
Entrepreneurship and Career Development Potentials for Nigerian Physicists

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Abstract: This paper review the entrepreneurial capacity among physicists and opportunities that abound to fresh graduates of physics who frequents white collar jobs. To achieve this, a critical assessment of who is an entrepreneur, features of the entrepreneurial process, levels of entrepreneurial development, essential characteristics of entrepreneurs, and perspectives of physics graduates in Nigeria was critically reviewed. The paper concluded that emphasis on adherences to entrepreneurial principles, practical contents and higher degree training in entrepreneurial physics would open up opportunities for fresh physicists within the myriads of job prospects in physics discipline.

Keywords: Entrepreneurship, Entrepreneurial Physics, Physicists, Nigeria

1. Introduction

Entrepreneurship is most definitively described as the relentless pursuit of opportunity without regard to resources currently controlled. There is an underlying process in entrepreneurship that starts with the identification of opportunity, creation of organization as a 'contextual opportunity event' and ends with harvesting the proceeds of such [1]. Entrepreneurial process features such characteristics as identified by [2] to include; initiation by an act of human volition, occurrence at the level of the individual firm, involves a change of state, discontinuity of a process, and other numerous antecedent variables that are extremely sensitive to the initial conditions of those variables.

The entrepreneur is part of a complex process of new venture creation' and are regarded risk-takers, creators, innovators and originator of new enterprises, commercial activities and new economic sectors [3, 4]. The study of the entrepreneur is actually one step removed from the primary phenomenon of entrepreneurship. This behavioural approach views the creation of an organization as a 'contextual event', the outcome of many influences.

1.1. Levels of Entrepreneurial Development

Those who want a greater sense of responsibility and control over their lives and have the confidence to experiment with that possibility often rise up from the ground level of employee status to the first level of entrepreneurship. They do this by first becoming self-employed, then developing managerial perspectives, having an attitude of an owner or leader, then finally becoming an entrepreneurial investor.

1.2. Essential Characteristics of an Entrepreneur

By examining the five phases or levels of entrepreneurship and one notice certain traits that are common to all successful entrepreneurs with a better understanding of the fundamentals that distinguishes extraordinary entrepreneurs from ordinary ones. Extraordinary entrepreneurs have many unique traits that are not common to other entrepreneurs, they share a kindred spirit, certain type of constitution and outlook, and a special drive and willingness to succeed. Rather than elaborating on the many differences within this broadly diverse demographic, it is more helpful to look at those aspects of similarity. ActionCoach [5] identified 12 characteristics that are found within all successful

entrepreneurs – and without which most people will fall short of what it takes to succeed in an entrepreneurial enterprise. These includes:

1. *Confidence*: Confidence is a hallmark of the entrepreneur. Not all of us are born with confidence, but that does not mean we are not capable of it. Many confident women and men gain their sense of self-esteem and faith in their ability to greet challenges by acting – even when they lacks the confidence – and then gaining strength and belief in themselves by seeing the results and gaining the praise and respect of others.
2. *Sense of Ownership*: Taking responsibility for getting things done – and doing them with care and attention – means to act like an owner. Rather than viewing a problem as someone else’s, the entrepreneur sees it as his or her own and takes pride in finding a solution, leaving things in better shape than they were before encountering them, and improving upon situations rather than leaving them unattended. While a sense of ownership makes for a stellar employee, the entrepreneur knows that the goal is not to be owned by the enslavement of too much responsibility. Rather than controlling situations in an attempt to possess them, the entrepreneur teaches other people how to take charge. In that way the clever entrepreneur uses individual accountability in the ultimate pursuit of profitability, teamwork, and overall success.
3. *Ability to communicate*: Entrepreneurs recognize that the most important part of any business is the human element. Human resources – whether in the form of clients, employees, or strategic partners – are what makes or breaks a business, and communication is the key to successful relationships with people. The entrepreneur works to hone communication skills, whether those are written, spoken, or non-verbal messages conveyed through body language.
4. *Passionate about learning*: Entrepreneurs are often “autodidactic” learners, which means that much of what they know they learned not in a formal classroom setting but instead on their own by seeking out information, asking questions, and doing personal reading and research. They also are quick to learn from their own mistakes, which mean they are less prone to keep repeating them due to arrogance, ego, or blindness to one’s own faults, shortcomings, or errors in judgement. To teach is to learn. And to lead, train, and impart experience to others the entrepreneur is constantly striving to learn more and get better educated.
5. *Team player*: Those who go into business for themselves but do not utilize teamwork wind up without the team but still have all the work to get done. They shoulder the whole burden for themselves, and wind up just trading their old job for a new and more demanding one – in an attempt to be self-employed. But the new venture carries greater personal and financial risks. On the other hand, team players know how to succeed by employing the physics of interpersonal synergy and dynamic relationships. One twig can be easily snapped, but a bundle of those small twigs becomes stronger than the sum of its individual parts and can be impossible to bend, much less break. The same goes for businesses, and successful entrepreneurs leverage teamwork to get the heavy lifting done without breaking stride.
6. *System-Oriented*: Like mathematical formulas, good systems allow us to reproduce great results every time – with less and less exertion of energy or resources. Entrepreneurs rely upon systems before they rely upon people, and they look for system based solutions before searching for human resource solutions. If the person gets the job done but falls sick or leaves, the job is threatened. But if a system is created to get the job done, anyone can step in and follow the blueprint to get the desired result. Similarly, when troubleshooting and problem solving, the entrepreneur will first examine and study the system – because a flaw in the system will produce a flawed outcome each and every time. Designing, implementing, and perfecting systems is one of the most useful and rewarding skills of an entrepreneur.
7. *Dedicated*: Entrepreneurs dedicate themselves to the fulfillment of their plans, visions, and dreams, and that tenacity of purpose generates electricity throughout the whole organization. One of the biggest reasons that companies fail is because they lose focus. Target a goal, clarify the objective, refine the brand, and narrow the margin of error. Regardless of what the effort might involve, an entrepreneur brings a single-minded dedication to the task by being committed to a positive outcome and ready and willing to do the needful. No matter what that might mean in terms of rising to meet a challenge or acting above and beyond the call of duty, the entrepreneur shows steadfast dedication.
8. *Appreciative*: Being grateful for what we have opens us up to receive more, and one reason that is true is because those who are grateful appreciate what they are given. They respect it and nurture it. They do their best to make it grow instead of allowing it to dwindle away due to neglect. Entrepreneurs learn to take nothing for granted in this world. That gives them the agility and flexibility to adapt to changes and demands, while it also invests in them a thankfulness that reminds them that riches and wealth are not about “stuff”, but are about fulfillment, satisfaction, and the pleasure that comes from one’s accomplishments and contributions.
9. *Optimistic*: A positive outlook is essential for every entrepreneur, who learns to see setbacks as bargain priced tuition for the valuable business lessons gained through firsthand experience. Past shortcomings, failures, or disappointments are relegated to the past

so that they cannot continue to haunt the present or obstruct the future. And when things go right and business prospers, this further fuels the optimism and positive mindset of an entrepreneur, helping to give impetus and momentum for greater accomplishments and increased hopefulness.

10. *Sociable*: Because business is all about people, entrepreneurs tend to be socially outgoing. They get excited about sharing ideas, products, and services, and that excitement is contagious to their employees, clients, friends, and other contacts both within and beyond the business sphere. But women and men who work hard as entrepreneurs also relish the unique opportunity to have fun doing something that they love as their primary vocation. Human resource experts, career counselors, and business psychologists all agree that those who do jobs they enjoy and are good at have higher rates of success and broader measures of satisfaction. Entrepreneurs know that firsthand, from their own experience, and they tend to be a fun-loving group of people both on and off the job.
11. *Role model*: Entrepreneurs not only lead themselves through self-motivation as self-starters who jump into tasks with enthusiasm, but they are also skilled at leading others. They know the importance of teamwork, and they understand the need to appreciate others, support them, and reward them accordingly. True leaders do not become indispensable, otherwise things fall apart in their absence and they can never rise to the highest level of entrepreneurial freedom and prosperity. Neither do they squander the potential of those working under their guidance. As renowned business consultant and retired United States Air Force Major General Perry M. Smith once wrote, "Leaders who share their power and their time can accomplish extraordinary things. The best leaders understand that leadership is the liberation of talent; hence they gain power not only by constantly giving it away, but also by not grabbing it back."
12. *Risk taker*: Many people could be successful if they only took chances. And many people who do take chances and become somewhat successful find the realization of their dreams an overwhelming possibility, so they sabotage their continued success by retreating back into a comfort zone of smallness. As discussed earlier, the employee mindset is preoccupied with a need for security. Those who cling to what is familiar to them – even if it means the denial of their dreams – lack the perseverance and ambition that the real entrepreneur exhibits. Entrepreneurs are not immune to fear. But they prioritize their approach to life so that the fear of failure, frustration, boredom, drudgery, and dissatisfaction far outweighs the lingering fear of success.

1.3. Constraints to Entrepreneurial Development

Three constraints of every entrepreneurial development include entrepreneurial mindsets, patterns of thinking, and belief systems [5]. They begin with the basic level of the employee – and an understanding that good employees often evolve into great entrepreneurs but for that to become an entrepreneur one has to first adopt a perspective and seek out a role above and beyond that of an employee.

- The employee sets goals mainly to impress others, to avoid confronting fears – including the fear of personal freedom and success – and to conform to a comfort zone rather than pushing to learn more and gain new experiences.
- Because of self-imposed limitations, employees prefer to follow someone else's game plan, and they lack the desire to become a self-motivated and self-reliant entrepreneur.
- They focus primarily on personal security and their emotional motivation derives from a fear of insecurity and a desire to be within the comfort zone of a secure situation.

1.4. Link between Entrepreneurship and Physics

There exist link between physics and entrepreneurship development. The development in physics leads to corresponding physics related entrepreneurship development. The study of physics has been and will continue to be of tremendous importance to humanity because of its central role in the global entrepreneurship development [3]. Entrepreneurship development leads to self-sufficiency and national economy. The objective of this paper is therefore to explore the rich career opportunities in the study of physics and its applicability in entrepreneurial development in order to reduce unemployment among the class professionals.

2. Physics and Entrepreneurial Development Potentials

The study of physics at all levels is crucial for any nation that wants to maintain its lead among the committee of nations [6]. In fact the technological potentials of any nation could be more accurately gauged by the quality of its physics education, for without physics, the technological culture of her citizens cannot be firmly rooted [7]. The scientific study of matter and energy [8] and how they interact with each other is referred to as physics while a physicist is a scientist who specializes in physics research study a wide range of physical phenomena in many branches of physics spanning all length scales: from sub atomic particles of which all ordinary matter is made (particle physics) to the behavior of the material universe as a whole (cosmology)[9, 10]. They utilize scientific methods to formulate and test hypotheses that are based on observation of the natural world.

The goal of physics in this regard is to use the results of these experiments to formulate scientific laws, usually expressed in the language of mathematics, which can then be used to predict other phenomena.

Physics from career perspective share some similitude with entrepreneurship. From the view point of the definitions of physics, it generally can be said that trained physicists apply their skills to engineering, computing, and finance, employing various entrepreneurial principles. The diversity of career development in physics made some physicists take up additional careers where their knowledge can be combined with further training in other disciplines, such as patent law in industry or private practice.

2.1. Entrepreneurial Opportunities in Physics

Training opportunities abound for graduates of physics. A physics graduate can venture into the field of engineering. Such graduates are qualified for postgraduate diploma (PGD) in petroleum, electrical, computer science or computer engineering. Other training opportunities include: Masters of Business Administration (MBA), and Masters of Public Administration (MPA). The interconnectedness between physics and mathematics has lured physics education graduates to professional examinations such as Chartered Institute of Bankers (CIB) and Association of Certified Chartered Accountants (ACCA) [11].

Several opportunities abound for physicists in entrepreneurial development, few of which include; transportation, aviation, medicine, industry, warfare, peace, entertainment and electrification among others [12]. However, areas of career and entrepreneurial development in any fields of engineering; field of Geophysics/ seismology which generally involved undertaking seismic exploration and producing controlled source seismic data by creating a picture of what lies below the earth's surface; Metallurgy concerned with the extraction and processing of various metals; Radiation protection practitioner specializing giving advice and guidance about the possible hazards of ionizing radiation, such as x-rays, as well as radioactive materials and waste. Other career opportunities in entrepreneurial physics include; Seismic interpreter which involve sending pulses of sound energy down through layers of rock beneath the earth's surface, Research scientist (physical sciences studying non-living systems to increase the understanding of how the physical world works, Investment analysts who provides research information to help traders, fund managers and stock brokers make decisions about investments, institutional teachers that offers to teach curriculum subjects to students, Meteorologists who study the causes of particular weather conditions using information obtained from the land, sea and upper atmosphere and several other related professional development opportunities.

2.2. Some Entrepreneurial Physicists

The three major employers of career physicists are the academic institutions, government laboratories, and private industries, with the largest employer being the private industries [9, 10]. AGCAS [13] attempted an extensive review of job prospects and careers in Physics. Physicists have two key advantages over someone with an MBA or a Business Studies degree [14]. They are primarily interested in things that can

either be measured, modelled or of determinative orders of magnitude. Entrepreneurial physicists are said to be highly mathematically competent, analytical and logical, and are habitually creative thinkers, excellent at problem solving and meticulous. Their thinking ability has earned them a global reference in solving most challenging human related problems and increasing life expectancy. In this categories are Larry Page, the founder of Google and Android mobile operating system, Elon Musk, the CEO of SpaceX, a company that designs, manufactures and launches advanced rockets and spacecraft, and also Tesla, a company making electric cars, and Geordie Rose the founder of D-Wave company that built the world's first commercial quantum computer [14].

Survey reports had found out that nearly one in eight of the physicists had founded their own company with most of the companies founded physics-based, including electronics, medical devices and instruments. However, many are not related to physics at all.

2.3. Challenges of Entrepreneurial Physicists in Nigeria

The importance of physics as a requirement for entrepreneurship development of any nation cannot be overemphasized, however, Nigeria as a nation with developing economy has suffered appreciably from high rate of unemployment, inconsistent power supply, inadequate food and water supply, poor medical care, as well as high corruption cases coupled with un-conducive working and living environment which predicated on low level of scientific and entrepreneurial development [15]. Concerted efforts made at tackling some of these menace was channeled to producing scientists at various levels; especially in physics for national and entrepreneurial development. For instance, the Federal Government of Nigeria through the Federal Ministry of Education in 2008 reviewed the physics curriculum physics in line with the MDGs and NEEDS [3].

Despite the above effort Nigerian government is still seen as the sole provider of employment to the teeming population of over 160 million people. The truth about this can be seen in the number of people who present themselves for public/government employment [16]. Oteje [17] stated that studies by the National Institute for Social Research (NISER) and the World Bank revealed that over 55 per cent of Nigerians of working age are unemployed, representing one in every five adults. The [18] also indicated that only one in every ten graduates get a job while a recent report by the National Directorate of Employment [19] indicated that over 200,000 Nigerian graduates who completed the National Youth Service Corps (NYSC) in the last five years, remained unemployed.

3. Conclusion

3.1. Conclusions

Nigeria as an emerging economy with huge natural resources base has potentials for entrepreneurial professional developments including Physicists; which are yet to be fully exploited given array of opportunities that abounds. The basic

principles of entrepreneurship highlighted, if strictly employed by fresh graduates of physics would definitely affords them prospects among the identified job options.

3.2. Recommendations

The following recommendations are made to improve job and career prospects among physicists:

Efforts should be intensified by policy makers of the delivery of the practical contents of entrepreneurship curriculum at every level of educational training. A formal Physics Entrepreneurship program at master's and doctoral levels should be introduced to provide training and empowerment for physicists as entrepreneurs.

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