.415		
	Total	71.600	89			

Source: Field Survey 2011

a) Predictors: (Constant): internet technology usage, automation of service delivery, use of toll-free communication.

b) Dependent Variable: organisational performance.

Interpretation of Results

The results from the tables above revealed that the extent to which the variance in organisational performance can be explained by service process innovation is 51.9% i.e (R square = 0.519) at 0.0001 significance level.

Decision

The significance level below 0.01 implies a statistical confidence of above 99%. This implies that service process innovation has a significant effect on organisational performance. Thus, the decision would be to reject the null hypothesis (H0), and accept the alternative hypothesis (H1).

Test of Hypothesis Two

H_{02} : There is no significant relationship between Process Service Modification and Sales Volume

Correlations

		The organisation modifies its product offerings (services) frequently to suit the needs of the customers	In the last two years, your organisation has experienced steady increase in sales
The organisation modifies its product offerings (services) frequently to suit the needs of the customers	Pearson Correlation	1	.408(**)
	Sig. (2-tailed)		.000
	N	90	90
In the last two years, your organisation has experienced steady increase in sales	Pearson Correlation	.408(**)	1
	Sig. (2-tailed)	.000	
	N	90	90

Source: Field Survey 2017

Coefficient of Determination (C.O.D)

C.O.D = r2 × 100%

Where r = Pearson Correlation

Thus;

C.O.D = (0.408)2 × 100%

C.O.D = 0.19584 × 100%

C.O.D = 19.584%

r = 0.408 which indicate 19.584% shared variance between process service modification and sales volume.

Decision

{r = 0.408, p < 0.01, n = 90}. The study pointed out that there is exist a significant relationship between process service modification and sales volume, thus the null hypothesis (H0), is rejected and the alternative hypothesis (H1) is accepted.

Conclusion

It was gathered from the field survey that to continuously improve on products/services, an organisation must be innovative in service rendering/product development and engage in continuous marketing research. suggestions also came from the field survey that increase in sales volume and market share are the likely outcomes for a company that continuously implements innovation in products process/services. Organisations that seek to improve on their overall performance should therefore embrace innovation in process by adopting internet technology, automating service delivery systems, using toll-free communication, and other innovative process tools. The study concluded that technology manger's role is to support management and staff in order to understand develop and implement process innovation technology for the sake of the firm and its surrounding stakeholder. This requires that the technology manager needs to be educated on how to manage teams, data analytics, and development techniques. The competitive market nurtures firms to be responsive to changes in customer expectation and technology. This also requires being fast on identify opportunities and bring products to the market. Thus, organisations should develop structures on process innovation basis so as to be better in responding to the requirements of the organization.

Recommendations

- Firstly, process innovation should be driven by future environmental requirements and a desire to have a more sustainable pre-treatment process. The process innovation project must be supported through the creation of focus groups to strategically plan approach and to the process innovation. By conducting workshops the company will find new opportunities for innovation;

- Secondly, there should be clarifying of objectives with the process innovation project which helped to visualize a future layout. The uncertainties in process

innovation project mainly evoked from being first of its kind, the timeframe, lack of knowledge, and leadership;

- A clear linkage between suppliers and uncertainty reduction in the process innovation must be observed which reduced uncertainties in process times, for the current state and the future.

Suggestions for Further Studies

- Further research could also be carried out to identify new trends in services, and innovative approaches for rendering services by organisations to their customers;
- A larger sample size comprising of several organisations as case study can be used in order to obtain the impact of process innovation on the performance of several organisation. This would generate wider findings and establish more reliable generalizations;
- A comparative analysis between the impact of process innovation in the public sector and that of private sector of an economy can be carried out to determine in which sector it is more efficient and effective.

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