



**SUSTAINABLE BUILDING DEVELOPMENT AND THE BUILT ENVIRONMENT IN NIGERIA:
A REVIEW OF THE IMPACT OF TECHNOLOGICAL INNOVATION**

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ABSTRACT

This study attempt to review the concept of sustainability, hence, sustainable development which stands for meeting the needs of present generation without jeopardizing the ability of the future generation to meet their own needs and offer a better life for everyone, now and for generation to come. The paper identified the attributes of sustainability associated with the built environment to include biophysical sustainability and technical sustainability and examine the concepts technological innovation and these attributes of sustainability. The examination in this paper revealed that the concepts of technological innovation agreed with the attributes of sustainability, hence sustainable development and built environment. The paper posit that technological innovation has great influence on sustainability of development and the built environment and also that sustainability of development spans from Environmental Assessment to environmental management system at development process, operation and demolition phases. The paper concludes that continuous technological innovation and implementation should be encouraged since it has positive impact on sustainability of development and built environment and recommend among others that a balanced progression of sustainability efforts should be maintained through technological innovation and implementation begin from environmental assessment through development phase and operation phase and the engagement of well skilled professional to implement the sustainability measure and in the conduct of the entire built environmental management system.

Keywords: *Technology, Innovation, Sustainability, built environment*

SUSTAINABLE DEVELOPMENT CONCEPTS DEFINED

Sustainability is a semantic modification, extension and transfer of the term 'sustained yield' and had been the doctrine and indeed the holy grail of development all over the

world for more or less two centuries. Sustainable is defined as been sustained, that is, being a method of using a resources so that the resources is not depleted or permanently damaged. Sustainability is concerned with how to maintained and even improve the quality of human life within the carrying capacity of supporting ecosystems (Williamson et al in Isiyaku 2009). Pius (2007), opined that sustainability is not only limited to the physical and the built environment but also to such areas as Agriculture, Trade, Economy etc. sustainability is a process which tells of a development of all aspects of human life affecting sustenance. It means resolving the conflict between the various competing goals, and involves the simultaneous pursuit of economic prosperity, environmental quality and social equity.

Therefore, sustainable development refers to a mode of human development in which resource use aims to meet human needs while ensuring the sustainability of natural systems and the environment, so that these needs can met not only in the present, but also for generations to come. It described efforts to guide economic growth, especially in less developed countries, in an environmentally sound manners, with emphasis on natural resources conservation. The term sustainable development was used by the Brundland Commission, which coined what has become the most often-quoted definition of sustainable development:” standing for development that meet the needs of the present generation without jeopardizing the ability of the future generation to meet their own needs. In other words, a better quality of life for everyone, now and for generation to come. It offers a vision of progress that integrates immediate and longer-term objectives, local and global action, and regards social, economic and environmental issues as inseparable and interdependent components of human progress. Sustainable development will not be brought about by policies only it must be taken up by society at large as a principle guiding the many choices each citizen makes every day, as well as the big political and economic decisions. This requires profound changes in thinking, in economic and social structures and in consumption and production pattern.

TECHNOLOGICAL INNOVATION CONCEPT DEFINED

Salge (2012), defined innovativeness as the company proclivity towards the adoption of new technology, thus representing its ability to adopt to different environmental opportunities. Frankelius, (2009) saw innovation as the application of new solutions that meet new requirements, inarticulate needs, or existing market needs. This is accomplished through more effective products, processes, services, technologies, or ideas that are readily available to markets, governments and society. The term innovation can be defined as something original and new that "breaks in to" the market

or into society. One usually associates to new phenomena that are important in some way. A definition of the term, in line with these aspects, would be the following: "An innovation is something original, new, and important - in whatever field - that breaks in to a market or society.

The role of innovation as a crucial driving force of economic development is widely acknowledged. In particular within the business setting, innovation is often considered to be a vital source of strategic change, by which a firm generates positive outcomes including sustained competitive advantage. Innovation itself is a broad concept that is conceived in a variety of ways. Innovation incorporate the adoption or/and implementation of a new defined rather in subjective ways.

The Technological Innovation System is a concept developed within the scientific field of innovation studies which serves to explain the nature and rate of technological change. A Technological Innovation System according to Suurs (2009), is a dynamic network of agents interacting in a specific economic and industrial area under a particular institutional infrastructure and involved in the generation, diffusion, and utilization of technology. The approach may be applied to at least three levels of analysis: to a technology in the sense of a knowledge field, to a product or an artifact, or to a set of related products and artifacts aimed at satisfying a particular societal function'. With respect to the latter, the approach has especially proven itself in explaining why and how sustainable energy technologies have developed and diffused into a society, or have failed to do so. The concept of a Technological Innovation System was introduced as part of a wider theoretical school, called the innovation system approach. The central idea behind this approach is that determinants of technological change are not only to be found in individual firms or in research institutes, but also in a broad societal structure in which firms, as well as knowledge institutes, are embedded. Since the 1980s, innovation system studies have pointed out the influence of societal structures on technological change, and indirectly on long-term economic growth, within nations, sectors or technological fields.

Technological Innovation System concept emphasizes that stimulating knowledge flows is not sufficient to induce technological change and economic performance. There is a need to exploit this knowledge in order to create new business opportunities. This stresses the importance of individuals as sources of innovation, something which is sometimes overseen in the, more macro-oriented, nationally or sectorally oriented innovation system approaches. Technological Innovation System approach often focuses on system dynamics. The focus on entrepreneurial action has encouraged scholars to consider a Technological Innovation System as something to be built up over time.

Technological Innovation Systems are defined in terms of knowledge/competence flows rather than flows of ordinary goods and services. They consist of dynamic knowledge and competence networks. In the presence of an entrepreneur and sufficient critical mass, such networks can be transformed into development blocks, i.e. synergistic clusters of firms and technologies within an industry or a group of industries.

ATTRIBUTES OF SUSTAINABILITY

Williamsom et al in Isiyaku (2009) pointed out that Sustainability is concerned with how to maintain and even improve the quality of human life within the carrying capacity of the supporting ecosystem. The issue of sustainability is not limited to the physical and the built environment but to all facets that comfort human life like agriculture economy etc. But the focus of this paper on the impact of technological innovation on the sustainability of development and the built environment generally. Humanity have the potential to make development sustainable. Hill and Bowen in Uche (2007) identifies four attributes of sustainability, thus social, economic, biophysical and technical sustainability. These attributes do not only act as the spine of sustainable development but they are referred to as pillars of sustainability. The built environment is concerned with the biophysical and the technical pillars of sustainability. These pillars of sustainability are further explained indicating approaches in evaluating the applicability and the importance of each pillar and it associated principles to a particular project. The principles of evaluation involves the following:

- Undertake prior assessment of proposed activities
- Involve people potentially affected by proposed activities in the in the decision making process in timely way
- Promote interdisciplinary collaboration and multi-stakeholder participation
- Recognize the necessity of comparing alternative courses of action
- Utilize a life cycle frame work
- Utilize a system approach
- Exercise prudence
- Comply with relevant legislation and regulations
- Establish a voluntary commitment to continual improvement of performance
- Manage activities through the setting, evaluation, feedback and self-regulation of progress

Identify synergies between the environment and development the contents of the attributes of sustainability directly associated with the built environment are summarized below:

Biophysical sustainability

- Extract fossil fuel and minerals and product persistence sustenance's foreign to nature at rate which are not faster than their slow redeposit in to the earth crust
- Reduce the use of the four generic resource used in construction namely; energy, water, material and land
- Maximize resource reuse and/or recycling
- Use renewable resources in preference to non-renewable resources
- Minimize air, land and water pollution at global and local levels
- Create a healthy non-toxic environment
- Maintain and restore the earth viability and ecological diversity
- Minimize damage to sensitive land scale including scenic, cultural, historical and architectural

Technical sustainability

- Construct durable, reliable and functional structures
- Pursue quality in creating the built environment
- Use serviceability to promote sustainable construction
- Humanize larger building
- Fill in and revitalize existing urban infrastructure with a focus on rebuilding mixed use pedestrian neighborhoods

SOURCES OF TECHNOLOGICAL INNOVATION

There are several sources of innovation. It can occur as a result of a focus effort by a range of different agents, by chance, or as a result of a major system failure. According to Childer, (2001) the general sources of innovations are different changes in industry structure, in market structure, in local and global demographics, in human perception, mood and meaning, in the amount of already available scientific knowledge, etc.



Three phases of the process of Technological Change

Source: Salge, (2012)

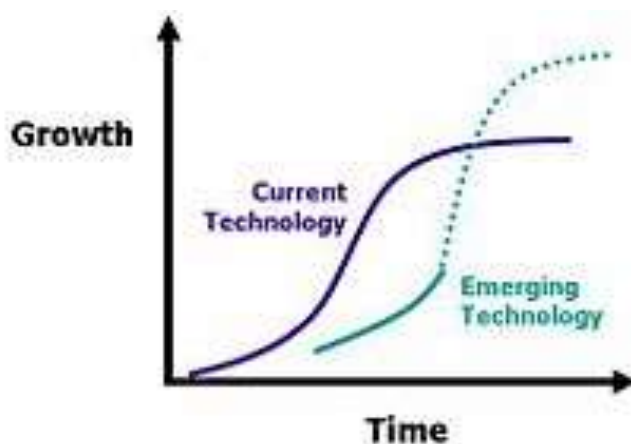
In the simplest linear model of innovation the traditionally recognized source is manufacturer innovation. This is where an agent innovates in order to sell the innovation.

Another source of innovation, only now becoming widely recognized, is end-user innovation. This is where an agent develops an innovation for their own use because existing products do not meet their needs. The robotics engineer Khan,(1995) asserted that innovations require only three things:

1. A recognized need,
2. Competent people with relevant technology, and
3. Financial support.

However, innovation processes usually involve: identifying needs, developing competences, and finding financial support. These goals vary between improvements to products, processes and services and dispel a popular myth that innovation deals mainly with new product development. Most of the goals could apply to any organization be it a manufacturing facility, marketing firm, hospital or local government. Whether innovation goals are successfully achieved or otherwise depends greatly on the environment prevailing in the firm.

Diffusion of innovation



Impact of technological innovation diffusion on growth

Source: Von, (1988)

STAINABLE DEVELOPMENT AND THE TECHNOLOGICAL INNOVATION

It has been pointed out previously that sustainable development is a development effort that seeks to address social needs while taking care to minimize negative environmental impacts. The attributes of sustainability that directly affect the built environment are the technical sustainability and the biophysical sustainability. The pillars of these attributes of sustainability can only be enhanced through technological innovation. For instance quality in creating the built environment and serviceability to promote sustainable construction with are the pillars of technical sustainability are directly affected by technological innovation. Sustainable growth of the built environment is also a function of advanced technology directly influenced by technological innovation.

CONCLUSION AND RECOMMENDATIONS

Nigerian built environment can be positively influenced by technological innovation. It is event from this paper that technological innovation has direct positive impact on the sustainability of development and the built environment generally. The pillars of technical and biophysical sustainability is seen to agree with the concept of technological innovation. This mean that technological innovation can positively influence sustainability of the built environment. The emphasis in this paper is that in sustainable development everyone is a user and provider of information. It stresses the need to change from old sector centered way of doing thing to new approach that involve cross-sectoral co-ordination and the integration of environmental and social concerns into all developmental process. This can only be achieved through technological innovation. The paper recommend among other that a balanced progression of sustainability efforts should be maintained through technological innovation and implementation begin from environmental assessment through development phase and operation phase and the engagement of well skilled professional to implement the sustainability measure and in the conduct of the entire built environmental management system.

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