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The Impact of Technological Innovation on a Country's Development: A Case of Listed Companies in Kenya

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Abstract

This study focused on the impact technological innovation has on a country's development; a case of listed companies in Kenya. The objectives of the study were to establish the influence of technological innovation adopted in introduction of new products on sustainable development, secondly, to examine the influence of technological innovation adopted in introduction of new methods of production on sustainable development, to determine the influence of technological innovation adopted in opening new markets on sustainable development and lastly, to establish the influence of technological innovation adopted in sourcing appropriate raw materials on sustainable development. The study employed both descriptive and inferential research design. The research focused on 63 listed companies in Kenya which formed our target population. The research used self-administered questionnaires to collect data. The data was processed using statistical package for social sciences (SPSS) version 17, Descriptive statistics, Regression analysis and Chi square statistics were used for analysis. The results were presented in summary reports and tables. The study established that technological innovation plays a key role in enabling firms expand their markets both locally and internationally, therefore having a positive. Impact on the firm's revenue and consequently the country's economy. The study also stablished that technological innovation plays an important role in enabling firms source for raw materials locally or internationally therefore building on the inter-organizational communication and trade. The study also established that technological innovations can be used in the creation of new products that help a company achieve a competitive edge at a global level. The study concluded that technological innovations have a huge impact on a country's development and on an organization's sustainable development. The study recommends that governments should prioritize to support firms in employing technological innovation as this has a direct impact on a country's development. The study also recommended that public private partnerships between the government and private sector should be encouraged as this will enable both entities tap into each other's strength.

Keywords: *Technology, Innovation and Sustainable development*

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Background to the Study

Throughout history, from the discovery of fire, the invention of the wheel to computing, humanity has relied on innovation to progress socially, economically and in all other spheres of life. Gerguri and Ramadani (2010) define innovation as "the process of transforming new ideas or knowledge into new products and services" (p. 2). Innovation is concerned with developing or enhancing a particular product, service or process to find new and better ways of providing service or satisfaction. Consequently, innovation can be considered with respect to all aspects of life including education, health, and business among others. Additionally, although innovation, invention and creativity are often used interchangeably, Gerguri and Ramadani (2010) argue that they are significantly different, particularly in academic and scholarly work. While innovation is concerned with utilizing a concept in practice, invention involves the creation of a new concept and creativity refers to the process of coming up with ideas. Technological innovation is of paramount importance to the growth and performance of the globalized economy and consequently the development of states. Gerguri and Ramadani (2010) argue that technological innovation provides new technologies and products to address challenges in the global production system as well as introducing safer, faster, cheaper and better ways of producing, delivering and consuming goods and services. This is particularly important for the modern economies where production is globalized. In most cases, production is geographically separate from consumption and therefore, involves technologies to ensure that products and services are produced and delivered on time, without affecting the quality.

Additionally, the scarcity of resources, both artificial and natural, demand utilization of available inputs in a sustainable manner. Consequently, it becomes imperative to create, diffuse and sustain innovation. Economic growth and human welfare are some of the indicators of positive growth and development in a country. According to Benjamin and Rai (2008), there is both theoretical and empirical evidence that technological innovation helps secure economic growth in the long-term. As a result, technological innovation secures human welfare and development. In addition, innovation occupies center stage in addressing challenges associated with economic growth and therefore, facilitate economic growth and advancement of human health and welfare (Benjamin & Rai, 2008). For example, technological innovation can be used to mitigate disease and hunger as well as look for better diagnostic or treatment options, and therefore, secure the long-term health and welfare of people. Despite the correlation between technological innovation and development, the adoption and utilization of technologies around the world varies. In the last few years, technological innovation in the information technology sector has helped transform the business environment worldwide. Owing to advances in communication, there has been unprecedented growth in productivity, wealth creation and economic activities (Gerguri & Ramadani, 2010). For instance, teleconferencing capabilities have revolutionized business meetings and communication, while Web 2.0 has changed how marketers interact with their consumers. Most of the developed world have taken advantage of the latest technological advancements to further their economies.

According to Mugabe (2011), Organization for Economic Cooperation and Development (OECD) countries which include the United States, Spain, Switzerland, France, Belgium, Greece, the Netherlands and most of Europe account for 86% of patent applications filed in 1998 and 85% of all scientific and technical journal articles published globally. In Africa, technological innovation has been adopted to a lesser extent compared to the rest of the world, and particularly developed countries. According to a report by New Partnership for Africa's Development (NEPAD), Africa lacks adequate African-led innovation system out of the dependence on traditional development approaches in the socio-economic transformation of the continent (2010). This is despite the link between science, technology and innovation (STI) and the development of a country (NEPAD, 2010). South Africa, Malawi, and Uganda top the list of countries that spend the most on research and development (R&D) with 1.05%, 1.70% and 1.1% GERD percentage of GDP (NEPAD, 2010). According to a report by the World Bank, Kenya has a particularly strong base of public sector institutions mandated to carry out research and develop innovations (Oyelaran-Oyeyinka, 2007). However, there is lack of innovation priorities, adequate funding and sufficient knowledge and skills (Oyelaran-Oyeyinka, 2007).

Regardless, various authors have reported increasing technological innovativeness in the country and an increasingly competitive business environment as a result. Maingi et al. (2013) argue that innovativeness of the Kenyan financial sector including the expansive Savings and Credit Cooperatives (SACCO) system, robust and well-regulated banking systems, mobile money transfer platforms, and Islamic banking platforms, have all been developed in response to unique Kenyan needs. Companies listed on the Nairobi Stock Exchange (NSE) are particularly receptive to technological innovation. In a study to determine the factors influencing financial innovation of firms in the NSE, Mwangi (2007) found that regulation, high corporate taxes, fluctuation of interest rates and unstable foreign exchange rates influenced financial innovation of firms at the NSE. Research on the impact and contribution of NSE-listed companies to the development of our nation as a direct result of their technology innovation is arguably ambiguous and not extensively covered, hence the need for this study.

Technological Innovation

Innovations are classified into new or improved products meant for consumers as well as for organizations and institutions. The innovation strategies for developed and developing countries vary in design, implementation and purpose. Developing countries tend to concentrate on reinventing production and distribution strategies whereas developed countries lay more emphasis on offering inputs (Barrientos-Fuentes & Berg, 2013). The main impacts of innovation are socio- economic and environmental, although intermediate ones such as institutional, productive and scientific also result. Impact assessment is necessary to reveal the economic efficiency of innovations and ultimately its sustainability (Barrientos-Fuentes & Berg, 2013). Economic growth is the bedrock of national development. The growth of economies provides positive human index indicators, the development of infrastructure and other physical systems as well as improves in the social and cultural aspects of a nation's citizens.

On the other hand, economic growth is widely dependent on innovation. Technological changes occur at four different levels: product changes, process changes, shifts from products to product-services and systematic changes (Ashford & Hall, 2011). While product and process changes involve technological innovation on small-scale, systematic changes involve a total overhaul of the system and may have immense implications for a business and the industry in general. Although all of these technology changes ought to be considered independent of each other, no distinction will be made for the purpose of writing this thesis and will, therefore, be discussed together.

According to Rosenberg (2004), innovation is the single most important constituent of long-term economic growth. This is because the increase in the output of the economy is dependent on either increasing the number of inputs, which may not be feasible, or finding the means to increase the output using the same number of inputs (Rosenberg, 2004). The latter is possible, particularly with the use of innovations. Hence, technological innovations can improve the outputs of a production process through spurring the creation of new products, new methods of production, new markets and improving the sourcing of raw materials.

Technological Innovation and New Products

Technological innovations can be used in the creation of new products that help a company achieve a competitive edge. The new products are created from either scratch or existing products. The purpose of creating new products is to ensure variety to consumers such that their preferences and needs are met (Hauser & Dahan, 2007). Technology is not stagnant but continuously grows and provides new opportunities to develop and re-develop products. For example, since the introduction of the first modern computer in the 1980s, it has grown, shifted and advanced. Over time, the concept of computing has been applied to develop other products such as smartphones. However, technological innovation advancement is not linear and therefore, the creation of new products does not follow a linear path. In the example given above, computing cannot be said to be the sole source of the smartphone technology because it was preceded by the invention of the telephone, pagers and many other technologies that made a mobile phone possible.

In the case of business, technological innovation may or not be linear. In cases when a certain company champions for the development of a certain technology, all resulting products may not be necessarily as a consequence of other technologies. Regardless, new technology is an opportunity to make new products and services, which are improvements of the previous ones. It is an intricate process involving a deep understanding of the client's preferences, the technology available and what the suppliers and competitors are doing (Hauser & Dahan, 2007). It tends to be expensive with high initial costs and high failure rates. However, sometimes, the company gets it right, and the products are made and sold successfully. In Kenya, mobile telephony has grown exponentially and has thrived in all aspects, currently at 80.5% penetration (CA, 2014). However, internet penetration is currently low at 34% (CA, 2014). Kenya is well known for its creativity and innovation on the

mobile platform. Innovations such as mobile money e.g. M-PESA has had such a huge impact on the economic development. Progress made with mobile phone technology can lead to rapid improvements in connectivity.

In essence, the mobile phone has been concluded to be the most powerful marketing tool available for business entities: traders and buyers alike. Despite it being initially developed as a social interaction tool, it has evolved to be a powerful marketing tool completely revolutionizing connectivity for small holders in developing countries. Since the adoption of the mobile phone technology, various studies have observed enhanced communication, information exchange and service delivery innovation (Tickner, 2009, Donner, 2009). In Kenya, research done showed that mobile phones are used to obtain information regarding the market to make negotiations favorable and easier (Okello, 2010).

Technological Innovation and New Methods of Production

Technological innovation enables creation and recreation of new methods of production to facilitate cheaper, more efficient and timely production of goods and services. According to Kask and Sleber (2002), high-tech manufacturing causes an 80% increase in output while less than 20% of growth input can be attributed to an increase in inputs. The increase in productivity without much increase in the number of inputs is good for the economy and the society in general. It reduces the rate of depletion of resources and does not increase the consumption rate (Kask & Sleber, 2002). Production involves changing of raw materials to finished products and services and may include high or low technology application. Low technology production tends to employ more people than high-tech jobs for companies of similar sizes. In addition, low-tech production processes may involve more people doing casual jobs. The result is that the firm spends a lot of money paying wages and salaries without forgetting the cost of damaged products as a result of human error. Applying technological innovation in the production reduces the number of damaged products and ensures quality. Additionally, more goods can be produced per unit compared to a production system with a low-tech application. According to Rinnebach (2014), the aim of technology application in any industrial process is to ensure timeliness and detailed planning of the process. Consequently, technological innovation in the production process results in better ways of production as well as timeliness, quality, and reduced costs. The results of such a process are higher productivity, better profit margins and competitiveness in the market.

Technological innovation and new markets

Technological innovation facilitates the creation of new markets for products. For example, the development of the mobile money transfer technology in Kenya created and tapped into a new market comprising of the previously unbanked populace. Technological innovation also enables companies producing physical goods to explore and reach new markets. For example, the Internet is an innovation that opened new and almost limitless markets for companies through the e- commerce platform. A company does not have to be limited to its immediate market which is often geographically limited. Selling online and making deliveries to customers far way in other parts of the country or globe almost

exponentially opens the market for the said company. According to Rinnebach (2014), technological innovation creates geographical expansion and differentiation. Rinnebach (2014) also observed that traditional fashion markets in the US and Europe are saturated and therefore, emerging markets in China, India, the Middle East and Brazil are good alternatives.

Technological innovation and sourcing of raw Materials

The last few decades has experienced a shift in the sourcing behavior of many companies in many countries. With improved global security, transport, communication and relations, companies prefer to buy their raw materials from the cheapest markets which in most cases, are located in Africa and Asia. A study to investigate the impact of outsourcing strategies and specific IT applications on production and outsourcing found that technology was important in facilitating the two processes (Bardan, Mithas, & Lin, 2007). The researchers believed that the implementation of information and communication technology enabled the businesses to collaborate within and across organizational boundaries to support joint decision making, increase the visibility of suppliers' operations and facilitated information exchange. The ability to facilitate inter-organizational communication and cooperation is the hallmark of modern day technology application in modern-day business operations because technological innovation has made it possible for firms located in Africa, Europe or the United States to buy from China, Bangladesh, India, Malaysia and other Asia giants. Countries in Asia can produce high amounts of products at the lowest costs due to cheap labor and operating costs. Technological innovations enable companies sourcing from cheaper companies, in a timely manner and on a budget. In addition, they can easily transport their raw materials either by themselves or by use of third parties and be able to track their shipments real time. Furthermore, it is possible to source multiple materials from multiple nations and easily coordinate shipping. According to Rinnebach (2014), sourcing of raw materials from other places, often geographically distant places is enabled by advanced technologies. Apart from raw materials, production and almost every other part of business operations may be outsourced. According to Bardan (2007), outsourcing allows companies to leverage suppliers' complementary skills and resources to access specialized skills, technologies, and capacity.

Conceptual Framework

The Conceptual framework illustrates the relationship between the independent variables (determinants of) and the dependent variable (sustainable solutions of impact that innovation has on a country's development in Kenya). Various identified factors: demographic factors, availability of adequate resources and push and pull factors influence the attainment of sustainable solutions in Kenya.

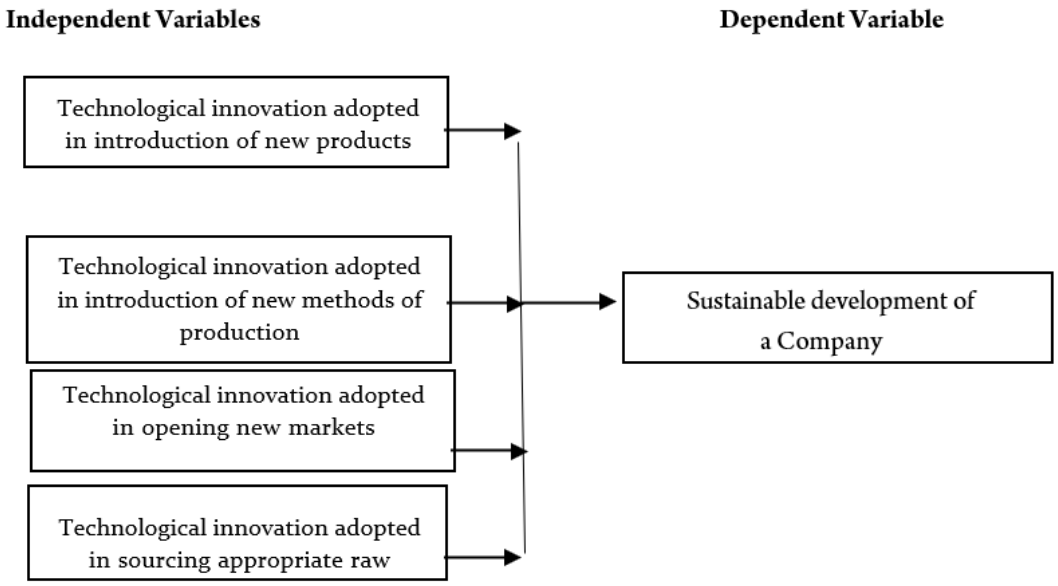

Figure 1.

Research Design

According to Ngechu (2004), a research design is a plan showing how problems under investigation are solved. This study has employed descriptive research. The purpose of descriptive research is to determine and report the way things are (Mugenda and Mugenda 2003). According to Kothari (2008) the main purpose of descriptive research is description of the state of affairs as it exists at present. The main objective of this study is to establish the influence of technological innovation on a country's development, a case of companies listed at the NSE, Kenya. The sustainable development of a company was compared against technological innovation adopted in introduction of new products, technological innovation adopted in introduction of new methods of production, technological innovation adopted in opening new markets, and technological innovation adopted in sourcing appropriate raw materials.

Summary of the Findings

The objective of the study was to examine the influence of technological innovation on a country's development with specific reference to firms listed in the NSE. Primary data was collected by use of questionnaires from specific firms listed in the NSE. This study sought to establish the influence of technological innovation adopted in introduction of new methods of production on sustainable development of a firm. This variable was found to be significant at 0.00 level of significance and [Exp (B) 7.14] indicating that it was important in influencing the sustainable development of a firm. This means that there is a positive relation between technological innovation adopted in introduction of new methods of production and sustainable development of a firm since the Exp (B) is greater than one. This study sought to establish the influence of technological innovation adopted in introduction of new products

on sustainable development of a firm. This variable was found to be significant at 0.02 level of significance and [Exp (B) 2.49] indicating that it was important in influencing the sustainable development of a firm. This means that there is a positive relation between technological innovation adopted in introduction of new products and sustainable development of a firm since the Exp (B) is greater than one.

This thesis sought to establish the influence of technological innovation adopted in opening new markets on sustainable development of a firm. This variable was found to be significant at 0.03 level of significance and [Exp (B) 12.46] indicating that it was important in influencing the sustainable development of a firm. This means that there is a positive relation between technological innovation adopted in opening new markets and sustainable development of a firm since the Exp (B) is greater than one. The other main objective of this thesis was to establish the influence of technological innovation adopted in sourcing appropriate raw materials on sustainable development of a firm. This variable was found to be significant at 0.04 level of significance and [Exp (B) 4.05] indicating that it was important in influencing the sustainable development of a firm. This means that there is a positive relation between technological innovation adopted in sourcing appropriate raw materials and sustainable development of a firm since the Exp (B) is greater than one.

According to Rinnebach (2014), the aim of technology application in any industrial process is to ensure timeliness and detailed planning of the process. Consequently, technological innovation in the production process results in better ways of production as well as timeliness, quality, and reduced costs. According to Rosenberg (2004), innovation is the single most important constituent of long-term economic growth. This is because the increase in the output of the economy is dependent on either increasing the number of inputs, which may not be feasible, or finding the means to increase the output using the same number of inputs (Rosenberg, 2004). The latter is possible, particularly with the use of innovations. Hence, technological innovations can improve the outputs of a production process through spurring the creation of new products, new methods of production, new markets and improving the sourcing of raw materials.

Conclusion

The study concluded that technological innovations have a huge impact on country's development
and on an organization's sustainable development.

1. **Technological Innovation in Introduction of New Products**
   Technological innovation is crucial in introduction of new products. As the findings indicated, most of the organizations used technology to introduce new products. Technological innovations can be used in the creation of new products that help a company achieve a competitive edge. The new products are created from either scratch or existing products. The purpose of creating new products is to ensure variety to consumers such that their preferences and needs are met.

2. **Technological Innovation in Introduction of New Methods of Production**
   Technological innovations are essential in introduction of new methods of production. Technological innovation enables creation and recreation of new methods of production to facilitate cheaper, more efficient and timely production of goods and services. Applying technological innovation in the production reduces the number of damaged products and ensures quality. Additionally, more goods can be produced per unit compared to a production system with a low-tech application.

3. **Technological Innovation in Opening of New Markets**
   Technological innovations play a significant role in opening of new markets as technology provides a competitive edge in terms of creativity, efficiency and cost reduction. Technological innovation enables companies producing physical goods to explore and reach new markets. For a country this is important as it has a positive impact on the economic development.

4. **Technological Innovation in Sourcing Raw Materials**
   Technological innovation has played a key role in enabling firms to source raw materials from other firms or countries for a more affordable price, technology also aids in overcoming geographical constraints. The ability to facilitate inter-organizational communication and cooperation is the hallmark of modern day technology application in modern-day business operations because technological innovation has made it possible for firms to source intentionally.

Recommendations

From the analysis, findings, and discussions of the study, it was found out that technological innovations are essential for a country's development. From the conclusion, not only does technological innovations aid in an organization's sustainable development, but they aid in efficient international trade and cost reduction. The researcher wishes to make the following recommendations:

i. The government should prioritize to support firms in employing technological innovation as this has a direct impact on a country's development. Support can be in the form of financial support, legal and regulatory support and access to market support especially within the global arena.
ii. PPP between the government and private firms should be encouraged as this will enable both entities tap into each other's strength. These include such as technological capabilities and innovation and skill set from the private sector, and financial capability and international reach from the governments.
iii. All organizations should be willing to employ new technological innovations in order to have a competitive edge and save both time and money.
iv. Staff training budgets should be set aside in order to make it easier for organizations to ease into daily use of technological innovations with a well-trained staff eager to be creative, efficient and attentive.

v. Research and development budgets should also be well utilized so as to encourage creativity within the organization and attract, nurture and retain top talents in an organization.

Recommendations

Since the study focused on firms listed in the NSE, it is suggested that the study be extended to other firms and institutions not listed to assess whether different findings may be reached regarding impact of technological innovation on a country's development.

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