

RESEARCH ARTICLE

Using Science, Technology, and Innovation (STI); in Achieving Sustainable Development in Developing Countries (DCs)

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Abstract

University-industry relations need to be strengthened; several institutions have technology transfer offices that assist in the formation of spin-off companies. On inventions and technologies, different commercialization routes, the functions of technology transfer offices, and diverse organizational structures will be examined. By showing current innovation and technology, this paper contributes to attaining sustainable development for developed nations by academic and agricultural industry report, development, and commercialization operations. This research aims to analyse and completely examine the scientific and technical literacy approaches for sustainable development in industrialized nations. The evident necessity of sustainable development on supporting scientific and technical advancement in the world's "developed," "developing," and "under-developed" countries is obvious. In this research, we look at how most countries maintain scientific and technical progress. The study also looked at the ideas that underpin the implementation of scientific and technical literacy, with a focus on sustainable development. As a result, proposals on how the Federal government or other agencies may promote sustainable in terms of science, technology, including innovation were made.

Keywords: Science; Technology; Innovation and Sustainable development

Introduction

Another vexing conundrum despite the continuous technological revolution, the majority of the world's population continues to live in abject poverty, with insufficient food, shelter, and electricity, and is afflicted by diseases that might be readily treated if clean water and basic pharmaceuticals were made available. Fortunately, a big number of erstwhile "developing" nations are now on the verge of development, thanks to technical transfer and breakthroughs that have benefitted and continue to benefit substantial segments of their people. Countries like China, India, Korea, Taiwan, Singapore, and, to a degree, Brazil, have pursued their own technical paths. However, the uses of technology remain a pipe dream for large areas of Africa, Asia, but also Latin America, despite the fact that new technologies such as photovoltaics, cellular phones, and indeed the Internet might help them "leap-frog" into the twenty-first century's technological development (Vergragt, 2006). "Development is frequently connected with diverse countries' scientific and technical breakthroughs. The so-called 'developing' nations of Africa may achieve progress, but the primary challenge is maintaining that development." (Ojimba, 2003).

The persistent contradictions between better lives for the wealthy few created and supported by technology to increase environmental degradation and deprivation for the large majority necessitate a deeper exploration but also

understanding of the nature of technology but also its partnership to society, particularly in the context of developing a sustainable, innovation, and creative society (Vergragt, 2006). In the context of efforts to accelerate a massive transition to a more sustainable global society, which will entail significant shifts in culture, beliefs, consumption patterns, governance, industry, and institutions (Raskin et al., 2002), the topic of technology's involvement becomes much more serious.

Technology has been at the forefront of development for centuries transitioning between different stages, passing through industrial ages to our now current technological age. The continuous innovation of technology is what led to the bringing of new products, processes and services enhancing good life to all citizens both rich and poor (Vergragt, 2006). Most of the products used in modern life are products of science; technology and engineering originating from resources extract and processed in industries (Kongoli, 2016) making Science, Technology, and Innovation an essential part of development.

Aim and objectives

The major goal of this article is to look only at sustainable development of rich nations and see how science, technology, including innovation might help developing countries attain the same or greater sustainable development. The following are objectives of the study:

1.To study the economic growth of the developing countries via the development and implementation of STI capacity.

2.To study the resources extracted and processed in industries making Science, Technology, and Innovation an essential part of development in developing countries.

To study the challenges for developing countries which will help in enhancing their ability to learn, adapt, and disseminate current and new information and technologies in order to promote equitable and sustainable development.

Literature review

According to (Calin S. Vac and Avram Fitiu, 2017), “We believe that these obstacles are natural, owing to the formation/deformation of every professional and psychological character over time, which is heavily impacted by the peculiarities of their own workplace. These hurdles result in communication and comprehension mistakes, which impedes the development of technology transfer initiatives and results in increased time and/or money expenditures, as well as the failure of expected output or outcome indicators. Based on the experience of a projects implemented inside the CPMTT and the effects propagated around them at the institution level (improving the mentality and education of our researchers via training and improvement projects in order to maximize their efforts but also yields on their areas of competence, but the use of Sustainable development like a catalyst institution in triple helix, their individual impressive results, but also by the institution—at a general level), We specify even a well sustainable development facilitates between both environments players, trying to make the activities compatible with one another and ensuring that all the indicators performed within the project are met, maximising the impact in the Economic and Social environment through specialised technology transfer services in solving societal problems, specifically in the field of agriculture).”

According to (Philip J. Vergragt, 2006), “We have attempted to demonstrate that steering technical progress in the path of sustainability through social helmsman ship is a difficult endeavor, as well as to suggest what is necessary to take it on. It asks for a shift in scientific attitudes, improved public awareness, the development of improved monitoring and forecasting systems in academia but also government, and, most significantly, a higher priority put on corporate social responsibility. Above all, it demands that the factors that are driving scientific and technical innovation—funding systems, military and economic interests, and consumers—be changed. It advocates for more openness in scientific and technology companies, so that society actors may better monitor, appraise, foresee, and influence changes early on. It advocates for fresh and comprehensive ideas of the scientific and technical underpinnings of a future society that is both sustainable and appealing, as well as one that

meets human wants and desires. It advocates for back cast and social experimentation, as well as innovative government models.”

According to (Trade and Development Board, 2018), “The 2030 Agenda for Sustainable Development calls for a transition that will be impossible to achieve without a concerted effort to bridge the technical divide between developed and poor countries. Technology and innovation must contribute to the economic, social, and environmental components of sustainable development. Policy frameworks for science, technology, and innovation (STI) will need to take into account new social concerns, engage new players, explore larger conceptions of innovation systems, and employ different ways to innovation. This note offers suggestions for how those new policy frameworks might be defined, as well as changes that might help align UNCTAD technical cooperation inside this area, such as the STI program review, also with Sustainable Development Goals, for consideration by the Multi-year Expert Session on Investment, Innovation, and Entrepreneurship for Constructive Capacity-Building and Sustainable Development.”

Science, technology, and innovation (STI)

The rapidly evolving and continuous dramatic growth in development over the last 20yrs is the result of combining science-technology-innovation system in a wide variety of social and economic objectives (Freeman et al, 2009). “Some developing countries have achieved significant economic growth through the creation and deployment of STI capacity” (UN, 2015).

The role of STI if implemented properly will promote the achievement of sustainable development. This role should include a full spectrum including women, young people, and indigenous communities.

“Political situation and well-functioning universities, an educated workforce, sensible research and education infrastructural facilities but also linkages among public and private innovation actors, enterprises dedicated to research and development, and a stable intellectual property rights (IPRs) structure are all necessary components of a well-functioning STI ecosystem.” (UN, 2015)

In developing countries, it is not just about implementing STI system in achieving sustainable development, another important aspect is the processes that will support and pave the way for the ability and involvement of individuals, businesses, firms, enterprises communities etc. STI system should penetrate and be implemented through different sectors such as health, agriculture, nutrition, marketing, management, and finance which will be drivers in achieving sustainable development. With the participation of this broad-spectrum, innovation capacity will gradually increase, leading to sustainable productivity and development.

However, developing nations' major innovation challenge is to improve their ability to learn, adapt, and disseminate existing and new information and technology in order to achieve sustainable and equitable growth. Exploiting the potential of newer technologies necessitates a learning and innovation-friendly environment. Developing nations should dedicate money, time, and concerted efforts to building and managing strong national innovation systems in order to gain more advantages from innovation (UN, 2018).

Social barriers affecting technological developments

Science and technology, according to seventeenth-century intellectuals like Descartes and Bacon, opened the keys to mankind's control over nature, something they considered as synonymous to human progress. The triumph of science and reason over superstitions and religion has been connected with the development of science and technology since the Enlightenment. Technological innovation always thrived because of knowledge based on observable observations but also rational thought. Technological innovation has long been associated with modernization and modernity.

From criticism of its reductionism through critics who underline those scientific truths are just as socially produced as a reflection on natural principles, the assumption that science represents reality or even ultimate truth has been questioned in numerous ways (Latour and Woolgar, 1979). Kuhn (1962) provided the framework for opposing logical positivism in his book *The Structure of Scientific Revolutions*, wherein he claimed that theories and facts had only meaning within a prevailing "paradigm." Latour and Woolgar (1979) Then, in an anthropological analysis of a modern scientific lab, he demonstrates how scientific truths are "socially produced" by scientists' interpretations of scientific measurements. As a result, the concept of "objective scientific truth" has been debunked. Following this study, the SCOT (Social Construction of Technology) hypothesis de-mystified technology (Pinch and Bijker, 1987; Bijker, 1995).

The concept of technology having undesired or unanticipated repercussions is equally new. Although the Luddites of such early nineteenth century broke machinery they saw as a danger to their jobs, and the Romantics condemned the dehumanising march of industrialization, it wasn't until the mid-nineteenth century that widespread fear of and opposition to technology emerged. Many individuals questioned the nature of individual scientist's ethical obligation after the atomic bombings of Hiroshima and Nagasaki unleashed immense carnage. To what degree is the scientist liable and responsible for the unintended and frequently unintended outcomes of his or her work? The idea of a self-evident relationship between societal growth and technical innovation has been called into doubt since then (Carson, 1962).

Decision-making on new technologies

Technologies co-evolve with societies (Saviotti, 2005), Technological advancements have an impact on society or vice versa. Who makes decisions on the development or direction of technological advances is a subject that is seldom posed and much less frequently answered. In the 1960s and 1970s, problems regarding expected and unforeseen repercussions, as well as the path and guidance of technological advances in science, technology, and society studies, technological prediction, and technology evaluation, were increasingly raised in academic circles (Smits and Leyten, 1988), technology policy, and appropriate technology (Vergragt, 2003). Military and business planners utilized most of these studies to better foresee and analyses the ideal courses of future technology, while others were employed to warn against potential disasters. The 1972 Club of Rome prognosis of an impending energy shortage and the potential of fossil fuel depletion is a well-known example.

Science and technology's evolution from tools to an all-encompassing culture appears to have disguised problems concerning their helmsman ship, particularly the potential of democratic choice directing them. Such questions were also obscured by the prevalent history and philosophy of science and technology (empiricism and logical positivism) that emerged in the 1930s, which claimed that scientific innovation is driven by innate human curiosity but that scientific discovery leads "automatically" to current technologies and commercial deployment.

Achieving sustainable development

Government

Government at all levels rank high among the most important drivers" (Verg, 2006) for achieving sustainable development. With proper embracement of the STI system especially in the fields of IT, Government is more qualified to be transparent and less prone to corruption. Therefore, it is important for the Government to realize and support all sectors of its country in the use of STI in achieving sustainable development. If the Government is on-board firsthand, its citizens will find it easier to transition and cope with technological changes making it sustainable and productive.

Government has the capacity to enforce strategies that will benefit its citizens in adapting to various trends in technology field ranging from health, finance, management, and nutrition. The government can build industries and support companies that will embed and standardize STI in its mission of sustainable development. The absence of Government will make achieving sustainable development using STI to have less impact, slow propagation and eventually lost its sustainability. Therefore, Government support cannot be overemphasized and is of high priority to the achievement of sustainable development.

Education and communication

There is a need for revolutionizing the education system of developing countries toward STI. Youths are the backbone of every country, especially in development. If the education system the youths are undergoing doesn't support sustainable development, the country will still be in the same place.

“The history of technology, cultural differences in technology, social forming of technological artefacts, societal processes and choice structures that frame technological innovations, and the repercussions of technology for society must all be taught in ways that engage learners in a greater knowledge of technical progress processes.”

The education system should connect culture, history, government, economy, and social values with STI. With this, a developing country will produce focused minds ready to lead it into achieving sustainable development.

Furthermore, considering mathematics is the foundation of science and technology, its level of understanding among developing countries needs to be elevated. There is a need to boost students love for mathematics; teachers to diversify their approach of teaching (Vac, S.C et al, 2015) all with the intention of sustaining scientific and technological development which will lead to achieving sustainable development.

Technology transfer among institutions and industries may accomplish a lot. "A collection of techniques that encourage overall transfer of new ideas, information, technologies, practises, and/or talents from one context to another," defines technology transfer" (Vac, S.C et al, 2015). "Technology transfer is a process of designating the official transfer to industry of discoveries coming from universities or detailed review, for commercial reasons in the form of new goods and/or services," according to the Organization of University Technology Managers" (Vac, S.C et al, 2015).

The most important factor in the success of technology transfer is the academic researchers' (Vac, et al, 2017). There is a need for relevant bodies to come together and establish a sustainable process through the Technology Transfer Office (TTO) to ensure positive mutual benefits between institutions and industries. Institutions and Industries should establish a proper understanding that will allow students to gain practical hands-on knowledge and industries to gain academic insight researchers. These way developing countries will reach a successful sustainable development.

Linking strategies

Developing countries should be able to review their existing strategic plans and be able to link it with trending STI framework addressing challenges, interventions, priorities, goals, and policies that will allow smooth transition among all sectors responsible for achieving

sustainable development using STI. They should come up with strategic plans that will meet “human needs and aspiration for freedom, belonging, and self-realization fulfilment as much as possible” (verg, 2006; Stutz, 2006). By looking into trends and development projected on how the future might look like and how they might get there, with this projection they can be able to determine their vision and build on it.

Self-organizing group

Citizens can organize themselves in ways that will foster the public good (Verg, 2006). These organizations are known as; Nongovernmental organization (NGOs), Self-Organization Groups (SOGs) are organizations that gain national and international recognition. They exist to address, solve, mitigate, or intercept issues that seem to be of concern in a community. These organizations can have an impact on the promotion of sustainable development in a country. Self-Organizing groups can gain influence within and outside a country thereby deriving the necessary strategy in promoting STI and achieving sustainable development.

Interaction

Like-minded people from different cultural and economic environments are already linked via the internet. This way so much can be achieved through discussion and interaction between experts in various fields of technology.

There are experts in the field of Artificial Intelligence (AI), Information and Communication Technology (ICT), Nanotech, Biotech etc. that are willing to help with resources to individuals ready to obtain them. By encouraging citizens and communities in tapping into these resources, developing countries can utilize this advantage and benefit from it thereby immensely saving effort and cost.

Business

Depending on the size of the business, whether \Multinational Corporations (MNCs) or Small-Medium Enterprise (SMEs) a business can decide to promote and implement sustainable development through STI within its business operations. Business can also contribute to its society by investing in research and development that will bring sustainable development in its environment. Stakeholders and entrepreneurs can orient business operations towards a standard that will enhance “environmental and Social Sustainability that will benefit its environment.

“Technological innovation is described as effectively bringing goods and processes to market that meet citizen-customer sustainability demands while also generating a modest profit for the company” (Verg, 2006). In this current era, businesses are already understanding and

accepting the role of STI in reducing cost, boosting productivity, and ensuring sound profit, however, stakeholders should realize it's not just about them, its more about how much sustainable development they can achieve together with its society.

Other programmes

Government, Stakeholders, Self-organizing groups, and other able sectors should be able to come up with creative programs that will promote sustainable development through STI. Programs such as workshops, TV shows, adverts, competitions, presentation etc. that will be done publicly or privately through media or at schools, workplace, markets etc. that will create awareness to the citizens of the country. Considering how media has dominated communication, it is a good channel that can be used in addressing issues of STI and fortifies the understanding of masses in achieving sustainable development through STI.

Discussion

As we can see, the "correct way" is not predetermined. It will include components such as a "good life" with "well-being" for everyone now and in the future, with protection of the Earth's biosphere, the eradication of poverty and associated health and housing issues, a sustainable agricultural and food system, and employment and leisure for all. If the correct drivers, institutions, and steering mechanisms are in place, technology may be able to assist in achieving this goal. In the second and last section of this essay, we'll look at "how to get there" and what mechanisms can aid society in developing the "correct" technology. Cultivating these conditions could serve as a springboard for building local, regional, and global policies and actions aimed at specific audiences in research, business, government, and non-governmental organizations. A call for a research and activity agenda backed by a group of devoted scholars, researchers, and activists might be the next logical step. When employing helix models to investigate innovation (ecosystems) and their growth with an emphasis on Civil Society participation, each region's innovation performance is purely reliant on the importance and growth of each sphere, and the strength of connection among them. As can be seen from the examples above, well-defined sustainable development could indeed drive innovation, promote new products, make it easier to commercialize research results on the industry, and generally enhance the overall transfer of technology process via all networks (program management, services, associative systems), thereby contributing towards both scholarly and agricultural industry study development. In fact, by solving societal needs and involving Society through open innovation ecosystems, a well-defined sustainability can bring but rather prove its advantages in the quadruple helix, and is the

reference strategy for the preparation of Innovation Techniques for Smart Specialization.

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