

Role of Science and Technology Entrepreneurs' Parks (STEPS) in Entrepreneurship Development: A Case Study

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ABSTRACT: *Small enterprises are considered as engines of economic development in developing countries including India. Technology Business Incubators/Science and Technology Entrepreneurs' Parks (TBI/STEP) in India have the objective of creating knowledge-based entrepreneurs, among others. The current paper overviews three actively functioning STEPs located in different regions of Karnataka State and studies one among them, viz., Sri Jayachamarajendra College of Engineering STEP, Mysore. The incubation facilities, services offered, etc., by the STEP and growth rates, investment and employment amongst the tenant and non-tenant entrepreneurs are analyzed. The study revealed that the growth rate of investment and employment with respect to tenant entrepreneurs is comparable to that of non-tenant entrepreneurs. Under utilization of incubation facilities and services are also observed. Then, the paper finds the factors driving an individual to become an entrepreneur, including the tenant and non-tenant entrepreneurs. Based on literature, 26 variables from 6 major areas were considered as potential drivers of entrepreneurship. Factor Analysis was then employed to reduce these 26 variables to 9 factors, which may be concentrated for entrepreneurship development. Essentially, there is a need to improve the public awareness of STEP activities and facilities extended by it, through enhanced publicity for creating more entrepreneurs in the region.*

Keywords: *Development, Factor-Analysis, Entrepreneurship, Services, STEP.*

I. INTRODUCTION

The importance of entrepreneurship for achieving economic growth in contemporary economies is widely recognized, both by policy makers and economists [1]. Audretsch states that “Entrepreneurship has become the engine of economic and social development throughout the world [2].” The potential of entrepreneurship as a vehicle to harness the talent, capacities and energies of people so as to create a vibrant economy has been increasingly recognized in most developing countries. In India too, the transformational power of entrepreneurship was recognized ever since the advent of independence. It has been almost half a century that the nation went ahead with several small-scale industries development policies in order to create economic development [3]. Economic development of any country is determined not only by the strength of its physical resources but also by the development and utilization of its human resources. For this reason it is important for a developing country like India, troubled by the twin problems of growing population and increasing unemployment, to promote entrepreneurship and self employment [4].

Technology and knowledge are becoming the buzzwords of the new millennium. As the technology is leapfrogging beyond the speed of light, enormous activities are underway in research and development areas paving ways for new and newer technologies day by day and also resulting into the emergence of new areas of technology. These rapid paces of developments in the field of science and technology are also leading towards a new class of knowledge savvy entrepreneurs and knowledge/technology driven enterprises, which are being recognized as an important factor for the economic development of nations and a source of value-added employment generation [5]. As one enters into the 21st century, both industrialized as well as industrializing countries are arguably poised on the threshold of a major economic transition from manufacturing-based economies to knowledge-based economies. Simultaneously, nations around the world are showing renewed

interest in entrepreneurship and technological innovation. It is increasingly recognized that entrepreneurial start-ups have important contributions to technological innovation, economic growth, employment generation and social equity.

Technology business incubation is an institutional mechanism to develop an atmosphere for innovation and entrepreneurship. Furthermore, it leads to active interaction between academics and industries and sharing ideas, knowledge, experience and facilities and for the development of new technologies and its rapid transfer to industries through setting up of start-up companies in the emerging areas of technology.

Technology Business Incubator/Science and Technology Entrepreneurs Park (TBI/STEP) experience in India has demonstrated the shining examples of knowledge-based ventures promoted by entrepreneurs. Many new ventures were created through the STEP in the past one decade and these ventures are truly growing. Some of them try to upscale into large-scaled industries providing growth, employment and hope for the nation. As a pure investment opportunity alone, STEP has provided more returns to the government in terms of direct and indirect taxes and employment opportunities. Therefore the investments made on TBI/STEP as such are commercially more lucrative when seen from a long term societal point of view.

The specific purpose of this paper is to gain some insight into the role played by an active STEP in entrepreneurship development in and around Mysore, in the state of Karnataka.

II. METHODOLOGICAL ISSUES

1 Objectives:

The current paper is based on a research study conducted with the following specific objectives:

- To overview the three active STEPs in the state of Karnataka viz., SJCE-STEP (Mysore), NITK-STEP (Surathkal) and BEC-STEP (Bagalkot).
- To study the case of SJCE-STEP (Mysore) in a detailed way.
- To analyze the factors which drive an individual to become an entrepreneur

2 Scope:

The scope of this study is limited to tenant entrepreneurs of SJCE-STEP and small-scale non tenant entrepreneurs in and around Mysore. It is ensured that the sector of business of tenant entrepreneurs and the non-tenant entrepreneurs is same.

3 Sample:

The total sample size of the sample in the study is 30. Out of these 30 entrepreneurs, 9 entrepreneurs are tenant entrepreneurs of SJCE-STEP and remaining 21 are non-tenant entrepreneurs. Only those entrepreneurs who have started business within the last three years are included in this study to ensure homogeneity among the non-tenant entrepreneurs and make them comparable with the tenant entrepreneurs of SJCE-STEP.

4 Methodology:

As far as the methodology is concerned, the study employed both secondary and primary data for meeting the stated objectives.

The first objective is met by mostly utilizing the secondary data pertaining to the three actively functioning STEPs in Karnataka. Catalogues, Brochures, Leaflets, Monographs, personal visits, websites etc., pertaining to the three STEPs are used to compile the overview. The second objective is met by using the primary data obtained through structured questionnaires administered by the researcher. The data is collected through personal interview with the entrepreneurs and STEP Authorities by the researcher. The principal component type factor analysis is made use off in meeting the third objective. The collected data is tabulated and statistically analyzed through SPSS (Statistical Package for Social Sciences) version 17.

III. AN OVERVIEW OF THE THREE ACTIVE STEPS IN KARNATAKA

This section presents an overview of the three actively functioning STEPs in the state of Karnataka.

1 SJCE-STEP:

Sri Jayachamarajendra College of Engineering – Science and Technology Entrepreneurs' Park (SJCE-STEP) was established in 1985 by SJCE at Mysore. SJCE is now an autonomous institution under V.T.U (Visveswarayya Technological University) Belgaum and is governed by the Grant-in-Aid rules of the Government of Karnataka. The institute offers graduate, post graduate and research programs leading to M.Sc. (Engg) and Ph.D. in Mathematics, Electrical Sciences, Civil Engineering, Mechanical Engineering and Polymer Science and Technology and other disciplines.

Table 1: Salient features of SJCE-STEP

Administration	
Year of Establishment	1985
Thrust Areas	Information Technology and Electronics
Legal status	Registered Society
Affiliation	Technical Institution / University linked
Incubation	
Floor area available for each incubatee	500, 1200 and 4000 sq. ft
Average period of incubation	2-3 years
Capacity	10 companies
Incubated	150
Employment generated	More than 2500
Seed Fund	
Sanctioning Agency and Amount	DST, GOI and Rs. 1 Crore

SJCE-STEP has been identified as the base for Indian STEP Association, promoting networking amongst all STEP in India and Science Parks globally, notably in the UK, the USA, Malaysia and Austria. SJCE-STEP is an active member of various industrial circles in the region. Industrialists approach SJCE-STEP for their employee training and calibration needs. I.T. companies in particular have been interacting with SJCE-STEP for Human Relations (HR) solutions and outsourcing of projects. SJCE-STEP is also well known in this city as the first destination for I.T start-ups for the incubation and mentoring support. This STEP has secured the “Best STEP award” from DST, GOI for the year 2000. Table 1 provides the summary of various features of this STEP.

2 NITK-STEP:

National Institute of Technology Karnataka - Science and Technology Entrepreneurs' Park (NITK–STEP) was instituted in 1994 by NITK at Surathkal. NITK is a residential Engineering college located amid 300 acres of sylvan surroundings. Surathkal is 22 kilometers North of Mangalore City along the Kanyakumari-Mumbai National Highway 17. NITK is easily accessible from all parts of the country. There are a total of 1400 U.G. students, 310 P.G. students and nearly two hundred girls staying in the various hostel blocks of NITK. NITK-STEP is a registered society formed in 1994 as per the Karnataka State Societies Registration Act, 1960. Since inception it has trained about 4,300 persons including men and women in different fields through entrepreneurship development programmes, skill development programmes and technology-based entrepreneurship development programmes. Many participants have set up their own micro and small scale industrial units and service providing units.

Table 2: Salient features of NITK-STEP

Administration	
Year of Establishment	1994
Thrust Areas	IT, Engineering Design, Multi technology integration.
Legal status	Registered Society
Affiliation	Technical Institution Linked / University linked
Incubation	
Floor area available for each incubatee	150 sq. ft.
Average period of incubation	2.75 Years
Capacity	10 companies
Incubated	30
Graduated	23
Graduated companies still in business	16
Employment generated	1200
Revenue generated	Rs. 20 Crore
Seed Fund	
Sanctioning Agency and Amount	DST, GOI and Rs. 1 Crore
No. of Companies who Received fund	6 companies
Total Amount Disbursed	Rs. 28 Lakhs

The STEP provides business incubation services to those who come forward to start their own units. Business incubation services cover infrastructure support, support in product development, assisting in tie-up with funding agencies, training and the like. In existence from past 16 years, NITK-STEP has a focus on incubating IT, Engineering Design and Multi-technology integration ventures. This STEP has graduated 23 firms which have created jobs for more than 1200 individuals while generating revenues worth Rs. 20 Crore. NITK-STEP is well known in the region amongst MSMEs and large-scale firms from the Industry, also among Chamber of commerce, technology institutions, innovators, women body associations, fishermen community, banking institutions and government bodies. The STEP is also associated with other social welfare associations like district industry center, handloom and handicraft segment, jewelry segment, agriculturists and prominent associations involved in community welfare development activities. Table 2 provides the summary of various features of this STEP.

3 **BEC-STEP:**

Basaveshwar Engineering College-Science and Technology Entrepreneurs' Park (BEC-STEP) was founded in the year 1999 by BEC at Bagalkot. BEC is now an autonomous institution under V.T.U Belgaum and is governed by the Grant-in-Aid rules of the Government of Karnataka. It offers bachelor degrees in ten disciplines and post graduate degrees in five areas. The campus is well laid on an elevated stretch of land of over 100 hectares on the outskirts of the city and is adjoining to New Bagalkot town. BEC-STEP has been the well-deserved recipient of the BEST TBI award from DST for the year 2007. With a focus on incubating startups in the areas of Food Processing, Textile technology (both handloom and power loom) and low-cost building Technology, BEC-STEP has incubated 29 firms in less than nine years since its inception. Possessing three specialized pilot plants for food processing and one Textile Pilot Plant, BEC-STEP offers its incubates access to resources not available to most fledgling businesses. Such unparalleled access has contributed considerably to the success of the incubatee companies of BEC-STEP. Table 3 provides the summary of various features of this STEP.

Table 3: Salient features of BEC-STEP

Administration	
Year of Establishment	1999
Thrust Areas	Food Processing, Textile Technology, Building Technology
Legal status	Registered Society
Affiliation	Technical Institution / University linked
Incubation	
Floor area available for each incubatee	150 sq. ft
Average period of incubation	6 Months
Capacity	7 companies
Incubated	29

IV. THE PERFORMANCE OF SJCE-STEP: AN ANALYSIS

The SJCE-STEP has contributed significantly to the development and nurturing of entrepreneurship in this region. The total employment generated by this STEP from its inception till now is 12,270 and a total of 8 tenant entrepreneurs have been very successful after completing incubation period. The other activities of STEP are given in Table 4.

Table 4: Activities of SJCE-STEP

Total training programs conducted till now	591
Total number of workshops organized till now	23
Total number of Technical consultant activities till now	25

To appreciate the role played by the SJCE-STEP in a more specific way, we try to compare various parameters like investment, employment etc., of present tenant entrepreneurs of STCE-STEP with that of non-tenant entrepreneurs of this region engaged in the same business sector. The data collected from the 21 non-tenant entrepreneurs and 9 tenant entrepreneurs of STEP was utilized for this purpose. Before providing such comparisons, a preview of social and other background of tenant and non tenant entrepreneurs provides a right background for viewing the results in the correct perspective.

The data collected from the tenant entrepreneurs revealed that all 9 members are male entrepreneurs and majority of them had their highest education as master's degree (66.7%). About 45% of them were in the age range of 31-35 years. The family size of the entrepreneurs is 3-5 members in 78% of cases. Most of the

entrepreneurs were in IT sector only. Whereas the data pertaining to non-tenant entrepreneurs disclosed that 86% of them were male and the remaining 14% were female. 48% of them had master's degree, and 52% of them were in the age range of 26–30 years.

Table 5: Investment of Tenant Entrepreneurs

Investment Range (Lakhs of Rupees)	No. of Entrepreneurs	Percent
0 - 2	3	33.3
2 - 5	4	44.4
> 5	2	22.2
Total	9	100.0

The investment range of various entrepreneurs of both tenant and non-tenant type are presented in Table 5 and Table 6. While the maximum number of tenant entrepreneurs is in the investment range of 2-5 lakh rupees, more than half of non-tenant entrepreneurs are in the investment range of 1-5 lakh rupees. Non-tenant entrepreneurs are also seen in the investment range of 15 lakhs and even more than that. However, such investments are not observed in the case of tenant entrepreneurs. This is quite understandable since tenant enterprises are basically start-ups, while the non tenant enterprises are mostly by people with some strong business and financial background.

Table 6: Investment of Non-Tenant Entrepreneurs

Investment Range (Lakhs of Rupees)	No. of Enterprises	Percent
1 - 5	11	52.4
5 - 10	5	23.8
10 - 15	3	14.3
15 - 25	1	4.8
> 25	1	4.8
Total	21	100.0

Almost similar observations can be made looking at the employment by the tenant and non tenant entrepreneurs as shown in Table 7 and Table 8 respectively. Employment size of tenant entrepreneurs is relatively small compared to non-tenant entrepreneurs.

Table 7: Employment by Tenant Entrepreneurs

No. of Employees	No. of Enterprises	Percent
1 - 3	3	33.3
4 - 6	4	44.4
> 6	2	22.2
Total	9	100.0

Table 8: Employment by Non-Tenant Entrepreneurs

No. of Employees	No. of Enterprises	Percent
0 - 3	5	23.8
4 - 7	9	42.9
8 - 11	3	14.3
12 - 15	2	9.5
>15	2	9.5
Total	21	100.0

The gist of the above comparisons is that tenant entrepreneurs are truly on the right track and their performance is comparable to that of non-tenant entrepreneurs despite all their limitations of lack of financial, family and business background. In this context, it is interesting to find what kind of facilities and services are provided by the STEP for tenant entrepreneurs and to what extent they are utilizing these facilities and services. Tables 9, Table 10, Table 11 and Table 12 are provided in this connection.

Table 9: Basic Facility Utilization by Tenant Entrepreneurs

Basic Facilities provided by the STEP	No. of Enterprises Availing	Percentage of Enterprises
Incubation space provided	9	100.0%
24 hours power supply	9	100.0%
Internet facility	2	22.2%
Photo-copying facility	1	11.1%
Office furniture	7	77.8%
Conference hall/seminar hall	6	66.7%
Other facilities	2	22.2%

Table 10: Support Facility Utilization by Tenant Entrepreneurs

Support Facilities Provided by the STEP	No. of Enterprises Availing	Percentage of Enterprises
Testing and calibration	1	11.10%
Personal computers facility	3	33.33%
Data bank facility	4	44.44%
Pilot plant facility	3	33.33%
Prototype development	2	22.22%
Other support facility	3	33.33%

A common observation which can be made after looking at these tables is that despite providing several facilities and services the rate of utilization seems to be not very high, barring a few cases

Table 11: Basic Services Utilization by Tenant Entrepreneurs Support

Basic Services provided by the STEP	No. of Enterprises Availing	Percentage of Enterprises
Training services	4	44.44%
Other basic services	6	66.67%

This may be due to lack of awareness or other reasons. This is to be thoroughly probed and improved for effective and more fruitful functioning of STEP in the years to come.

Table 12: Support Services Utilization by Tenant Entrepreneurs Support

Support Services provided by the STEP	No. of Enterprises Availing	Percentage of Enterprises
Software services	3	33.33%
Technical support services	1	11.11%
Common utility services	9	100.00%
Other support services	2	22.22%

V. FACTORS DRIVING ENTREPRENEURSHIP

Finally, we would like to empirically determine important factors which drive an individual to become an entrepreneur. This helps in developing entrepreneurship further in this region by reinforcing the efforts of STEP. We have used the perceptions of both tenant entrepreneurs of SJCE-STEP and non-tenant entrepreneurs of the region for this purpose.

1 Factors influencing Entrepreneurship: A brief review of literature:

Why and when do people become entrepreneurs? Researchers have long been curious about this issue. Researchers like Kirzner [6], Schumpeter [7,8] and Hayek [9] have worked on this, even though satisfactory answers to these questions have been rather elusive even after three decades of research (Brockhaus [10]; Brockhaus and Horwitz [11]; Gartner [12]; Churchill and Lewis [13]; Shaver and Scott [14]). Researchers have traditionally considered either individual factors (Hornaday and Aboud [15]; Carland, Hoy, and Carland [16]) or contextual factors in explaining why some individuals choose to become entrepreneurs. Studies considering both sets of factors together in an examination of a person's decision to become an entrepreneur are rare.

Being an entrepreneur, one who is self-employed and who starts, organizes, manages, and assumes responsibility for a business, offers a personal challenge that many individuals prefer over being an employee working for someone else. Entrepreneurs accept the personal financial risks that go with owning a business but

also benefit directly from the potential success of the business. Being an entrepreneur is often viewed as an aversive career choice where one is faced with everyday life and work situations that are fraught with increased uncertainty, impediments, failures, and frustrations associated with the process of new firm creation (Campbell, 1992[17]). Not surprisingly, many researchers have investigated the motivation to become self-employed. Considering the exhaustive literature available and discussion with the experts the following factors are considered for this empirical research.

- ❖ Financial ability
- ❖ Innovativeness
- ❖ Market demand
- ❖ Family business
- ❖ Self employment and
- ❖ Previous work experience

2 Factors influencing Entrepreneurship: Results of Empirical Data Analysis:

In this study, 6 major factors likely to influence an individual to become an entrepreneur discussed above are included. They are represented through 26 different dimensions (As in Table 14). A likert scale is used to measure the response of 30 entrepreneurs (21 non-tenant and 9 tenant entrepreneurs) on these 26 dimensions. To analyze the data and to arrive at any meaningful deduction we need to reduce the variables to a manageable level. Factor Analysis is ideally suited to do this job.

Table 13: Total variance explained by the extracted factors (Eigen value more than one)

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.153	23.665	23.665	6.153	23.665	23.665	4.810	18.500	18.500
2	3.857	14.835	38.500	3.857	14.835	38.500	3.181	12.236	30.736
3	2.986	11.486	49.986	2.986	11.486	49.986	2.743	10.548	41.284
4	2.041	7.849	57.835	2.041	7.849	57.835	2.361	9.082	50.366
5	1.849	7.113	64.948	1.849	7.113	64.948	2.106	8.102	58.467
6	1.596	6.138	71.086	1.596	6.138	71.086	2.083	8.013	66.480
7	1.467	5.642	76.728	1.467	5.642	76.728	1.812	6.968	73.448
8	1.209	4.651	81.379	1.209	4.651	81.379	1.710	6.578	80.026
9	1.103	4.241	85.620	1.103	4.241	85.620	1.454	5.594	85.620

Hence, Principal Component type Factor Analysis adopting Rotation Method of Varimax with Kaiser Normalization is employed. The Rotation converged in 11 iterations. This produced 9 components as given in Table 13 and graphically depicted by the Scree plot in Fig.1.

Scree Plot

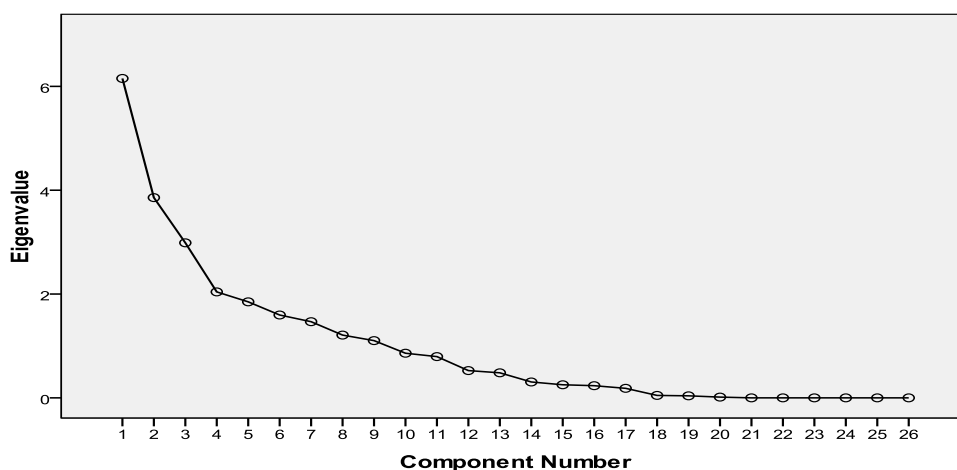


Fig 1: Scree Plot showing the extracted factors graphically (Eigen value more than one)

Table 14 (split into two parts) gives the factor loadings on 9 components by each of the 26 variables after the rotation. Considering these factor loadings the 9 components may be named as given below:

- ❖ Component 1: Technical Knowledge & Feasibility
- ❖ Component 2: Self Esteem & Pride
- ❖ Component 3: Family Background
- ❖ Component 4: Freedom for Innovation
- ❖ Component 5: New Product/Process
- ❖ Component 6: Easy Financing
- ❖ Component 7: Product Differentiation
- ❖ Component 8: Financial Capability
- ❖ Component 9: Availability of Land

Table 14: Factor loadings after the rotated component matrix

Dimensions	Component									
	1	2	3	4	5	6	7	8	9	
I became Entrepreneur, because I worked with my family business				-.456	-.562					.406
Inevitable family circumstances made me an Entrepreneur			.893							
I became entrepreneur because my family business was under loss			.911							
I am an entrepreneur because I have got education in the same field			.745							
I became an entrepreneur since I did not wanted to work under others		.955								
I became an entrepreneur, because, I wanted to be a Boss		.929								
I became an entrepreneur, because, I can give employment to others	.449	.462								
I became self employed because, I can do innovations in my enterprise				.750						
I became self employed, because, I wanted freedom in my own decisions		.619					.543			
I had previous experience, hence I became an entrepreneur	.898									
I am entrepreneur due to my working in similar type of enterprises earlier	.721									
I had worked in my family business so I became a new entrepreneur				-.752						
I had technical know-how/ Mgmt. techniques/communication skills, so I became an entrepreneur	.904									

It may be found that these 9 components must be duly considered in developing entrepreneurship in general, and in this region in particular. The STEP, while carrying out entrepreneurship development programmes must aim to develop as many of these components as possible to create more and more new entrepreneurs in the region in the years to come.

Table 14: Factor loadings after the rotated component matrix (Contd.,)

Dimensions	Component								
	1	2	3	4	5	6	7	8	9
I became Entrepreneur, because I worked with my family business				-.456	-.562				.406
Inevitable family circumstances made me an Entrepreneur			.893						
I became entrepreneur because my family business was under loss			.911						
I am an entrepreneur because I have got education in the same field			.745						
I became an entrepreneur since I did not wanted to work under others		.955							
I became an entrepreneur, because, I wanted to be a Boss		.929							
I became an entrepreneur, because, I can give employment to others	.449	.462							
I became self employed because, I can do innovations in my enterprise				.750					
I became self employed, because, I wanted freedom in my own decisions		.619					.543		
I had previous experience, hence I became an entrepreneur	.898								
I am entrepreneur due to my working in similar type of enterprises earlier	.721								
I had worked in my family business so I became a new entrepreneur				-.752					
I had technical know-how/ Mgmt. techniques/communication skills, so I became an entrepreneur	.904								

VI. CONCLUSIONS

This paper presented an overview of the three actively functioning STEPs located in different regions of the state of Karnataka and then dealt with SJCE-STEP in detail. The study analyzed the existing incubation facilities, services and the technologies transferred to the entrepreneurs by this STEP. Subsequently, it obtained the growth rates, investment and employment amongst the tenant entrepreneurs of SJCE-STEP and also non-tenant entrepreneurs of the region around Mysore. It is found that despite SJCE-STEP offering the several facilities and services, they are not completely utilized by the tenant entrepreneurs. Finally, through factor analysis the paper obtained nine components from 26 different variables, which may be targeted for entrepreneurship development. It is also necessary to improve the awareness of SJCE-STEP activities such as the available facilities, services and technology transfer assistance among the potential entrepreneurs through enhanced publicity for fruitful outcome in the long run.

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