

# Implementation of Physics Research Outcome: Panacea for Resuscitating the Nigerian Dwindling Economy

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This paper discusses the implementation of physics research outcomes for the resuscitation of the Nigerian dwindling economy in all spheres, spur growth, and produce highly skilled manpower that can lead and sustain the economic prosperity the nation desires. To objectively perform this task, the researchers used observational studies to compare the practices of two advanced countries, United States of America and Switzerland with the practices in Nigeria, using descriptive cross-sectional study design procedure for the three different climes. The results show a wide range of research funding / implementation gap between the Western world and Nigeria. Findings also revealed that while almost every physics research outcome is being funded and implemented by different agencies in the two advanced countries, close to nothing is being funded let alone implemented in the Nigerian State. This review therefore recommended a pragmatic viewpoint to the funding of physics research results and the implementation of research findings for the development of Nigeria's economic.

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### **Background to the Study**

There is no denying that globally, all scientists work together to address the issues plaguing humanity across a number of economic sectors via scientific advancements, the development of new technologies, and creative applications of state-of-the-art research knowledge which have been affirmed as germane tools for driving success in our competitive global economy. As a result of this, one of the most important performance indicators of a nation's potential economic advantages for bringing about development at the national and international levels is the strength of its venture into research and development (Heyard & Hottenrott, 2021). This, notwithstanding, must include the collaborative effort of both the public and private sectors. This is based on the fact that developmental drive is the collective responsibility of all.

Taking a cue from how advanced countries employed research outcomes in boosting their economies, there has been a strong clarion call for governments of underdeveloped and developing countries to, as a matter of urgency, separate politics from education and sincerely fund relevant university research as a tool to encourage local creativity, maximize wealth and bring about prosperity (Fleming *et al.*, 2019; Bloch & Sorensen, 2015; Sarkies *et al.*, 2017; Omosule, 2018, Poege, *et al.*, 2019). This is due to the fact that pertinent scientific research outcomes produced by Western institutions have been adjudged to have a track record of being highly influential in the majority of these knowledge-based economies (Institute of Physics, 2017). A good example is found in (Organisation for Economic Cooperation and Development [OECD], 2019) and (Institute of Physics Report [IOP], 2017) where studies have indicated that more than forty percent of jobs in the United Kingdom (UK) industrial sector are not just related to physics, but created as products of Physics Research.

In order to buttress the preceding claim, findings of numerous studies on physics education in developed nations, for example, have produced amazing accomplishments when put into practice (Bowe, 2016; IOP, 2017 & IOP Report, 2017). Using this as a template to foster economic growth and increase their Gross Domestic Products ( GDPs ), Omosule (2018) submitted that developing African nations are expected to adopt the method of adequate funding and implementing university research and other research organisations within their locality to advance their course and move a step further by adding to the global body of knowledge, the relevant indigenous creativity and / or innovations that are necessary to better the lots of humanity the world over. This becomes imperative because, in the majority of developed nations with significant increases in research and development expenditures, the viability of this boosting their economies have been demonstrated and celebrated without a shadow of doubt. For instance, Bloch & Sorensen, (2018), noted that “over the previous 25 years, the average OECD country's GDP share of research and development climbed from 1.6% in 1986 to 2.2% in 2011” (pp. 2 – 3). The study also found that in post-secondary education, it has nearly quadrupled from 0.31% to 0.57% as a percentage of GDP over that time (4 – 6).

As a rider to the above, our review highlights the need for a result-driven Physics research funding and implementation, in order to explore the rich potentials of scholars in the Nigerian higher institutions of learning and implement the outcome of their research endeavours for

optimal performance of the nation's economic system. The following questions are instrumental in any drive for the advancement of any economy. Is there accessible research funding? Are researches thoroughly carried out, whether or not there are accessible research funding? How does non-implementation of self-sponsored research outcome affect critical scientific researches? A painstaking examination and implementation of each of the questions above is instrumental in the development of any economy the world over.

After examining the international dimensions to research funding and implementation, this paper provides a mind-blowing difference in the average number of quality research funding and implementation between the two advanced countries and the developing nation, Nigeria. Our focus is to objectively unravel the opportunities inherent in sincerely funding and implementing scientific research in Nigeria. For example, funding and implementation of university research outcome should be based on each research institution's capacity to proffer practical solutions to the problems bedeviling each sector of the economy. This will further serve as encouragement to all researchers of the country, while other research bodies are expected to take a cue by becoming productive and researching to rescue their immediate environment from future economic challenges.

Thereafter, we explored the rationale behind adequate research funding in the Western countries and came up with four interrelated goals in their epoch moves: providing accessible fund for meaningful research encourages mass research outcome; implementation of relevant individual research outcome gives room for a sizable amount of options to boost the economy; implementation of research outcome unravels talents and promotes scientific innovations; and building and funding innovative scientists/researchers leads to creativity and new inventions. After critically examining these rationales, we presented a more pragmatic view of potential gains inherent in implementing university research outcome for the Nigerian economic development. The paper concludes by enumerating the implications of implementing scientific research outcome to resuscitating the current dwindling Nigerian economy and future economic/scientific challenges that may later come our way as a nation.

### **Research Agencies / Implementation Levels in US, Switzerland and Nigeria**

The process of putting a particular intervention into action within a system or organization is known as implementation. To say the least, several calls have been made in support of the use of research outcome by African governments to formulate policy and give their economies a boost (Usmeldi, 2018; Wilson et al., 2015; Bao & Koenig, 2019; and Science, 2016). This is because, quite a number of Western nations with productive education and buoyant economies have been identified with proper funding and implementation of university research findings. For instance, the United States of America that is having the highest number of public research funding departments and implementation level has been known to maintain stable economy with reasonable GDPs for the past 5 decades. Among the public research funding departments/agencies in the United States of America (USA) include but are not limited to: United States Agency for International Development (USAID); United States Department of Education (ED); United States Department of Energy (DOE); Environmental Protection Agency (EPA); National Aeronautics and Space Administration

(NASA); and the National Science Foundation (NSF) to mention but a few. In the same vein, Switzerland, a country with 3.9% of Nigerian population (worldometers.info) can boast of research funding agencies like Universal Postal Union (UPU); World Health Organisation (WHO); World Intellectual Property Organisation (WIPO); World Meteorological Organisation (WMO); Optimus Foundations (UBS); C&A Foundation - Laudes Foundation; Human Dignity Foundation; Jacobs Foundation; MAVA Foundation; Novartis Foundation; and OAK Foundation to mention but a few. Drawing from the above, one would expect that the Nigerian nation, with its teeming population of 227,149,302 according to worldometers, would parade quite a mouthful of research funding departments/agencies. However, it is pathetic to know that the Nigerian nation only parades one research funding agency in the name of Tertiary Education Trust Fund (TETFUND), (tetfund.unn.edu.ng). This TETFUND intervention was designed to give Nigerian scholars or researchers per se, the opportunity to look inward and locally generate practicable results that will put the nation in an enviable position within the competitive global economy. Howbeit, its focus has been a bit shifted politically as it has been subdivided into two arms: while one arm's research award is dedicated to the National Research Fund (NRF); the other is saddled with Institution Based Research (IBR).

### **Impact of Physics Research Funding / Implementation to Global Economy**

Clearly, the best way to capitalise on the economic potential a nation desires in line with several kinds of discoveries is to fund and implement physics research, or related initiatives that directly aim to develop new technologies or advance ones that already exist. The design of novel materials with desirable qualities such as Magnetic Resonance Imaging, MRI is based on research in physics. The cost of standard resistors, dynamic elements like capacitors, solar power, rechargeable cells, solar televisions, and low energy-consuming pressing irons in countries like China, North Korea, US, and Switzerland have all decreased as a result of this research, which is essential for the switch to sustainable energy sources. Physics knowledge has aided in the development of novel production and analysis methods in multidisciplinary research, which has advanced the fields of nanotechnology and space research (Murray & Treanor, 2021; OECD, 2017).

In addition to this, another justification for maintaining and implementing Physics Research has to do with cutting-edge technologies, especially ones that flow tangentially from basic physics studies whose goal is to satiate universal curiosity. Take, for instance, the 1980s global data sharing requirement from the European Organisation for Nuclear Research's (CERN) high-energy particle accelerators. This issue was solved in a way that directly influenced the development of the popular World Wide Web which later metamorphosed into today's digital revolution a few decades later. With the help of the aforementioned examples, one could argue that research with direct applications is simple to defend; yet, there are philosophical and economic justifications for investing in physics even in cases when the payoff is not immediately apparent. The rationale is that research programs in physics produce the technical labor force that the competitive digital economy of today requires.

In spite of the huge gap between the attention the Nigerian Physics/Physics Education researchers receive from their Government as compared to what their counterparts in the Western world enjoy, they still, on daily basis, produce several research outcome whether in the fear of publish or perish syndrome of the university system or in the quest for scholars to contribute their quota to the global body of knowledge in this present atomic age of speed. However, what is most pathetic to say the least, is the failure of the government of Nigeria to put into practice, several Physics education research outcome that are capable of changing the narratives of the nation's fluctuating and put her economy in the right stead in our collective bid to switch from consuming nation to production nation.

## Results

**Table 1:** Share of International / Foreign Students Attracted by Well-Funded Educational Research

Category of Education	Switzerland	OECD Average	EU 23 Average	US.	Nig.
	<b>2017</b>				<b>**</b>
<b>Bachelor's or Equivalent</b>	10%	4%	7%	1.3%	0.16
<b>Master's or Equivalent</b>	29%	13%	13%	2.6%	**
<b>Doctoral or Equivalent</b>	55%	22%	22%	1.6%	**
<b>All Tertiary Levels of Education</b>	<b>18%</b>	<b>6%</b>	<b>9%</b>	<b>5.5%</b>	<b>0.16%</b>

**NB:** \*\* Not Available

**Table 2:** Employment Rate by Educational Attainment

Category	Switzerland	OECD Average	EU 23 Average	US.	Nig.
	<b>2018</b>				
<b>Short-Cycle Tertiary</b>	<b>***</b>	<b>82%</b>	<b>82%</b>	<b>73%</b>	<b>**</b>
<b>Bachelor's or Equivalent</b>	<b>88%</b>	<b>84%</b>	<b>84%</b>	<b>78%</b>	<b>**</b>
<b>Master's or Equivalent</b>	<b>88%</b>	<b>88%</b>	<b>88%</b>	<b>83%</b>	<b>**</b>
<b>Doctoral or Equivalent</b>	<b>92%</b>	<b>92%</b>	<b>93%</b>	<b>83%</b>	<b>**</b>
<b>All Tertiary Levels of Education</b>	<b>89%</b>	<b>85%</b>	<b>86%</b>	<b>78%</b>	<b>**</b>

**NB:** \*\* Not Available

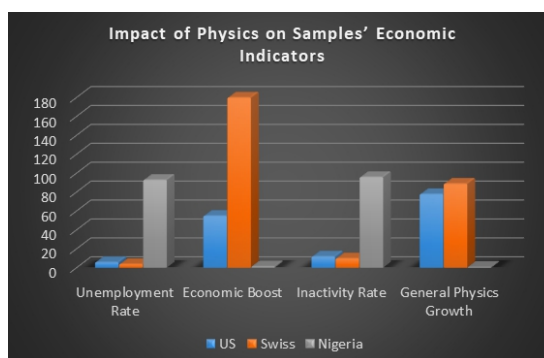
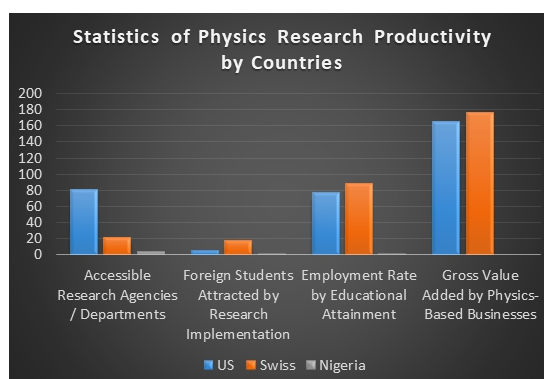
**Table 3:** Employment, Unemployment and Inactivity Rates of 25 - 34-Year-Olds with Upper Secondary, Post-Secondary and Non-tertiary Education

Category	Switzerland 2018	OECD Ave. (2018)	EU 23 Average (2018)	US.	Nig.
Employment Rate	86%	78%	79%	78%	**
Unemployment Rate	5%	7%	8%	6%	**
Inactivity Rate	10%	16%	14%	12%	**

NB: \*\* Not Available

**Table 4:** Accessible Research Agencies in US, Switzerland and Nigeria

Category	US	Switzerland	Nig.	Total	Distribution by Countries
Public	43	13	4	60	US (71.7%): Swiss (21.7%): Nig. (6.60%)
Private	38	9	**	47	US (80.9%): Swiss (19.1%): Nig. (0.00%)
Total	81	22	4	107	US (75.7%): Swiss (20.6%): Nig. (3.70%)





**Table 10:** Implementation Levels

<b>Countries</b>	<b>Average Physics Research Implementation</b>
<b>United States</b>	<b>11 %</b>
<b>Switzerland</b>	<b>18 %</b>
<b>Nigeria</b>	<b>****</b>

**NB:** \*\*\*\* *Not Available*

### **Discussion**

There's no gainsaying the fact that in research and development, the worth of funding determines the level of implementation. This is because, no development-driven government or private organization / agency will continue to invest in research that would not be put to use, whether directly or indirectly. As portrayed in table 4. the United States of America with a population of 335,893,238 has 73% of its attention dedicated to quality research and development compared to Switzerland whose population is put at 8,796,669 and dedicating 24% to research while Nigeria, with a population of 227,149,302 gives less than 3% of its attention to issues bothering around research and development. This is found in (Alagbe, 2022) who submitted that science research projects in Nigeria are not truly and objectively funded by any reputable research council.

Apart from the TETFUND, which lacks explicit guidelines guiding research in Nigerian universities, other research institutes established by the Federal Government has a designated area of research focus. Examples of such are the Nigerian Institute for Oil Palm Research (NIFOR); Nigerian Institute for Rubber Research (NIRR), the Nigerian Institute for Social and Economic Research (NISER). Looking at the above names, it readily comes to mind for one to conclude that each of these institutes already has a specific set of researchers they look forward to. With the above state of research focus, one is right to claim that the attention given to individual Physicist's attempt at proffering practical solutions to Nigerian economic challenges through several physics' education researches is close to nothing before the Federal Government of Nigeria, which is the single body funding research in this part of the world.

This is further reflected in table 4.0 where a woeful 0.04% of Nigerian population is seen to have access to research funding as compared to 27.3% Swiss population. In the same vein, table 1.0 which describes the number of foreign / International students by educational research in Switzerland also attests to this. In the table, the number of undergraduates, master's and doctoral students attracted by educational research is seen to double the average number attracted by the entire European Union in 2017. In the same vein, the United States, with 5.5% international students numbering 1,094,792 according to Washington DC, 2018 contributed \$44.7 billion USD to the nation's economy. This is compared to Nigerian setting where foreign / International students to local students' ratio is put at 1: 610; a meager percentage of 0.16. This conforms to the findings of Abolade, (2019) where Nigeria has been found to perform woefully on the internalization index.

In August 2019, the nation's tertiary institutions committee under the leadership of the immediate past INEC boss, Professor Attahiru Jega lamented that out of 194 institutions surveyed, Nigeria can only boast of 1,856 foreign students out of a total of 1,132,795 students in enrollment. In addition to this, the survey submitted that in Nigerian universities, polytechnics, and colleges of education, the percentage of international students is 0.18 percent, 0.29 percent, and 0.04 percent, respectively. Succinctly put, this implies that far less International students service the Nigerian economy with their country's currencies, when compared to the mass exodus of Nigerian citizens who daily travel abroad in search of well-funded academic / industrial researches. To further corroborate this, Alagbe (2022) in his study of the Nigeria Market Motivations Report noted that out of every ten Nigerian student, nine are currently seeking to completely quit schooling in their home country for a better school where research is funded and its outcome is being implemented abroad.

### **Conclusion**

From the review, it was observed that effective implementation of Physics research outcome is key to the growth and development of any nation's economy. It is noted that in order for the scholars and average citizens of a country to develop positive perception and venture into mind-blowing research, it is imperative for the Nigerian government to establish an objective research institute in every sector of the country's economy. It is also observed that the degree of research implementation will not just bring about satisfaction but also encourage an average Nigerian scholar to venture into more creative scientific research which will help to place the Nigerian economy in an enviable position within the comity of all nations. This is observed in the attitudes of Nigerian scholars who continue to venture into various scientific researches in spite of the close to zero motivation on the part of their government. Thus, it is concluded that effective funding and implementation of Physics research outcome is key to rescuing our nation Nigeria from this present economic quagmire.

### **Recommendations**

Some of the recommendations derived from the review include:

- i. The need to assemble or compile all physics / physics education research outcome for immediate implementation
- ii. The need for the establishment of a separate Science / Science Education Research department at the Federal and State levels.
- iii. The need to as a matter of urgency, stop all importations of Physics-derived equipment / appliances and saddle the Nigerian physicists / physics education experts with the responsibility of locally manufacturing same with immediate alacrity.
- iv. The need to engage only qualified science / science education experts in the nation's Ministries of education, science and technology
- v. The need to engage only qualified science / science education experts in the leadership boards of the nation's / state's department of science / science education research
- vi. It is essential for every physics / physics education department to as a matter of urgency, venture into designing, building, producing and manufacturing of scientific components, equipment, tools and devices.



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