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TECHNOLOGY INCUBATORS AND INSTITUTIONAL DEVELOPMENT

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Abstract

Globally, technology business incubator (TBI) has become a growing initiative to promote the entrepreneurship. Recently TBIs has gained significant attention from research scholars and play a vital role to facilitate the development of entrepreneurial society. The institutions are established and leadership is groomed via entrepreneurial society. Moreover, entrepreneurial culture encourages the entrepreneurial society for economic development, innovation, technology competitiveness and sustainable job creation. A government backed TBI, Plan9, is presented to highlight the significance towards developing an entrepreneurial society in a developing country context, Pakistan. Plan9 has introduced unique practices with a broad vision for a sustainable entrepreneurial growth. University industry linkages are created, entrepreneurial education and training programs for social awareness are operationalized, innovative ideas are encouraged and financial innovation without equity share and funding support are designated. This paper presents a comprehensive spotlight over the dynamic capabilities and entrepreneurial culture of plan9. Furthermore plan9 is encouraging to promote entrepreneurial society, institutional development and leadership. Lastly this research recommends that the other TBIs should be initiated by the collaboration of government and private sector to nurture the entrepreneurial society.

Keywords: Technology business incubators, entrepreneurial society, institutional development, Plan9, Entrepreneurship

1.0 INTRODUCTION

Entrepreneurship is the new theoretical phenomena of economic development evolved from physical capital and then knowledge [1]. Nonetheless, a sustainable economic development would be achieved by governments through indulging the entrepreneurial concept [2]. The entrepreneurial culture flourishes the society by reducing unemployment and inducing living standard. The concept of entrepreneurial society is emerged in 1990s, still gaining popularity in several economies. Entrepreneurial society focuses on the entrepreneurial culture as one point agenda for sustainable job creation, economic development, innovation and technology competitiveness [3]. Moreover in an entrepreneurial society; leaders are groomed, institutions are developed and entrepreneurial capital is generated [1].

In the current scenario of the world, business incubators gain much popularity for promoting entrepreneurial activities in the society, creating leaders and developing institutes [4, 5]. Additionally, it is firmly acknowledged that the 21st century will rely on knowledge, innovation, entrepreneurship, and business incubators (Al-mubaraki and Busler, 2013). BIs typically support economic development [7], commercialization of research [8] and creation of new start-ups, which normally have fewer chances to survive, to become self-sustained and grow successfully [9].

In this study, the social mechanism of the incubation system is analyzed by adopting institutional approach. Previously, researchers have paid less attention to the social perspective of incubation system [10]. The social connectivity bounds the individuals as well as groups to perform for the social welfare. The aim of the study is to analyze the social perspective of incubation system

through institutional practices, rules, structure, norms and actions.

1.1 Business Incubators: An Overview

In earlier times, incubators remain less advantageous to gain much popularity. However, the scenario changes and incubators become the area of focus globally with a figure of around 7000 (National Business Incubation Association). Although the foundation of first business incubator, a privately owned for profit, in 1959 at Batavia, New York by Joseph Mancuso; incubators are argued as a contemporary component for economic development, job creation, financial sustainability and establishing institutes and leaders. Even though developed countries enjoy the first mover advantage, developing countries are also in the queue. On the other hand, [12] defines the incubators as a mechanism to create new entrepreneurs with provision of resources and services.

The objectives of establishing and promoting incubators can be summarized as 1) Job creation 2) Networking 3) Commercializing new technologies 4) Assisting new start-ups 5) National and regional development 6) Supporting financial framework of businesses 7) Fostering the entrepreneurial culture 8) Strengthening the university industry linkages [4, 12–14]. In addition, researchers identify the main functions of incubators as follows:

- Provision of comfortable space
- Access to advanced technical equipments
- Managerial support
- Access to financial capital
- Filtering the risk during entrepreneur's earlier age
- Rationalize transaction cost
- Screening and selecting incubates
- Support in development of business plans

2.0 BUSINESS INCUBATORS AND INSTITUTIONAL DEVELOPMENT

Institutional development, comprises of institutional rules, social norms and cognitive structures [15], leads to the sustainable economic growth [16]. However, business incubators work as a tool to strengthen institutional development in the economy by promoting the entrepreneurial society. To promote the institutional development, private sector needs to stimulate through favorable government policies [16]. In BIs context, [17] analyze the institutional emergence, environmental effects on institutions and mechanism to achieve the institutional goals. The theoretical basis stands on the institutional theory to achieve the objectives. Similarly, [18] also apply institutional theory and argues that the incubator's strategy does not directly influence the performance of BIs.

The institutional perspective guides in evaluating the design, practices, rules and coordination mechanism of various stakeholders including government, industry, academic units and community involved in the incubation system. Institutionalists conceptualize institutional theory as an authoritative framework designed for social structure [15, 19]. Institutional theory validates the theoretical framework to analyze the design, rules and regulations, practices, and the institutional environment BIs. However, [20] argues the existence of this institutional environment as a mechanism of organizational control. Whereas organization control manipulate the allocation of resources and identify the future directions.

Institutional theory mainly focuses on the control systems; their existence, diffusion, its contribution towards sustainability and its social behavior perspective. The institutional theory basically originates from the research of [21]. He argues that the formation of organizations over the period as a technical oriented system saturate with value. According to [22], institutionalization is a social design for a specific element such as estate. However, the key to success of the institutionalization is the institutional structure that embeds pressure on organizations.

2.1 Growth and Development of Business Incubators in Asia

Asia, the largest and most popular region with around 50 countries, enjoys more than 2000 BIs. Out of 2000 figure; InfoDev, a World Bank program, reports that most of the BIs are operating in the populous countries of Asia such as China and India. Business incubators are being accelerating in China in a remarkable way especially during the last decade [23, 24]. Whereas, the first BI in China was started in 1987 by an initiative of Ministry of Science and Technology at Wuhan, Hubei Province [24]. Table 1 shows some facts and figures about Chinese TBIs:

Table 1 Statistics of TBIs in China

Year	Number of TBIs	Space Area (10,000 sq. m.)	Number of Tenants	Total Income of Tenants	Number of Graduated Tenants	Number of Employees
2008	670	23,155,000	44,346	186,620	31,764	928,000
2010	896	30,439,000	56,382	332,950	36,485	1,178,000
2012	1,239	43,758,000	70217	495,830	45,160	1,437,000

(Source: Ministry of Science and Technology, China)

The two well know examples of BIs in Asian developing countries reported by InfoDev are Tianjin Women's Incubator (TWI) established in 1988 in China and Tiruchirappalli Regional Engineering College Science and Technology Entrepreneurs Park (TREC-STEP) in India. The First one, only TWI has generated more than 4000 jobs although more focused toward services industries. However, Second one (TREC-STEP) targeted various industries with 62% (180 enterprises) in mechanical engineering, 20% in ICT and only 13% in chemical industries. The development of innovation based new products contributes with 45%, import substitutes 10% and 3% export (InfoDev).

The key principal of incubation systems in Asia is to develop a dynamic incubation environment by promoting the networking activities among business incubation communities through knowledge sharing, learning and coordination. These actions are in line to strengthen innovation and entrepreneurship in Asia. The objectives of Incubation system in Asian region summarized by [25] are as follows:

- Networking
- Create learning environment by providing a platform
- Encouraging and promoting entrepreneurial events and activities
- Managerial support for advice on rules, practices and structures
- Business development plans for financial self-sustainability

Additionally, Asian Incubator Network (AIN) is established in October 2007 to meet the challenges of technology transfer, globalization, training, awareness among stakeholders and linkages amongst industries, academia and government. Unfortunately, Pakistan is still trying to become the member of this network association.

2.2 Scope of Business Incubators in Pakistan

Business Incubators have a broader scope in Pakistan. As per statistics of World Bank Indicators, the population of Pakistan in year 2013 is around 182 million and the sixth populous country in the world (Pakistan Economic Survey, 2013-14). In addition, the population growth rate of 1.95% is also fairly high among other developing countries even higher than the average growth rate of south Asian countries.

However, the situation is not much satisfactory in other economic pillars such as unemployment. The high unemployment rate remains around 5% during the period 2010 to 2013 which is also become a challenging task for Pakistan to rationalize it. To tackle high unemployment rate is more difficult then it seems. As the student enrollment in universities and institutes is almost doubled from 2006 to 2013 (shown in Table 2).

Table 2 Statistics about HEIs and Enrollment in Pakistan

	2006	2007	2008	2009	2010	2011	2012	2013
Higher Education Institutions	118	121	126	127	132	138	146	153
Enrollment	521,473	639,597	738,373	803,507	948,268	1,017,282	1,077,779	1,204,349

(Source: HEC, Pakistan)

Surely, the enrolled students are becoming the part of labour force in coming years. To arrange jobs and employment for such a huge quantum seems near to impossible until or unless feasible measures are taken. Whereas researchers acknowledge business incubators: a measure for job creation and entrepreneurial development [4, 9, 26, 27]. In this competitive world, it becomes irrational to get a good

job by all graduating labour force. They definitely have to look for other opportunities such as to become entrepreneur. As business incubators provide a platform to develop entrepreneurs and businesses. Therefore, business incubators are fruitful for a developing country i.e. Pakistan.

Fortunately, Pakistan has realized the significance of business incubators. And similar to other developing countries, Pakistan is also institutive to support the incubation system for the economic uplift, reducing unemployment, promoting industrial culture, grooming leaders and establishing institutes. A delay with limited scope initiative, still appreciable and a positive sign for the country. In Pakistan, currently around 28 incubators of different types including academic incubators, technology incubators and industrial incubators are functioning on the mission.

2.2.1 Technology Business Incubators

In this study, the case of an incubator i.e. Plan 9 is also a model of technology business incubator. TBIs are a special form of BIs targeting technology and innovation [28]. Simply, TBI is an entity that supports and promotes innovation. The concept is broaden by consider three elements for being TBI [29]. First, TBIs focuses on the creation of technology based new start-ups as its mission. Secondly, TBIs rely on the strong linkages with research universities and institutes. Lastly, TBIs are geographical proximity to university campus. Interestingly, TBIs are more famous in developing countries and majority of incubators are TBIs [30]. Though the term technology being used in broader sense. Some examples of TBIs in Pakistan are depicted in below Table 3:

Table 3 Features of TBIs in Pakistan

Name	Founder	Mission	Year	Location	Facilities
Plan 9	Punjab Information Technology Board	To instil the culture of tech entrepreneurship and achieve sustainable growth for early stage product-based ideas by providing domain specific mentorship and investment opportunities to create commercially viable technology start-ups from Pakistan.	2012	Lahore	▪ Networking with investors, industrial experts and mentors ▪ Exposure to international conferences ▪ Entrepreneurial education ▪ Linkages with academia ▪ Managerial support ▪ Office space ▪ Legal advice ▪ Trainings and workshops ▪ IT equipment and internet facility ▪ Stipend for incubate team members
Business Incubation Center	COMSATS Institute of Information and Technology / HEC	To facilitate fresh student entrepreneurs to develop technology based innovative companies.	2010	Islamabad	▪ Patents Registration, Patent drafting. ▪ Incorporation of start-up companies. ▪ Copy rights ▪ Trade marks ▪ Providing legal opinions to departments. ▪ Drafting MOUs, agreements, NDAs, Policies etc. ▪ Facilitate incubation companies in taxation & accounts matter.
Technology Incubation Center	National University of Science and Technology/ Ministry of Science & Technology	To attract and nurtures technology based start-ups and transform them into commercially viable enterprises.	2005	Islamabad	▪ Infrastructure ▪ Furnished office ▪ IT & Office equipment ▪ Lab & library ▪ Fax, photocopy, printing ▪ Conference room ▪ Security services ▪ Janitorial Services ▪ Business Support ▪ Networking Opportunities ▪ Financial Management ▪ Entrepreneurial training ▪ Advice on legal matters ▪ Access to knowledge base and resources for value addition ▪ Business Development Plan ▪ Managerial Support

2.2.2 Academic Incubators (AIs)

AIs are among the state-of-the-art incubators based on academic environment in Pakistan. AIs enjoys the advantages of job opportunities for university own students, pre and post incubation regular monitoring and interaction with private sector to facilitate them. AIs provide a facilitative environment for wealth creation by ensuring technical, legal and financial support for successful coordination between the universities, industries, government and community [5]. The task to establish, strengthen and promote the incubation system at universities and research institutes is laid down with Higher Education Commission (HEC) of Pakistan. The policy framework of HEC to see the universities feasibility and select them for establishing incubators rely mainly on three fundamentals 1) sound R&D activities 2) Entrepreneurial support and 3) industrial area. However, the main objective in establishing the incubation centre's at universities is to develop successful firms that can survive financially and freestanding.

Table 4 Features of AIs in Pakistan

Name	Founder	Mission	Year	Location	Facilities
Business Incubation Center (BIC)	University of Agriculture / HEC	Nurturing start-up companies and young firms by helping them to grow and survive when they are most vulnerable.	2009	Faisalabad	▪ Lab & libraries ▪ Physical infrastructure ▪ Assist in feasibility projects preparation ▪ Business development plans ▪ Managerial support ▪ Financial support ▪ Legal advice ▪ Shared services to reduce transaction cost
Business Incubation Center (BIC)	University of Engineering & Technology/ HEC	To promote the creation of new ventures to strengthen research and technology innovation at universities to contribute in the economic development.		Lahore	▪ IT infrastructure ▪ Furnished office ▪ Business Plan development ▪ Intellectual property rights ▪ Financial consultancy ▪ Video conferencing, seminars, meeting rooms etc.
Center for Entrepreneurial Leadership and Incubation	IBA Sukkur/HEC	To provide infrastructural and managerial support to strengthen new enterprises for economic growth of Pakistan.	2012	Sukkur	▪ Business development support ▪ Networking opportunities ▪ Industrial clustering ▪ Access to finance ▪ Physical infrastructure ▪ Workshops and seminars

2.2.3 Industrial Business Incubators (IBIs)

IBIs are another type of BIs distinguished by focusing towards industries. These incubators are industrial nurseries for nurturing new business start-ups for the promotion of entrepreneurship and industrial clustering. In Pakistan, currently three IBIs exists and all are led by Government. Generally, these IBIs provide consultancy to government to strengthen industries, how to address industry issues, the industry requirements, prioritize industrial sector for the economic development of Pakistan.

Table 5 Features of IBIs in Pakistan

Name	Founder	Mission	Year	Location	Facilities
Small & Medium Enterprise Development Authority	Ministry of Industry, Govt. of Pakistan	To develop SME sector and adding value to national income by creating employment opportunities.	1998	Lahore	▪ Information resource center ▪ Legal and contracting advice ▪ Technical Support ▪ Trainings, workshops, seminars and conferences ▪ Business development centers ▪ Entrepreneurial activities ▪ Managerial consultancy ▪ Industry support program
National Industrial Parks Development & Management Company (NIP)	Ministry of Production, Govt. of Pakistan	To promote industrialization by establishing industrial parks, supporting interaction between government and industries and facilitating creation of jobs.	2006	Karachi	▪ Infrastructural support water, gas, electricity, telecommunication at a single platform. ▪ Security ▪ Industrial clusters ▪ Commercial support banks, offices, markets, Medicare etc.
Pakistan Council of Scientific & Industrial Research (PCSIR) Laboratories Complex Karachi	Govt. of Pakistan	To facilitate academic and industrial research for better utilization of local resources and industrial development.	1953	Karachi	▪ Provision of Up-graded Pilot Plant facilities ▪ Consultancy for ISO 9000 / 14000 / 17025 Certification ▪ Investigative analysis and R&D for import substitution. ▪ Feasibility studies an technical advisory. ▪ Help in crisis situations. ▪ Environmental and Pollution Studies. ▪ Quality Control Services ▪ Services to Government, private departments and NGOs on technical matters. ▪ Process and product development technology. ▪ Consultancy ▪ Evaluation and exploitation of locally available raw materials. ▪ Analytical testing and calibration services. ▪ Center for repair and maintenance of scientific equipment

3.0 Case Study: Plan 9

Plan9 is a TBI located at Arfa Software Technology Park in Lahore, Pakistan. Lahore is one of the populous cities in Pakistan with a population of around 7.5 million. Almost 35 Universities are delivering knowledge to society in the city. Plan9 was established in 2012 with a tagline 'where ideas take flight'. The focus of the incubator is more towards an innovative idea. Plan9 is actually an initiative by the government under the umbrella of Punjab Information Technology Board (PITB). PITB is an autonomous body to promote the idea of innovative economy. Moreover, PITB is also committed to provide IT based solutions in the presence of favorable environment and infrastructure. The government, local enterprises and international businesses are the main clients of PITB.

Additionally, the incubation system at Plan9 is state of the art. The incubator helps to develop a new versatile approach in the business community of Pakistan. Newly graduates from universities are encouraged to start their own business. An incubation period of 6 months works to convert the idea into a growing business entity. A non-equity based concept differentiates Plan9 from traditional ones. Fresh young individuals having entrepreneurial skills, commitment, dedication and industrial know-how are the main focus of Plan9. The incubatees during their early stage of start-ups also guided about business and financial plan, product development, public relations and marketing mechanism, training and communication, legal requisites and other managerial tactics. So far, more than 60 start-ups have already enjoyed the Plan9 benefits.

Plan 9 provides various types of facilities and services to their incubatees. The services and facilities contains but not restricted to furnished office space, provision of IT equipments' such as laptops, internet connectivity, uninterrupted power supply, managerial and legislative support, networking with potential customers, trainings and workshops. Moreover, Plan9 also advices it's incubatees on hiring requirements and process. The networking opportunities are extended to access industrial experts, mentors, investors and to participate in international conferences.

An environment suitable for the promotion of entrepreneurial activities and business development is also ensured. However, more attention pays to early stage ventures to help them grow and survive in an efficient and self-sustainable way. Indeed, the main aim of establishing Plan 9 is to promote the techno entrepreneurial culture and support early stage ideas by ensuring mentorship and financial opportunities to develop potential technology start-ups in Pakistan.

Actually, Plan9 is working with a broad vision and not restricted to facilitate only incubatees. Several other programs are also executing parallels. One of them is a fellowship program for entrepreneurial education and awareness to society. This fellowship program is based on the concept of internship for students. Students can get exposure in working environment through interaction with Plan9 team and start-ups. This opportunity of 6-12 weeks helps the young students to get hands-on experience before entering the professional life in a more elegant way. Specifically, students get more familiar with business development, content writing, research, marketing techniques, graphic designing, software development and other such tasks. In addition, Plan9 is also working at the children level to bring awareness about entrepreneurial skills at the grass route. A program of Whiz Kids is introduced in this regard for the grade 7 to 12.

The concept of university industry linkages also prevails at Plan9. Many reputable universities such as NUST, GIKI, FAST, BNU, NED and Bahria University are in partnership with Plan9 to bring awareness and promote entrepreneurial skills among the young students. Thus, seminars and workshops are arranged at universities to become an entrepreneurial society.

In addition, a distinctive approach prevails regarding the financial support for start-ups. Surprisingly, no financial support is committed to start-ups. However, funding channels and potential investors are introduced. This also helps start-ups to be more targeted oriented. The focused, goal oriented and viable ideas mostly able to achieve the funding from external sources such as Plan9 Angel Investors Club. The purpose of the club is to promote the idea of 'angel investment' and to provide funding in feasible technology based projects.

In order to become incubatees, an individual(s) should hold a Pakistani citizenship and an innovative product development idea. A team of two members is the minimum personnel requirement to become the part of Plan9. Moreover, it is made obligatory for all team members to ensure their presence in the incubator during all working days and hours.

The selection procedure of Plan9 is much similar to other incubators. The advertisement regarding the opportunities for new start-ups is announced two (2) months before the execution. The formal applications are accepted through an automated online system. After the online applications received, shortlisting is conducted. Once shortlisting is completed, invitations are submitted to shortlisted teams to join Launchpad. A panel of judges in the Launchpad rates the teams and finally the top scorers are selected to join Plan9. The relation of Plan9 and incubatees is not restricted to incubation period. The post incubation support is also the part of Plan9 agenda. Graduated incubatees also have the opportunities to become the part of Plan9 Alumni Network.

4.0 CONCLUSION

TBIs are growing all over the world. Asian developing countries have also operationalized the TBIs in order to promote and develop the entrepreneurial culture and an entrepreneurial society. The entrepreneurial society is driven by leadership and institutional development. TBIs are also excelling in Pakistan as institutional development machine. A bright future is waiting ahead for TBIs in Pakistan. Although, TBI is relatively a new phenomenon in Pakistan, have a great potential to contribute in the economic development. A TBI, Plan9, in Pakistan has performed in a remarkable way and become a productive model. A phenomenal progress in a short span of time is itself an achievement. Plan9 is contributing aggressively in developing new institutes with long survival and growth perspectives. Incubatees get advantageous from the value addition services and facilities of Plan9. Indeed, Plan9 is a unique concept in a developing country, Pakistan.

In addition, the presence of wide potential market and limited supply of incubator's validate the establishment of more incubators with government support and collaboration of private sector. Plan9 is a role model for further establishments of TBIs to strengthen the economy and moves towards an ecosystem with institutional development and leadership.

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