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Perspective

Bio-entrepreneurship: Scenario and opportunities for developing countries

M. Faisal Shahid, M. Kamran Azim*

Department of Biosciences, Mohammad Ali Jinnah University, Karachi-75400, Pakistan.

*Corresponding author; Kamran.azim@kamran.azim

Abstract

'Biotech Startup and Entrepreneurship' culture is under extensive demand these days. With each passing day, there are greater moves to connect industry and academia which are fundamental pillars of this field. However, such culture is not giving off fruit in the developing countries. Academia-industry liaison has been pivotal for growth of an economy sector. This bond has flourished over time and has given off purpose oriented outcomes with direct impact on the society. The biotechnology sector is no less than same. However, lack of such linkage is a bottle neck in the developing world. This review pointed out factors contributing to scenario and opportunities for Bio-entrepreneurship in developing economies.

Introduction

A Biotechnology startup or a Bio-startup refers to a business that produces end user products requiring research and development. Most Bio-startups are involved in diverse healthcare technology areas such as medical devices, diagnostic kits, pharmaceuticals *etc.* (1,2). Despite being very well-received in developed countries such culture has not flourished. One reason for this is that under financial objectives the biotechnology (biotech) sector is considered "*Profit Driven*", instead of "*Need Based*" business (3,4).

Main factors for the lack of a fruitful and vibrant Biotech startup culture from academia in developing economies are mentioned in a descending order of importance below:

Lack (or) non-substantial technical knowledge of venture capitalists:

The primary reason of venture capitalist's monotonous policies can be primarily linked to lack of knowledge and no past business expertise and experience in the biotech sector (5-7).

Government policies for the sector are seconded by congenital options:

According to 2016-2017 report of the Planning Commission of Pakistan, Biotechnology and Environmental sciences come under "*Inter-provincial Coordination Division*" (8,9), rather than under direct focus of the federal Government. Few projects are approved for scaling up

and establishing biotechnology sector by government's investment. Moreover, occasionally high potential projects are rejected by the public sector development programs (9).

Lack of Sustainable Public Policies:

Several policies have been formulated for transition from a conventional economy towards a knowledge based economy. However, issue remain with sustainability of such public policies (10,11), In a report published in 2008 (11) out of more than hundred critical laboratory inventions, only five could be translated, the respective startups were created as industry spin-offs and their products eventually reached the market. Out of those only one product had use in healthcare sector.

Lack of "*Technical Man Power*"

Another factor for lackluster performance of bio-startups is lack of trained human resource (12,13). Such a human resource includes graduates and post-graduate degree holders in life science disciplines. They possess basic knowledge of subject but lack product development mindset of translating a lab discovery to an industrial spin-off by attracting venture capitalists (14). Such culture for translating lab based inventions is flourishing in India but not in other South Asian and developing countries (14).

Low Number of Biotechnology / Biosciences Training Centers:

This is an important factor contributing to hurdles in bio-based startups. It has been endorsed by AIO (2014) report by NEPAD that high quality R&D setup remains critically low in developing countries (15).

Misaligned Priorities of Scientific Community:

The academics and scientists are more interested to attain incentives offered by the government rather than creating an impact on society (18,19,20).

Opportunities and Hope for Developing Countries

Despite multiple hurdles, there is a tremendous element of opportunity for bio-entrepreneurship in developing countries (20,21). These opportunities are listed below:

Availability of Low Cost of Human Resources

There is a significant difference in cost of full time employees (FTE) within developed and developing countries. The investment factor for mass production of a value added product in developed countries is much higher compared to developing world. Technology development in a developed country can be outsourced to a developing country (22,23) at a fraction of cost. This approach creates a "*win-win*" situation for the innovator, venture capitalist and the third party that scales up the design (24).

Lower Establishment Cost:

In light of the first point, it is obvious that establishing a biotechnology firm in a developing country would be economical compared to a high income country where FTE rates are immensely high (26,27). In such cases, a startup can manufacture a product in bulk in a low income country since employment is cheap enough. Moreover, countries with low HDI prefer foreign investment to employ their existing human resource (28,29). This is how India developed as an automobile manufacturing regional hub in South Asia (low employment cost and low cost with government incentives to foreign investors) (30,31). The same scenario has been replicated by Indian economic policy makers for transforming India as a regional hub for bio-pharmaceuticals, generic pharmaceuticals and other biotechnological outsourced products. (31-35).

Consumerism and Competition

In the book "*Civilization: The West and The Rest*", Prof. Niall Ferguson used the word "*Consumerism*" as a vital ingredient in the economic surge of European economy (36). An identical picture emerged in the developing countries in other regions. For example, Pakistan has a population of >200 million citizens, making it the sixth most populous country of the world (37) with ~60% population below the age of 60 years. This country has the potential for becoming the next livewire of youth (38). Despite past security issues, the country has potential to be a future hub for biotechnology industry (39). Despite all problems presented as obstacles, Pakistan qualifies as a lead candidate for Biotech based startups. Currently, venture capitalists are massively spending on projects for bio-hydrogen production (37). The agricultural biotech sector grew by 6.9% in 2014-2015 (36). Moreover, there are a variety of research fields other than Agro-business sector. There are currently 28 technology incubation centers (situated primarily in different universities across Pakistan) working in different areas of science, technology and engineering (38). Moreover, the Higher Education Commission (HEC) of Pakistan has initiated projects to link academia and industry such that inventions and discoveries are translated to industry (39). Apart from HEC, several government departments and NGOs in Pakistan have also initiated 'Academia-Industry' linkage programs (39). These organizations provide incentives for industry spin-offs from universities including seed funding for prototype development for a startup. Hence, university researchers can apply for seed funding from these organizations instead of going to commercial banks (38,39).

Conclusion:

To conclude, low income developing countries are suffering due to lack of interest from their governments, low quality research and policy glitches. However, it must be noted that countries like Pakistan have tremendous potential for biotech startup and industry establishment. Developing countries are facing multiple hurdles ranging from political instability, reluctance from venture capitalists, and lack of technical man power to start and run a biotechnology startup. Still there is a vast scope for improvement if the current situation. Despite having difficulties, Pakistan possesses good potential and to a large extent fulfills all conditions conducive for biotechnology based startups and industrial spin-offs. With the completion of the China Pakistan Economic Corridor (CPEC) project, Pakistan can become a pivotal transit point of the future allowing the bio-startup culture to flourish in near future.

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