



Entrepreneurial opportunities in science and technology education for a diversified economy

Ibiyinka Ogunlade¹⁻³

1. Department of Chemistry, Ekiti State University, Ado-Ekiti, Nigeria
2. Visiting Professor at Afe Babalola University, Ado-Ekiti (ABUAD), Nigeria
3. Director of Children-in-Science and Technology (CIST), Nigeria

Article History

Received: 11 November 2016
Accepted: 09 December 2016
Published: January- March 2017

Citation


Ibiyinka Ogunlade. Entrepreneurial opportunities in science and technology education for a diversified economy. *Science & Technology*, 2017, 3(9), 20-27

Publication License



This work is licensed under a Creative Commons Attribution 4.0 International License.

General Note

 Article is recommended to print as color digital version in recycled paper.

INTRODUCTION

The role of human in wealth creation and overall influence on the economy of any nation cannot be overemphasized. This in turn could be hinged on the utilization of Science and Technology education in providing appropriate knowledge and skills for its citizenry which will enable them become creative and innovative, thus opening up new entrepreneurial opportunities.

Nigerian economy is heavily dependent on the oil sector. As at 2000, oil and gas exports accounted for more than 98% of export earnings and about 83% of Federal government revenue, as well as generating more than 14% of its GDP. It also provides 95% of foreign exchange earnings, and about 65% of government budgetary revenues. Prior to independence, agriculture was the main source of the nation's revenue, but the discovery of crude oil coupled with the high demand and astronomical rise of prices of oil in the global market led Nigeria to be over dependent on oil, to the neglect of other viable sectors in the economy. The proceeds accrued from the oil have been mismanaged with corruption as the hydra-headed monster. Focusing on only one source of revenue leaves the national economy highly vulnerable to fluctuations in supply and demand of crude oil (in terms of volume exported) and the volatility in oil prices, which makes planning for economic development difficult. Several studies including Leiderman & Maloney (2007) and Hesse (2008) in Nair *et al* (2011) have established that diversified economies in the long term perform better than mono-

cultural economies. One of the reasons for this phenomenon is enhanced learning, which occurs especially through manufacturing and ends up raising income and productivity levels within the economy. Hence it can be said that an economy needs to have a reasonable degree of diversification if it is to achieve sustained long-term economic growth and development.

CONCEPT OF ENTREPRENEURSHIP

A synthesized definition of entrepreneurship from various authors states "Starting a business from scratch." It is the capacity and willingness to develop, organize and manage business venture along with any of its risks in order to make profit. It includes the process of designing, launching and running a new business. It could also be defined as the process of bringing research from the laboratories to the market.

Entrepreneurship is about self-employment which will generate employment opportunities for others that must work with an individual as the work cannot be done alone. Entrepreneurship is the most effective method of bridging the gap between Science, Technology and the market. These entrepreneurial activities significantly and positively affect the economy by providing jobs and supplying goods, services, needs and requirements of the market. Creativity alone is not sufficient for innovation. Innovation also requires the development, production and implementation of ideas and for innovation to occur, the entrepreneur must possess not only business acumen but capability, ability as well as ingenuity with focus on all environmental factors to make significant impact. Nwafor (2007) stated that an entrepreneur must be skilled, confident, creative, and competent and disciplined enough to seize opportunities that present themselves, regardless of the economic situation. According to Okpara (2000), an entrepreneur is a human bulldozer who can convert a stumbling block into a stepping stone with the knowledge of Science and Technology. Entrepreneurship is concerned with wealth creation through the addition of value rather than its manipulation. Soyinbo (2006) analyses entrepreneurship as the process of identifying an opportunity related to needs and satisfaction and converting it to products and services of value.

ENTREPRENEURIAL OPPORTUNITIES AND INNOVATIVE ACTIVITIES

Nigeria is naturally endowed with entrepreneurial opportunities. However, the realization of the full potential of these opportunities has been dampened by poor national infrastructure, adoption of inappropriate industrialization policies at different times amongst other factors. Several policy interventions that were aimed at stimulating entrepreneurship development through small and medium scale enterprises (SME) promotion based on technology transfer strategy have failed to achieve the desired goals. This has led to the most indigenous entrepreneurs becoming distribution agents of imported products thereby jettisoning indigenous entrepreneurial capacity for manufacturing, mechanized agriculture and expert services (Thaddeus, 2012).

With the recent global economic crisis, virtually the whole world has embraced free enterprise economic system, thereby making entrepreneurship the cornerstone and mainstay of free enterprise economy which according to Afolabi (2015), involves discovery, evaluation and exploitation of opportunities to introduce new goods and services.

Studies by United Nations International Development Organization in Nigeria (UNIDO-Nigeria) in 2012 showed that Micro, Small and Medium Enterprise (MSME) have the propensity to drive the Nigerian economy. Data revealed that there are currently over 17 million MSME employing over 31 million Nigerians. MSMEs account for over 80% of enterprises that employ about 75% of the Nigeria total workforce. Therefore, formulating and effectively implementing MSME policies which represent ways of building capacity to engage in entrepreneurial activities. This is expected to play a central and invaluable role in helping Nigeria to diversify its economy; especially by reducing dependency on oil. In 2012, Global Entrepreneurship Monitor (GEM) empirically identified Nigeria as one of the most entrepreneurial countries in the world. The study showed that 35 out of every 100 Nigeria are engaged in some kind of entrepreneurial activities. It is therefore imperative at this point in time to critically examine and evaluate not just the principles of entrepreneurship but the practice and its critical role in economic growth and development as well as diversifying a developing economy such as Nigeria's.

ENTREPRENEURIAL START-UP PROJECTS

The bridging of gap between the town and gown can be achieved faster if entrepreneurship education is embraced in all institutions. Hence, the recent introduction of entrepreneurship activities in institutions of higher learning across the country.

Recently, Education Regulatory Bodies, such as NUC, NBTE, and NCCE designed and recommended entrepreneurship courses that will expose undergraduates to necessary skill acquisition, sufficient and relevant knowledge and required attitude for job creation and employment opportunities.

It is believed that the entrepreneurship education will inculcate in the students the capacity and ability to start, develop and run

profitable enterprises both during and after their graduation from the school system.

Start-up projects which are believed to require minimal capital to be sourced from government, non-governmental organizations and other funding agencies include but not limited to the following:

Small scale and medium scale enterprises and services which involve manufacturing using locally available human sources and raw materials. This cut across:

- Production of essential chemicals for agricultural, industrial and domestic usage.
- Pig, fish, poultry, snail farming as well as other veterinary services.
- Service delivery: e.g. Laundry services, school runs, reliable car pick-up, home service for the wealthy, busy individuals and the aged and so on.
- Food and food products such as yam, plantain, cocoa flour.
- Fabrication of machines and equipments for various designs of building blocks.
- Dress and bead making, dyeing and design materials.
- Making of detergents in different concentrations for industrial and domestic uses.
- Gift items: Utilization of locally available raw materials for souvenirs and gifts would help to preserve cultural heritage and identity as well as bring in the much needed foreign exchange and create employment/jobs for the Nigerian youths.
- Ornamentals: The use of ornamentals for scenic and aesthetic purpose continues to be a source of foreign earnings in most parts of the world; such include tropical flowers which are in high demand in the developed world. Nigeria, endowed with variety of flowers will generate substantial foreign currencies if many indigenous Nigerian tropical flowers such as *Anthurium spp.* in different colours, Ginger flowers of various colours, Sunflowers etc can be processed for export.
- Drinks: Beverages - alcoholic and non-alcoholic, such as Zobo, Kunnu, Soya milk. Raw materials for cocoa-based products and beverages which are in high demand all over the world can be utilized as a basic entrepreneurship opportunity start-up material if government and private investors can tap into the venture especially now that Nigeria is witnessing dwindling revenue from its major export product; oil and gas.
- Fabric: Use of imported clothing materials is a major drain of the lean foreign exchange due to high rate of foreign exchange. Hence aggressive use of locally manufactured clothing is imperative and all necessary area of this industry should be given comprehensive attention in order for the sector to be optimally developed.
- Cosmetics and Chemical/ Pharmaceuticals: A lot of cosmetic products with edible and non-edible oils as base are in abundance and can be developed for local and international use. Such include local soaps, Coconut oil and Shea butter, Moringa oil. Hair attachments and weave-on which are in high demands can equally be captured as a foreign currency earner.
- Skill acquisition in building materials and accessories making to complement building technology; such as paints making, tiling, aluminum materials and asbestos.
- Knowledge in computer application and services such as setting up internet connections, software development, hardware solutions and repair.
- Providing technological services in the area of alternative to power such as skills in inverter and solar panel production.
- In order to harness all the start-up projects, science and technology must play a prominent role.

SCIENCE AND TECHNOLOGY EDUCATION

Science is the systematic way of acquiring knowledge through observation, experiment, sometimes testable explanation and predictions about nature and the universe. Technology can be said to be the practical application of scientific knowledge. It can also be defined as the study of science and skills to design and produce resources for the benefit of the society. The relevance of Science and Technology education to entrepreneurial opportunities and hence national development cannot be overemphasized. Science and Technology is a basic platform on which other developments are hinged as illustrated in Figure 1. Science and technology is an integral part of the policy and strategy for national development, hence formulation of educational issues that will aid implementations and interpretations of such policies to make science and technology education have a meaningful and significant impact on all the facets of society must be put in place.

IMPORTANCE AND BENEFITS OF SCIENCE AND TECHNOLOGY

The advent of Science and Technology has brought so many improvements to mankind. Since the industrial revolution in the 18th century science has witnessed steady improvements. Some of the sectors which have been positively impacted by science and technology include energy, physical sciences, information and communication amongst others. The human society in general has enormously benefited from invention of technology. Infrastructure in our world has grown with the aid of science and technology.

Means of transportation by air, sea and land were realized and these benefited the society a great deal. In the past, almost everything was analog but thanks to science and technology, for the continuous digitization. The invention of the telephone and radio services has expanded human communication.

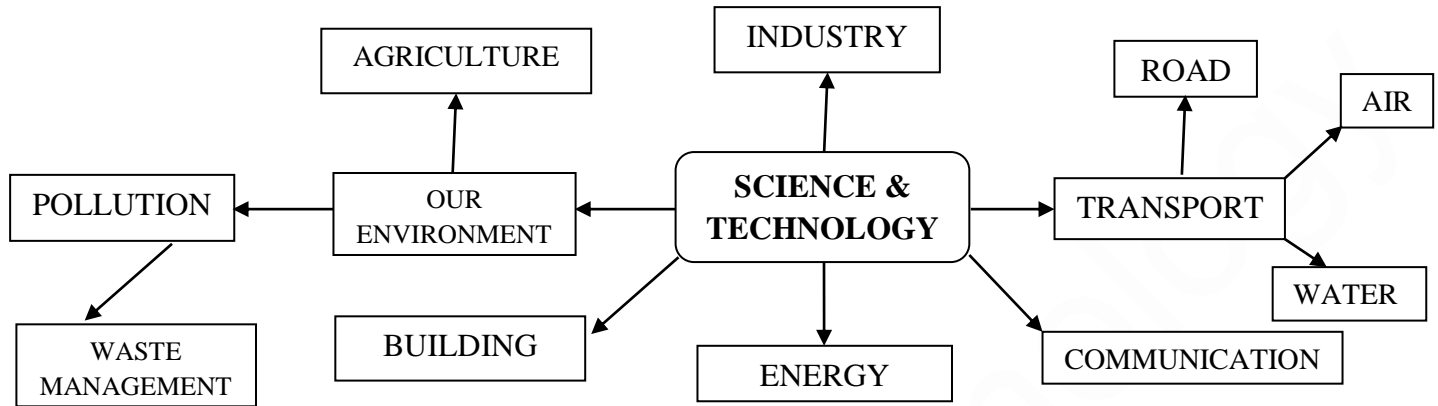


Figure 1 Relevance of science and technology to entrepreneurship opportunities

Some advantages of science and technology include improved transportation and communication, quality health care, easier methods of conducting business, and improved learning capabilities. The increased convenience of travel and improved levels of health care that have resulted from investments in science and technology have had a positive and significant impact on the society. Society cannot do without the industries as at today. With improved technology, time is no longer a constraint on communication. Technology has made the world a global village. Technological advances also enable people to access education from across the world. E-learning provides students with personalized educational resources that allow them to manage and control the process and content of their studies. E-learning tools and resources allow for immediate feedback on the learner's performance. It also connects students from different locations and makes the learning and collaboration experiences more enjoyable. Additionally, the combination of medicine and technology is paramount in the revolution of health care. Chronic diseases such as cancer are only treatable as a result of scientific and technological advances.

Science and technology education equips students with basic knowledge, life skills and scientific literacy which prepare them for the future. In a rapidly-evolving world, science and technology education is an instrument of utmost importance in the search for sustainable development and poverty reduction. In Nigerian context, educational system is faced with many challenges in science and technology. Some of the challenges are:

1. Falling enrolment
2. Increasing gender gap
3. Outdated and irrelevant curricula
4. Faulty teaching methodology
5. Lack of qualified and competent teachers
6. Lack of adequate infrastructure
7. Lack of role model
8. Scarcity of books
9. Communication gap between scientists and researchers' societies

However, these challenges can be surmounted with a diagnostic approach to the economy of Nigeria.

NIGERIAN ECONOMY: PAST, PRESENT AND FUTURE

Nigeria with a population of about 170 million people is comprised of different tribes of various socio-cultural and religious backgrounds. It is a middle income mixed economy and emerging market with expanding services, communication technology and entertainment sectors. As a nation, she is blessed with natural resources scattered all over the states of the federation. Fossil fuel and mineral oil and gas are found in the south-south, south-east and south-west; coal and lignite in the south-east; bitumen, also known

as tar is of large deposit in some parts of the south-west and south-south regions; solid minerals such as tin ore, columbite, tantalite, wolframite, thorite and molybdenite are found in sufficient quantities in the north, middle belt, part of south-west and south-south. Other natural metallic and non-metallic mineral resources found in different regions in Nigeria include lead, zinc, silver, gold, copper, iron ore, manganese, uranium, thorite, zircon, limestone, marble, clay, kaolin and so on.

Nigeria is ranked 21st largest economy in the world and largest in Africa in terms of Gross Domestic Product (GDP) which is the total market values of goods and services produced by workers and capital within a nation's borders during a given period (usually 1 year). It is also the 20th largest in terms of Purchasing Power Parity (PPP). The size of the economy is expected to increase with the manufacturing projected to be the largest on the continent. However, this could be hampered by underdevelopment coupled with years of mismanagement of the country's oil revenue and its vast resources. Economic reforms of the past decades have failed to put Nigeria back on track toward achieving its full economic potentials. Agricultural sector is largely subsistence, which has not kept pace with the increasing population in Nigeria. This has led to high dependence on large quantity of food imports.

After the global meltdown in 2009, several domestic economic outputs have been driven by entrepreneurship with several sectors contributing to the GDP of the countries. Nigerian GDP growth in 2016's two consecutive quarters has been negative. It is no longer news that the present situation of Nigerian economy is precarious as it is in the middle of a recession. This has in turn affected the interest rate which is put about 30%. The recession has taken its toll on every facet of the lives of the citizenry as there is untold hardship due to high prices of commodities. Premium Motor Spirit (PMS) also known as petrol is currently sold at N145 per litre. A bag of rice is currently sold for N32,500. The unemployment and underemployment rates are at 12.1% and 19.12% respectively and are still growing. The level of inflation is in double digit while Naira to Dollar exchange rate is over N400 to \$1. Youth employment is at 42.24%. The stock market value is on a continuous steady decline. Loss of jobs is common while the country's purchasing power is rapidly declining.

Having crude oil as the chief source of revenue earner has made Nigeria to be classified as a mono-commodity based economy, thereby causing economic crisis and with the recent drop the prices of crude oil in the global market, the present economic situation calls for an aggressive diversification of the economy. An essential requirement in sourcing for other economic activities is INNOVATION, which is defined as the ability to achieve change that creates a new dimension of performance that is novel to the national economy.

DIVERSIFICATION OF ECONOMY

A diversified economy is that which has different revenue streams and provides a nation with the ability for sustainable growth because of elimination of sole reliance on one particular type commodity for its revenue.

It can also refer to the diversification of markets for exports or the diversification of income sources. This economic concept equips a nation with the security and reliability that it needs to cushion the effects in the case of a revenue stream failure. A well diversified economy can withstand the adverse impacts or shocks from external events while fostering robustness, growth resilience over long term. Economic diversification in its standard usage, either in terms of the diversity of economic activities or markets, is a significant issue for many developing countries, as their economies are generally characterized by the lack of it. They have traditionally relied heavily on the production and exportation of primary commodities that are predominantly vulnerable to climate variability and change. Nigeria, should borrow a leaf from the Gulf Cooperation Council states such as United Arab Emirate, Qatar and Bahrain. They have successfully diversified their economies and reduced dependence on oil and low-wage expatriate labour and refocused it on other economic activities. The new economic activities involve tourism, education, solid minerals exploration and exploitation, production, construction and other service sectors. As a matter of fact, researchers are able to point to empirical evidences that list diversification as one of the primary reasons that an economy is less likely to be volatile.

Benefits of Diversification

Diversification when implemented properly and appropriately makes a nation's economy robust, stable and ensures resilient growth over long term. Greater diversification would:

1. Reduce shocks to volatility and uncertainty in the global oil market
2. Create private sector jobs
3. Increase productivity and sustainable growth, and
4. Establish viable non-oil based economy, that will be needed in the future when oil revenues dwindle further or ceases outright.

Factors Affecting Diversification of the Nigerian Economy

I have strong convictions that successive governments must have made some efforts at diversifying the Nigerian economy but some

factors must have been militating against such efforts. The factors in my opinion are as follows:

1. Lack of political will to implement previously proposed diversification plans and road maps
2. Decay in the country's educational system
3. Incessant corruption at all levels of government
4. Insecurity of all sorts; such as food insecurity
5. Lack of patriotism – (I want to call our attention to 2nd stanza of the Nigerian National Anthem and Pledge)
6. Lack of proper control, management and governance at all levels of government
7. Lack of initiative and creativity
8. Erratic power supply
9. Unavailability of potable water
10. Poor health care system
11. Poor road networks and transportation systems
12. Misplaced priority
13. Relatively expensive communication tariff

Way Out and Way Forward

The way out of this economy downturn is to think nature, act nature and go back to the nature. All we are saying is Agriculture is the way out. A nation that cannot feed its people cannot survive and thrive

As a nation, we must all come together to help the country and bring it out of its present economic woes through innovative ideas. Nigeria must be self-reliant; in order to achieve this feat, our children, our youths, our future need re-orientation at an early age. Science and Technology education must be given priority.

Personal Contribution to Science and Technology Education in Nigeria

Chairman, Distinguished ladies and gentlemen, permit me to inform this audience that realizing the gap in our educational system, I started a crusade over two decades ago, here on this campus Adeyemi College of Education, Ondo by initiating a project in 1992, aimed at catching them young for science. This is tagged "Children Science Clinic (CSC)", designed for African children, aged 5 to 12 years through out-of-school activities, community-linked and integrated approaches.

The objective of the project is to develop scientific skills in children and motivate them through science drama, science exhibitions, competitions and excursions to science-based industries within their immediate environment. The skills acquired enabled the children initial ideas to be linked to new experience as discussions of scientific ideas, principles and concepts are handled by professionals as role models, using activity based and child-to-child approaches (Ogunlade, 1999, 2005, 2015).

The effect of the workshop series on the performance of the children was assessed using various methods such as verbal, written and formal evaluation pre and post workshop tests. At exactly a decade of the operation of Children Science Clinic, the phase two of the project was launched also in this citadel of learning, on the 5th of November, 2002, tagged Children-in Science and Technology (CIST). The aim of CIST is to popularize science and technology among children for self-reliance, through workshops, talk shows, role modeling, seminars and conferences.

It is gratifying to inform this gathering that CIST has become a household name within and outside Nigeria, since its inception with various workshop and conferences held in different locations in Nigeria, Ghana and Tanzania.

It is my belief that with CIST, the rate of unemployment will be drastically reduced and our youths will be successful entrepreneurs.

CONCLUSION

This paper has elaborated on the need for diversification and the importance of science and technology education in the diversification process. The Nigeria economy has to be diversified away from crude oil and have other means of revenue generation. There is a need to create awareness and inculcate the spirit of science and technology education in our schools right from the primary level. The science and technology curricula should address issues that are typical to our environment and culture. Science concepts and fundamental principles must be integrated to make science fun to all including children. This will make science education become more meaningful, less abstract and more practical. Students of various branches of physical and chemical sciences and technology should be empowered with technical, practical and applied knowledge and skills with which they can be self-reliant, hence become self-employed and employers of labour. Finally, quality science and technology education is essential in achieving an appreciable level of entrepreneurship opportunities which is essential for the diversification of the Nigerian Economy

which will reduce poverty and make sustainable national economic development a reality.

Recommendations

Mr Chairman Sir, may I propose the following recommendations:

1. There is a need for stepped-up investments by both government and private sectors in education, especially in science and technology, technical and vocational education.
2. Investments in physical infrastructures, and strengthening of the legal and regulatory environment to reduce the cost of doing business (including providing free trade zones) should be encouraged.
3. Encouragement of entrepreneurship and innovation through improved access to information, communication technology, and finance, together with aggressive investment in Research and Development (R/D)
4. Science and technology education should be made a priority by government in the broad national development strategy.
5. Demonstration of political will by the government in working to rebuild the Nigerian economy through science and technology education.
6. Constant and aggressive media awareness to promote science and technology education and programmes that will inculcate in the Nigerian youths the value and importance of science and technology education to national development.
7. Provision of intermittent courses, capacity building, training and retraining in science and technology education for professional development.
8. Bridging of gaps between science, technology and the public.
9. The Federal Ministries of Science and Technology and Industry Trade and Investment should, in regular consultation with our universities, design various business models with locally sourced raw materials that entrepreneurs can tap from.
10. Universities offering entrepreneurship education should be close to industries for practical exposure of the lecturers and students to create awareness of different business models and opportunities.

REFERENCE

1. Abumere, D.I., Agweda, F. E., Garuba, M.A. (2012). The Contribution of Science and Technology Education to National Development: The Nigerian Experience. *Journal of Education and Practice*, 3(1), pp. 20 - 21.
2. Afolabi, A. (2015). The Effect of Entrepreneurship on Economy Growth and Development in Nigeria. *International Journal of Development and Economic Sustainability*, 3(2), pp. 49 - 65
3. Atkin, J.M., Black, P. (1997). Policy Perils of International Comparisons. *Phi Delta Kappan*, (September), pp. 22 – 28
4. Callen, T., Cherif, R., Hasanov, F., Hegazy, A., and Khandelwal P. (2014). Economic Diversification in the GCC: The Past, the Present, and the Future. *IMF Staff Discussion Note*, SDN/14/12, pp. 4 - 11.
5. Dess, G.G., Lumpkin, G.T. (1996). Clarifying the Entrepreneurial Orientation Construct and linking it to Performance. *Academy of Management Review*, 21(1), pp. 135 -172.
6. Duru, M. (2011). Entrepreneurship Opportunities and Challenges in Nigeria. *Business and Management Review*, 1(1), pp. 41 - 48.
7. Nair, R., Veeresh, N., and Eagar, R. (2011). Innovation for Economic Diversification – Experience from the Middle East. *Prism / 2 /*, p. 49.
8. Nwafor, P.Z. (2007). Practical Approach to Entrepreneurship: Small and Medium Scale Enterprises (SME). Enugu, *Precision Printers and Publishers*, pp. 27 - 29.
9. Ogunlade, I. (1999). 'Catch Them Young.' A Philosophy for the Development of Science in Nigeria. Corporate Publications, pp.19 – 22.
10. Ogunlade, I. (2005). Non-formal Approach to the Popularization of Science and Technology Education to Children in the 21st Century. *International Journal of Children-in-Science and Technology*, 3(2), pp. 146 – 149.
11. Ogunlade, I. (2015). *Food and Education: Catalysts for Sustainable Development*. 41st Inaugural lecture delivered at Ekiti State University, Ado-Ekiti.
12. Okpara, F.O. (2000). Entrepreneurship, Text and Cases. Enugu, *Precision Printers and Publishers*.
13. Omole, C.O., Ozoji, B.E. (2014). Science Education and Sustainable Development in Nigeria. *American Journal of Educational Research*, [online] Volume 2(8), p.595.
14. Soyibo, A. (2006). The Concept of Entrepreneurship. *Journal of Enterprising Culture*, 1A(i), pp. 65 - 84.
15. Thaddeus, E. (2012). Perspective: Entrepreneurship Development and Growth in Nigeria. *Entrepreneurial Practice Review*, [online] Volume 2(2), pp. 31 - 35.
16. Uzonwanne, C.M. (2015). Economic Diversification in Nigeria in the Face of Dwindling Oil Revenue. *Journal of Economics and Sustainable Development*, 6(4), p. 66.
17. Benefits of Science and Technology to the Society. [online] Available at: <http://www.studymode.com/subjects/benefits-of-science-and-technology-to-man-page1.html> [Accessed 23 Sept. 2016].

18. What is diversified economy? [online] Available at: <https://www.reference.com/world-view/diversified-economy-55ce5506ad732b10> [Accessed 23 Sept. 2016].
19. <http://www.unesco.org/new/en/education/themes/strengthening-education-systems/science-and-technology/browse/1/> [Accessed 23 Sept. 2016].