

TECHNO-ENTREPRENEURIAL ECOSYSTEM OF PAKISTAN AND THE ROLE OF GOVERNMENT SUPPORTED BUSINESS INCUBATION CENTERS: A DESCRIPTIVE STUDY

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ABSTRACT

The current study specifically aims to find out the role of government support along with higher educational institution's role in augmenting the techno-entrepreneurial ecosystem. The study is exploratory in nature and uses descriptive design to find out trends in the emergence of entrepreneurial ecosystem of Pakistan over the years. Data from thirteen incubators of three major cities of the country is used for the research. Results show that there is positive trend in the emergence of entrepreneurial ecosystem of Pakistan. Government support and inclusion of more incubators in the system has boosted the techno-entrepreneurial ecosystem. The study contributes to the existing research on entrepreneurial ecosystem by discussing the government and higher educational institutions' role as the support factors.

Keywords: Entrepreneurship, Incubators, Entrepreneurial Ecosystem, HEIs.

INTRODUCTION

Importance of measuring the entrepreneurial ecosystems is increasing day by day with increasing research in this domain. Researchers are emphasizing the value of measurement in order to understand the economy (Stam, 2018) and the pattern of emergence of ecosystem (Roundy et al., 2017). Within the domain of entrepreneurial ecosystem, the term technology entrepreneurship is now replacing all the concepts due to the rapid emergence and spread of technology in all businesses.

Technology entrepreneurship according to Matejun (2016) is all about identification and development of market opportunities, developing innovative employee attitude, building on R&D, cooperation with R&D institutions. The purpose is to ensure knowledge exchange and market distribution of technological innovation effects through developing marketing abilities connected with it (Lin, 2014). The involvement of a business in techno-entrepreneurship increases the innovativeness of a firm in terms of its products & services, processes, organization & management and technology innovations themselves. Technology has enhanced the capacity of value creation (Hull et al., 2007) of the businesses along with entirely transforming the design, launch and operations of a new business (Hsieh & Wu, 2018). The whole process of entrepreneurship is an outcome of organized interaction among entrepreneurs, institutions and other participants & beneficiaries of the system (Palmer et al., 2018). The role of higher education institutes and universities is undeniable in promoting technology entrepreneurship. There are studies available (e.g. Nichols et al., 2017) that establish the importance of entrepreneurial universities and academia. Studying the entrepreneurial ecosystems and

measuring them is helpful to understand it in a better manner (Stam, 2018). It eases understanding the pattern of economies as a system and the evolution of entrepreneurship. The role of economy as a system helps to figure out how it enables/disables individuals becoming entrepreneurs Fagerberg (1988).

Mechanisms are being developed across the world to measure the ecosystems. Developed economies are doing great in this regard. One such example is the Kaufmann Index (2017). Bell-Masterson & Stangler (2015) have also developed the mechanism to measure the ecosystem on some suggested parameters. There is however need to have the basic database for applying such indices. In Pakistan the basic dataset required to perform such analysis of the ecosystem is either missing or incomplete. To the best of researcher's knowledge there are is very little research previously done on finding out the statistics on techno-entrepreneurial startups' statistics in Pakistan, particularly the trend over-time. There is a report recently published by Social Innovation lab in (2018) and a qualitative study on the impact of higher education institutes by Ahmed et al. (2019) on developing entrepreneurship in Pakistan. In 2016 (Qaisar, 2016) conducted a study on the role of technology incubation centers on the economic growth of country. None of them except the social innovation lab (2018), however focused on providing the outlook of Pakistan's ecosystem and the proportional impact of establishment of business incubation centers on the emergence of entrepreneurial ecosystem Mumtaz et al. (2017).

The objective of the study is to present an overview of the technology entrepreneurial ecosystem of Pakistan as there is no consolidated data available currently on the statistics of startups despite government emphasizing on entrepreneurship. The data collected and presented in this research will provide a basic outlook of the current system which may further help in policy making in order to boost the entrepreneurial ecosystem.

Another objective of the study is to find out the impact of creation of business incubation centers on the emergence of entrepreneurial ecosystems in Pakistan in general and the emergence of techno-entrepreneurial ecosystem in specific Merton (1973).

LITERATURE REVIEW

Entrepreneurship is defined as the process of exploration, evaluation and exploitation of opportunities for creating new goods and services (Schumpeter, 1934; Shane & Venkataraman 2000; Spiegel, 2017).

In (2017), Spiegel presented a new and refined definition describing the entrepreneurial ecosystem as "*A combination of social, political, economic, and cultural elements within a region that support the development and growth of innovative start-ups and encourage nascent entrepreneurs and other actors to take the risks of starting, funding, and otherwise assisting high-risk ventures*"

Spiegel & Marxt (2011) have defined technology entrepreneurship henceforth called as 'techno-entrepreneurship' in the following manner: "*Techno-entrepreneurship investigates all questions related to the successful formation, exploitation and renewal of products, services and processes in technology-oriented firms. To do so, researchers in TE apply different perspectives and levels of granularity to investigate the question, how technology-oriented companies can build, sustain or expand their competitive position in an ever-changing environment. This includes new technology-based firms (NTBF's) as well as incumbent technology-based firms (ITBF's).*"

Technological innovations have changed the whole outlook of the technology world. The advancements in the fields of communication and information technology have redefined the

businesses world (Le Dinh et al., 2018). Some of the entrepreneurs may use technology as input for their products or services. Yet others might use the technology platforms to present, market and sell their traditional/conventional products, called as platform strategies. Computing, storing and researching information is not only becoming easier, but also more flexible and economical as cloud services are continuing to evolve and the internet transforms towards the so-called Internet of Things (IoT). With blockchain, the transition to the “*Internet of Values*” has just begun. By 2020, IoT technology is expected to be implemented in 95 per cent of electronics for new product designs and a worldwide volume of \$1bn of legalized cryptocurrencies will be traded in the banking industry (Richter et al., 2015; Panetta, 2017). In order to cope up with the emerging takeover of technology, entrepreneurs and entrepreneurial economies need to adapt to these changes. In this regard, support may be received from different sources. Knowledge spillovers are deemed significant contributors and hence the need for knowledge economy is established (Ratten & Jones, 2020).

Nichols et al. (2017) have described the supportive role of academic libraries to entrepreneurship, while Le Dinh et al. (2018) suggest possible research opportunities regarding their living lab approach. Technology is a promising area for entrepreneurship but at the same risks associated to it is also huge. Feedback from the individuals entering the technology ecosystem, their support for the new entrants, and cooperative collaborations may decide the success of technology ecosystem launch (Srinivasan & Venkatraman, 2018). According to Ojala (2016), feedback from existing entrepreneurs may help reduce uncertainty Thurik et al. (2013).

Motoyama & Knowlton (2016) have identified the simple yet influential factors for the startup ecosystem. These elements include existing entrepreneurs, support organizations focusing on entrepreneurship, supporting individuals and investors, entrepreneurial events, and universities. An important finding of theirs is that most founders were students and researchers at the universities Kuratko et al. (2017). Direct involvement of faculty and professors in commercialization of ideas was not found (Motoyama & Knowlton, 2016). The execution and application of the knowledge in the form of working projects and startups was being carried out by the students (Bigos & Michalik, 2020).

Pakistan is lagging behind in terms of general education and research and development. The National Science, Technology and innovation policy has pointed out lack of researchers and research and development activity in the industrial sector of Pakistan. There are overall 162 researchers per million population according to them. The current government has been showing their concern and focus towards entrepreneurship and sustainable economic development through entrepreneurial economy, which is a part of Vision (2025) of the country. In this context, government has taken initiative through the higher education commission (HEC) to provide financial support to the universities for establishing the business incubation centers. Private sector is at the same time playing its role through incubation centers, accelerators and providing investment opportunities Dy et al. (2017).

Looking at the importance of technology entrepreneurship and the role of business incubation centers in this regard, in the light of literature review, we come up with the following set of hypotheses.

H₁: *There is an overall increasing trend in the number of start-ups in Pakistan’s entrepreneurial ecosystem with increasing number of university-based incubators.*

H₂: *Techno-entrepreneurial ecosystem is emerging with the inclusion of more incubators in the system*

RESEARCH METHODOLOGY

Research Design

The study followed descriptive research design as the objective of the study is to figure out outlook of the entrepreneurial ecosystem. It utilizes the numbers and the spread of startups in Pakistan. Descriptive designs are exploratory in nature and help researcher to find out answers to the definition and composition of the phenomenon. No exploratory study can result in the repetition of something already done (Swedberg, 2018). The current study is justified to be exploratory in nature as it explores the area which is not fully explored, lacks complete facts and would result in better understanding of Pakistan's ecosystem (Dosi et al., 1990).

Population and Sample

The population consists of Incubators listed on the Higher education commission website for the government supported incubators. While for private incubators the lists were developed based on the information available on internet. The study sample was selected based on the geographical location of the incubators. Islamabad, Lahore and Karachi based public and private incubators were chosen for the study (Coleman, 1958).

We collected the lists of startups in each incubator. Some incubators have provided their lists on the website while in other cases the researcher contacted the focal person and requested for the lists through email. Lists were arranged year-wise. For this purpose, startups were contacted through the contact information provided by the incubators to get the rest of details. Out of thirty listed government supported incubators (BICs) on Higher Education Commission website, seven were selected for the study based on their geographical location. While six private incubators (PICs) were chosen as study sample. So, in total the sample comprises of startups from thirteen public and private incubators Kraus et al. (2020).

Theoretical Model

Following is the conceptual model built on the basis of literature survey, shown in Figure 1.

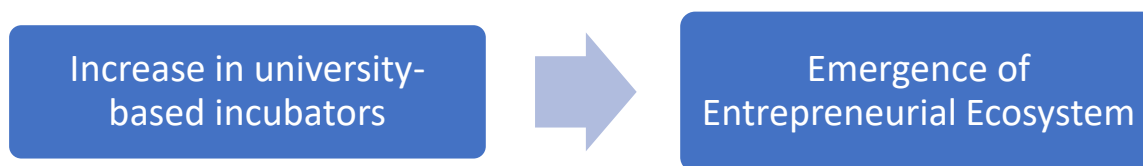


FIGURE 1
CONCEPTUAL MODEL

Methods

Data were analyzed using Microsoft Excel. Descriptive analyses were done to do the trend analysis. Charts, graphs and frequency tables and percentages are used to describes and present the results (Cohen, 2006).

RESULTS AND DISCUSSION

For the current study, in total from thirteen incubators, startup data was collected. This includes ten public business incubators (BICs) and three private incubators (PICs). The time zone for which data is collected is from the year 2016 till the quarter one of year 2020. As per the findings the total number of startups in the sampled incubators is given in Table 1.

Sr.#	Name	5year	Total
1	BIC 1	12	26
2	BIC2	4	26
3	BIC3	5	12
4	BIC 4	6	19
5	BIC 5	54	54
6	BIC 6	14	53
7	PIC1	2	22
8	PIC2	19	29
9	PIC3	28	45
10	PIC 4	17	24
11	PIC 5	20	27
12	PIC 6	16	20
13	PIC 7	15	13
	Total	212	370

Table 1 shows that there were total three hundred and seventy (370) business initiatives in total in these thirteen incubators from the dates of their inception till the first quarter of year 2020, While since year 2016 till 2020 this number is 212. It means that 57% of the startups have emerged during the period starting from 2016. The major reason behind this phenomenon is that the govt support in the form of funding and others through the higher education commission (HEC) started in this period. Trend is shown in Figure 2 through a graph below.

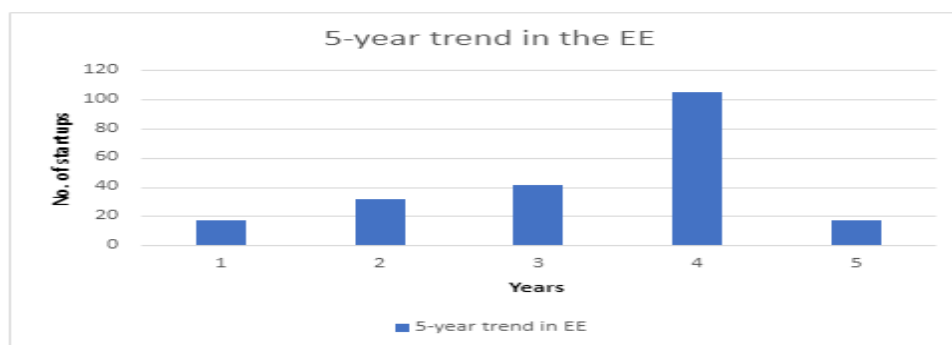


FIGURE 2
NUMBER OF STARTUPS SINCE 2016

The graph clearly shows a significant increase in number of startups after the inclusion of government funded business incubators established mostly in 2018. Year 2019 is showing the maximum number of startups while quarter 1 of 2020 is following the same trend.

One of the main objectives of study is find out the emergence pattern of startups in the latest technology. That is the startups working in the domain of Robotics, IoT, Blockchain, AR

(augmented reality), VR (virtual reality) etc. Classifying the startups into this categorization of technology we get the statistics shown below.

The startups working in the latest technology domains described above are categorized as tech-startups while others are placed in the non-tech startups column though might be using some form or older versions of technology. The same has been presented in the graph shown below in Figure 3 where horizontal axis is showing incubators while vertical axis shows number of startups.

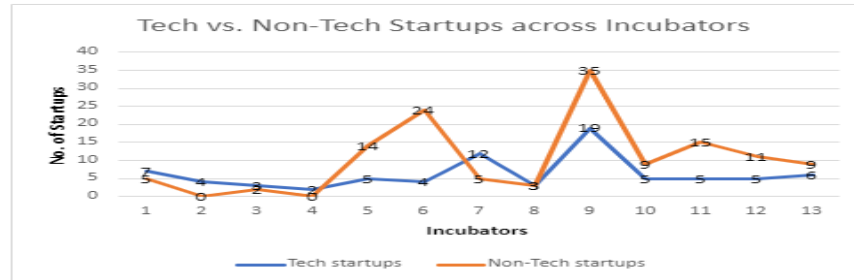


FIGURE 3
TECH VS NON-TECH STARTUPS

The number of latest technology-based startups have been increasing along with the total number of startups. The trend seems almost proportional as depicted below in Figure 3 where on the horizontal axis numbers are showing years from 2016-2019 while vertical axis is showing the number of startups shows in Figure 4.

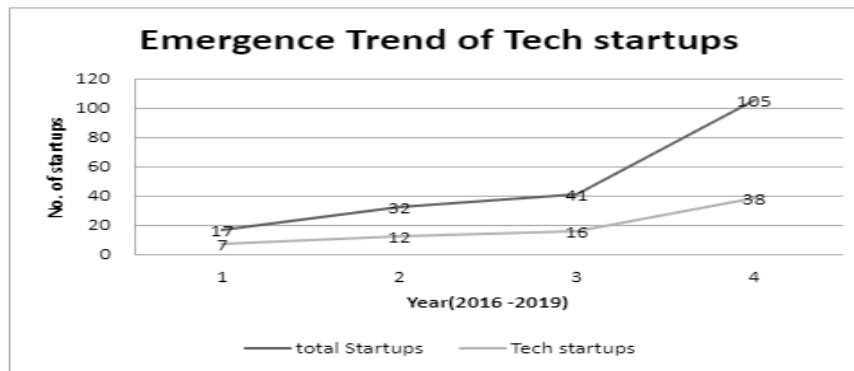


FIGURE 4
TECH VS. NON-TECH STARTUP TREND OVER YEARS

An important variable under exploration for this study was to find out the impact of establishment of business incubators by HEC with the help of higher education institutes. The data clearly shows a positive relationship between the increase in number of startups along with increase in number of incubators. The higher education institutes are contributing to the development of entrepreneurial ecosystem. The number of technology-based startups can also be seen increasing over the years and with more incubators being added into the ecosystem (see Table 2).

year	No. of Incubators	Total No. of startups	No. of Tech startups
2015	5(3 BICs, 2 PIC)	-	-
2016	9(3 BICs, 6 PICs)	17	7
2017	9(3 BICs, 6 PICs)	32	12
2018	12 (6 BICs,6 PICs)	41	16
2019	13(7 BICs, 6 PICs)	105	38
2020 (Quarter 1)	13	17	7

Discussion

The objective of the study was to find out the pattern of emergence of tech-startups over the years. The analysis of data from incubators and startups shows that there is clearly a positive trend in the emergence of startups. The number of startups including the high-tech startups is proportionally rising. Focus of government towards entrepreneurship has positively influenced people towards taking entrepreneurial initiatives.

Another objective was to find out the influence of higher education institutes in the emergence of tech-entrepreneurial startups in specific and entrepreneurial ecosystem in general. There are clear evidences available from the study that the inclusion of business incubation centers (BICs) has boosted the entrepreneurial activity in the cities under study. Since the BICs are being facilitated by the government through financial support and encouragement it is evident that the role of government is very crucial in augmenting the economic activity. Technology based startups have also increased in number and the rise is mostly contributed by the government-supported business incubation centers, be those university-based or not. So, this may be concluded that the role of higher education institutes and government is undeniable for the emergence and development of entrepreneurial ecosystems. In conclusion, the data is in line with our proposed hypotheses and supports the assumptions of the study.

The research provides useful insight into the entrepreneurial ecosystem and provides guidelines for government and higher education commission. It helps them in studying the trend and hence promoting more of entrepreneurial activities at university level. HEC should help the universities in establishing and developing their incubators. Government should help the HEC through better policies and financial support for such initiatives.

The higher educational institutes are one element from the support domain of an ecosystem. The study considers only this factor and that too in a descriptive manner. There are other factors that provide support to startups such as community and networks etc. Future studies could include other variables from different domains of entrepreneurial ecosystems and explanatory studies may be conducted for the empirical evidence. Context specific antecedents and strengthening variables should be studied.

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