

## Technological Intelligence and organisational Performance: Moderating Role of Process Innovation

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### ABSTRACT

Previous studies have shown that technological intelligence is directly related to organizational performance. However, several studies indicated that the significance of the relationship between the variables must be moderated by other variables. Some authors argued that innovation plays an important role in the achievement of firm performance. Therefore, this study examined the relationship between technological intelligence and firm performance. It was observed that there is a gap in the relationship between technological intelligence and firm performance. In developing framework, this study integrated process innovation as a variable which mediates that relationship. This paper recommended that insurance companies should use their technological intelligence to enhance performance through process innovation.

**Keywords:** Technological intelligence, Firm performance, Process innovation

### INTRODUCTION

The importance of technological intelligence as a strategic and tactical resource is globally recognised as a source of competitive advantage in the business environment. Firms today are undergoing an increasingly competitive environment shaped by globalization, advances in technology, social and economic changes as well as fast shortening product life cycle which has led to hyper-competition ( Muthama & Ngugi, 2012). Conventional knowledge indicates that organisational performance depends on organizational capability and the owner's technological intelligence to establish technical threats and opportunities in the external environment and coming up with strategies aimed at ensuring organisational performance. Insurance penetration in Nigeria is one of the lowest in the world, about 86% of Nigerians do not have any form of insurance cover. Despite the fact that the Nigerian environment has a high and increasing level of risk, less than 2% of insurable risks are covered by insurance. The main reason given by Nigerians for not subscribing to insurance products is lack of awareness of the benefits. The emergence of Digital - Mobile Internet Penetration, Social Media, and E-commerce - presents new opportunities for insurers to expand insurance penetration, involve and

educate the public on the benefits of insurance products and eventually realize their prospects by increasing the contribution of the insurance sector to Nigeria's GDP. This digital activation guide takes a look at the current landscape of the insurance sector in Nigeria, recognises potential opportunities that insurance companies can leverage to compete positively and stay relevant in a rapidly connected world. ( Web coupers, 2016).It has been noted that changes in technology which is triggered by constant innovations, affect everyone's business. Intelligent organizations do not await change; but they vigorously monitor and keep an eye on changing environment and new innovations to benefit from them (Veugelers et al., 2010). While only few companies make use of technology competitive intelligence, other companies invest their intelligent efforts merely on their current status. Therefore, technological intelligence permits a firm to respond to threats from, as well as to identify and exploit opportunities resulting from technological and scientific changes. It is usually focused on technological trends and scientific breakthroughs and can develop information on opportunities as well as threats for the firm ( McGonagle & Vella, 2002).

The impact of technological intelligence on organisational performance has been one of the

significant issues discussed in Nigerian economy from the 1990s onward. Many empirical studies have been conducted in developed and developing countries in this regard. Although most studies have emphasised positive effect of technological intelligence on organisational performance, however, some have shown a negative effect, and which have led to some inconsistencies with regard to organisational performance. Consequently, the objective of the study is to examine the effect of process innovation on the relationship between technological intelligence and organisational performance.

### LITERATURE REVIEW

Different views and scholarly discourse are contained in this section along conceptual and empirical and theoretical lines on the subject matter of technological intelligence, process innovation, and employee productivity.

#### Conceptual Review

##### *Technological intelligence*

Technology intelligence is defined as information sensitive to business about the development of external sciences and technology that can affect the company's competitive position. Adopting technology intelligence is nothing more than an informal technology monitoring and is also a structured process that involves four major steps (Norling et al, 2000): firstly, planning, organizing and conducting competitive intelligence efforts, secondly, intelligent information gathering, thirdly, analysis of data and lastly, dissemination of results for practical uses.

Ashton and Klavans also defined technology intelligence as business sensitive information on scientific or external technology developments, opportunities and threats that can influence a company's competitive position. They have emphasised that technology intelligence has its focus on external organization problems, and is sensitive to business and pragmatic. The Coburn' definition of technology intelligence is presented as, the analytic process that changes the scattered information on competitor's technologies into appropriate and applied strategic technology about position, inclinations and amount of their activities.

There are two noticeable differences between the two definitions above: firstly, Ashton and Klavans define technology intelligence as information, but Coburn defines it as a process.

Secondly, while Coburn explains technology intelligence in relation to information, Ashton and Klavans ascribe it to any relevant external data, and emphasize that competitive advantage can be affected by the actions of competitors, as well as the influence of government, customers, suppliers, and scientific advancements (Courseault 2004).

Some of the advantages of technology intelligence are that, Technology-oriented competitive intelligence permits a firm to respond to threats from, as well as to identify and exploit opportunities resulting from technological and scientific changes. It is usually focused on technological trends and scientific breakthroughs and can develop information on opportunities as well as threats for the firm (McGonagle & Vella, 2002). This type of competitive intelligence, support innovation strategies as well as research and development, and has become a growth area within competitive intelligence (Correia & Santo, 2010). Other advantages include better communication, easy access to information, Social networking, efficiency and productivity, improved decision making and encourages innovation and

##### *Process Innovation*

“An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.” (OECD, 2005, p.46).

Process innovation is a type of process development, which is the development of a firm's manufacturing processes (Frishammar, J. & Hörte A.S. 2013), and has been defined as the creation and implementation of new concepts and methods in manufacturing companies. This involves a number of heterogeneous activities such as introduction of equipment, new management practices, and changes in the production process (Reichstein & Salter, 2006).

Process innovation capability can be seen as the firm's ability to acquire, assimilate, transform, and exploit technically related resources, procedures, and knowledge for process innovation purposes. Companies that develop and implement new process technologies quickly and effectively get competitive, for example by being protected from imitation (Pisano 1997, p.16).

Wheelwright (2010) 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 summarised as resource utilisation. Renewal and transformation of the organisation, the third benefit, emphasises organisational benefits. Positive outcomes associated with the process capture commitment, innovation, and creativity of the whole organisation. In addition, it fosters new thinking, and increase the organisational ability to recruit the best people. A 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

### *Organisational Performance*

Organisational performance has been identified as the central determinant of firms' competency in retaining customers (Yee, Yeung, & Edwin, 2010). Firm's performance measurement can be divided into two components namely financial performance (Kaplan & Norton, 2001) and non-financial performance, which respectively evaluates firms' monetary and non-monetary dimensions (Avci, Madanoglu, & Okumus, 2011). Financial performance reflects the firm's financial situation which can be evaluated using indicators such as profit margin, return on assets (ROA), returns on sales (ROS), return on investment (ROI) and others (Yee et al. 2010). Firm performance comprises the actual output or results of a firm as measured against its intended outputs.

Non-financial performance measures inherently focus on the long-term achievement of firms by concentrating on customer gratification, internal business process, productivity, invention, and employee fulfilment. Furthermore, dimensions such as quality of service, resource consumption, and invention are also influencing firm's non-financial performance (Zigan & Zeglat, 2010).

### *Empirical Review*

In a study to determine the influence of competitive intelligence practices in Essar Telcom (YU) K. Limited (Mutua, 2010) noted that to cope with the level of competition, firms adopted strategic actions which enabled market

penetration; specifically, differentiation and innovation for products were adopted. The study found that the players in the market had introduced cheaper but quality handsets that met the needs of the lower end of the segmented market. The firm was found to have used various competitive intelligence practices to gain understanding of competitor's future moves, analysis of competitor's strategies, and analysis of industry players' capability.

Wright, Fleisher and Madden (2008) examined the characteristics of competitive intelligence practice in R&D driven firms in the United Kingdom pharmaceutical industry. The study found that the state of competitive intelligence practice in the industry was both fragmented and embryonic. The background of those practicing competitive intelligence were found to have come largely from marketing, information and technology, technology and R&D. The sources and analytical tools most used by practitioners were customers, suppliers and distributors. The study found that the views of both senior management and other department heads on the contribution of competitive intelligence made to the overall performance were mixed or inconclusive.

Capatina and Samtani (2012) found that almost all the Romanian companies surveyed were very optimistic about the prospects for the software services industry in the future and that all seemed focused on innovation and creation of differentiated experiences for the clients. Increasing the client's efficiency and reduction of costs for doing business was found to be a top priority.

Most Indian firms found that the uncertainty in the environment was affecting business growth, and innovation also featured as a way of improving efficiency and reducing costs. Most of these companies were found to have adopted aggressive strategies to make the best use of opportunities being presented by the changing environment.

The big players were found to have focused on moving up the value chain while the others preferred to focus on their niche area of expertise.

Correia and Santos (2010) in an exploratory study of Portuguese biotechnology industry examined competitive intelligence as a source of competitive advantage. It was found that competitive intelligence activities were carried out in an informal way, mostly by the decision

makers themselves. Differences were also found in the level of informality in the competitive intelligence activities between the two organizations. The larger and older organization tended to be more formal in approach to competitive activities while the smaller younger organization was found to rely more on informal approach.

**Technological intelligence and organizational performance**

Empirical evidence has shown that there is a positive and strong relationship between technological intelligence and organisational performance dimensions as shown in the table below:

**Table 1.** Summary of Empirical Review of Technological intelligence and organizational performance

S/N	Author	Research variables	Findings
1	Fatemeh H., Habib E. (2014)	Competitive Intelligence, technology intelligence, business performance	There is a relationship between technology intelligence and business performance in industrial city of Ardebil with respect to market, competition and customer dimension.
2	Paul W., Hannah B., & Linda K. (2016)	Competitive intelligence, Technology oriented competitive intelligence, Firm performance, competitive strategy	The findings indicated that technology oriented competitive intelligence practice had a positive and statistically significant relationship with the performance with firms listed on the Nairobi securities exchange.
3	Abbas k., &Ebrahim H. (2016)	Competitor intelligence, market intelligence, technology intelligence, strategic innovation	The results showed that strategic intelligence and all its dimensions – i.e. competitive intelligence, business intelligence, technology intelligence and knowledge management- have great impacts on employees' organizational performance.
4	Fattaneh, N. G. Mehrdad G. C., & Mohammad, T. (2015)	Business intelligence, information technology and performance	Research findings indicated that technology intelligence has positive and significant impact on the performance of organisations
5	Asare Y O. & Emmanuel B. (2018)	Marketing Intelligence, Business Competitive Advantage, Internal Records, Competitor's Sales Data, Marketplace Opportunity, Competitors' Threats, Competitors' Risks.	IT technology have positive effects on innovation activities that would improve the competence, operational efficiency, productivity of employees, and ultimately their performance.
6	Ali K., Fahri S., Hakan E., &Tanyel C. (2016)	Competitive intelligence, technological intelligence and performance	The findings showed that implementation of TI methodologies enable proactive searches for information on potential technology-related developments.

Source: Literature Review

**Technological intelligence, Process innovation and organisational performance**

Empirical evidence has shown that process innovation has a strong effect on the

relationship between technology intelligence and organisational performance dimensions, as shown in the table below:

**Table 2.** Summary of Empirical Review of Technological intelligence, Process innovation and organizational performance

1	Indiran P. N. & Muhammad H. (2018)	Information technology capability and innovation capability	The results showed a moderate and statistically significant relationship between IT Capability and Innovation Capability
2	Gebremichael S. H. & Hou R. (2016)	Organizational learning, technological innovation, firm	The study result discovered that technological innovation capability has a mediating role on the relationship between organizational learning capability and firm

		performance, and Competitive advantage	performance. Moreover it has a direct positive effect on firm performance.
3	Philipp K. (2008)	Information technology, Innovation and Firm performance	It was found that all studied types of innovation, including Internet-enabled and non-Internet-enabled product or process innovations, are positively associated with turnover and employment growth.
4	Namchul S. (2007)	Information Technology, Innovation, Firm Performance, Organizational Changes.	Our results show that there is a strong positive relationship between IT innovation and firm performance as measured by Tobin's q and revenue per employee
5	Rytis K. , Rasa N. , Ausrine L., &Sigitas V.	Innovation, technological level, company's performance	The study found that high and medium-high-tech enterprises are superior in terms of productivity, volumes of export and indicators of return on assets, comparing to medium-low and low-tech enterprises.

Source: Literature Review

**Theoretical Review**

*Diffusion of Innovation theory*

The diffusion of innovations theory was propounded by Everett Rogers, and it explains how, why, and at what rate new ideas and technology spread.

The core assumptions of the theory are that diffusion research, canters on the conditions which increase or decrease the likelihood that a new idea, product, or practice will be adopted by members of a given culture and diffusion is the “process by which an innovation is communicated through certain channels over a period of time among the members of a social system”.

The theory considers a number of attributes associated with technological innovations and which are believed to influence the rate of adoption of the innovations. This theory is applicable to the study because innovations generated through research and development would need to be integrated with other business process to create a competitive advantage for the business in the market.

Diffusion of innovation theory explains the importance of technology intelligence in the process of identifying and exploiting scientific and technological opportunities, exerting a significant influence on the ability to innovate and is viewed as a major source of competitive advantage.

The theory is normally applied to the dispersion of technical innovation over a period of time by members of a social system. Karshen as and

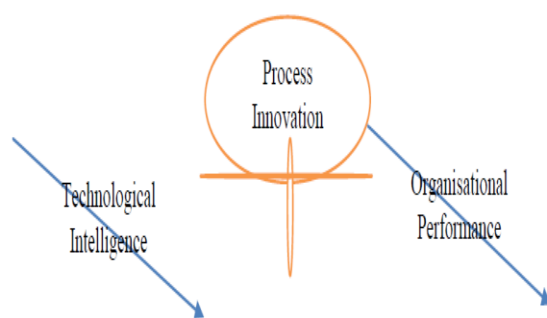
Stoneman (1995) indicate that the three main elements of the diffusion model are: identification of stages of diffusion, characteristics of innovation that impact upon the rate of diffusion, and the adopter's strategy. The innovation decision process is a process that occurs while individuals participate in a series of actions related to decisions. In the current competitive environment, innovation is generally considered a firm's core value creation capacity and one of the most important competitive weapons (Sandvik & Sandvik, 2003).

**MODEL DEVELOPMENT**

In developing a conceptual framework of the relationship between technological intelligence and organisational performance, variable process innovation can be used as a variable of mediation. The use of the process innovation as a variable that mediate the relationship between technological intelligence and organisational performance is based on the explanation given by some of the researchers in previous studies, where a component of the environmental factors will affect the performance of organizations, such as Indiran & Muhammad (2018); Gebremichael & Hou (2016); Philipp (2008); Rytis, Rasa, Ausrine, &Sigitas (2017).

Implicitly, Technology-oriented competitive intelligence permits a firm to respond to threats from, as well as to identify and exploit opportunities resulting from technological and scientific changes. It is usually focused on technological trends and scientific breakthroughs and can develop information on opportunities as well as threats for the firm

(McGonagle & Vella, 2002). This type of competitive intelligence, support innovation strategies as well as research and development, and has become a growth area within competitive intelligence (Santo & Correia, 2010). The objective of product innovation has a dual orientation: responding to customers' request for new products and fulfilling the executives' desire to capture new markets (OECD, 2005; Damanpour, 2010). Innately, it enables the organization to differentiate its products (Porter, 1985) and modify the offers to the customers (Bessant, et al., 2005) which is difficult to be copied or produced by other organizations (Gonzálezü Alvarez & Nietoü Antolín , 2005). In contrast, the process innovation is internally focused (Martínez-Costa & Jiménez Jiménez, 2009) and orientated towards reduction of the delivery lead-time and operational costs (Damanpour, 2010). It enables firms to benefit from cost leadership strategy (Ortega, 2010). The cohesive interrelationship between the product and process innovation capabilities allows firms to achieve competitive advantages both from differentiation and cost leadership schemes. Therefore, the technological innovation capabilities are the core resources to create and sustain the competitive advantages of the firms (Barney, et al., 2001). This in turn results in superior firm performance (Camisión & Villar-López, 2014).



**Figure 1.** Researcher's Conceptual Model

**Source:** Muritala (2018)

### METHODOLOGY

This study adopts a literature review of works of previous scholars.

### CONCLUSION

This paper studied the direct impact of technological intelligence on firm performance when mediated by process innovation. A literature review of past work of researchers was carried out and this validates the inter connection of the three constructs. The study

result showed that technological intelligence has a significant positive effect on firm performance. It also revealed that apart from significant positive effect on firm performance, process innovation mediates the relationship between technological intelligence and firm performance.

The study shows that technological innovation capability enables firms to develop unique new product at low cost facilitating toward the differentiation and cost leadership approaches. Similarly, Organizational learning capability is the source of unique, inimitable and infinite knowledge creation aiding firms to develop, maintain and use the dynamic core proficiencies. Based on the resource based view (RBV) technique both process innovation and technological innovation capabilities are core resources for sustainable competitive advantages which led to superior firm performances.

Some critical contributions can be derived from the review. First, the result obtained augments the understanding of the positive effect of technological intelligence on firm performance. Second, the review also, sheds light on the mediation role of process innovation on the relationship between technological intelligence and firm performance which is not yet well studied (Hailekiros & Renyong, 2015).

Managers and supporting organizations should not only focus exclusively on either technological intelligence or process innovation, but should give due emphasis on the combined and synergetic approach to get the maximum firm performances benefits from these capabilities.

### SUGGESTIONS FOR FURTHER STUDIES

Notwithstanding the contributions, the study has some limitations. Firstly, the moderating variable of process innovation aimed at the large scale companies. Large scale companies which are used as a basis in the arguments put forward are likely to have the staying power of influence of the environment and are relatively stable. Therefore, in future research, this framework can be proven by taking the unit of analysis on the insurance industry. Secondly, although these propositions are persuasive, there is yet no empirical evidence to support it. We know little about the interactive effect of technological intelligence and organizational performance, using process innovation as a moderating variable of insurance companies.

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