

Operation of Technology Business Incubators in Selected State Universities in the Philippines: Basis for Strategic Action Plan for Sustainability

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Abstract- This study was conducted to explore the operations of university-based technology business incubators in selected state universities in Luzon. Specifically, the study described the profile of the business incubators in terms of organization management, cost of establishing the project, number of personnel, nature of employment, objectives of the business incubator, linkages, accomplishments, programs, and services. The study also determined the challenges encountered in the operation and services availed by the TBI. Descriptive research is the design of the study with five universities serving as the foci of the study. The respondents from these universities were TBI managers and previous clients or incubatees, The study reveals that incubators help small and medium-sized businesses flourish. Business incubators are successful because to their facilities and infrastructure, human resource expertise, and tenant intangibles. Without academic, industrial, and government support, incubators are bound to fail.

Entrepreneurial programs were launched at major research institutes to allow university scholars to pursue commercial applications of their research without leaving academia. These incubators helped universities retain prominent faculty and produce IP suited for commercialization. Beyond retaining employees and earning revenue through IP commercialization, these incubators helped institutions build reputations for cutting-edge research. Convenient access to university intellectual capital, technology, and skilled technical labor is vital to the survival and growth of new

businesses. Many regional universities are focused on research and economic development in addition to teaching. As a result, they create business incubators. The incubators' goals include creating an atmosphere and culture favorable to student-run firms, increasing university intellectual property commercialization, attracting technology-based businesses, and providing a living laboratory for students to work in an entrepreneurial setting. Building incubator networks to share best practices and get government support is crucial to gaining competitive and comparative advantages. Buildings and infrastructure are important, and so are the incubator's resources, such as mentorship and passion. This study also proposed a strategic action plan for the selected technology business incubators to improve their operation.

Index Terms: Technology Business Incubators, State Universities and Colleges, Business Incubation

INTRODUCTION

Entrepreneurship and innovation have substantial regional features, which policymakers are increasingly recognizing. Throughout the last five decades, technology business incubation (TBI) has developed as a revolutionary technique for promoting local and regional ecosystems for creative entrepreneurship. Various examples of effective incubation structures, such as technological incubators, accelerators, and scientific parks, have contributed to the creation of sustainable regional ecosystems by concentrating innovative entrepreneurial activity and attracting policymakers' attention (Mian, 2012). Policymakers throughout the world

are looking for strategies to improve regional economic growth because of the relationship between innovative entrepreneurship, competitiveness, and economic well-being (Colombo and Delmastro, 2006). Incubation platforms are now widely regarded as playing a critical role in encouraging the development of a regionally creative business environment. In response to the present global economic challenges, incubation platforms are seen as significant engines for job creation and tools to start and rejuvenate industries and regions (Aaboen 2009).

Business incubators are non-profit organizations that support creative start-up businesses in achieving rapid development and success. They provide various business services and resources, including physical space, financial and technological help, and networking connections. In general, technological business incubators are developed as a result of public-private partnerships between universities, companies, and all levels of government (Etzkowitz, 2003).

In terms of concept, incubators assist in the connection of science, technology, education, expertise, entrepreneurial talent, and money (Smilor and Gill 1986, Mian 2016). They are part of a regional ecosystem that includes industrial clusters, academic institutions, research laboratories, banks, and investors. As a result, incubators are mechanisms that are believed to be unique in providing critical links in the entrepreneurial value chain at the national and regional levels (Phan, Siegel, and Wright, 2005). They are hybrid organizations that encourage technological diffusion into the local economy by collaborating with universities, industry, and government institutions (Etzkowitz and Klofsten 2005). Link and Siegel highlight their regional significance in fostering technology-based economic growth and contributing to the promotion of the location's image, which is hypothesized to operate as conduits for building entrepreneurial capital within an area (2007). With entrepreneurial universities increasingly being seen as engines of knowledge-based regional economic growth through technology transfer and commercialization of research findings, a regionally integrated technology incubation mechanism has the potential to be the primary vehicle for nurturing and growing such businesses (Smith and Zhang 2012). As a result, a contextual examination of these incubation models as components of their regional ecosystems is required to shed light on the interactions and dynamics between incubators and regional players, as well as to assess their significance in regional economic growth.

The number of existing TBIs in the country is insufficient to serve small and medium-sized businesses, startups, and university researchers. (PASUC, 2019). Various Technology Business Incubators (TBIs) have, nevertheless, been established in the Philippines throughout the previous decade. The bulk of these university-based TBIs are funded by the Department of Science and Technology (DOST). DOST-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD) finances 14 TBIs, whereas DOST-Philippine Council for Agriculture, Aquatic, and

Natural Resources Research and Development funds 16 TBIs. This study seeks to describe the operation of these university technology business incubators in selected state universities in Luzon, particularly those funded by the government. Moreover, this study will also determine if TBIs are fully operational and are meeting their intended purpose. Thus, this study would be of relevance to address the concerns of the TBIs and maximize their utilization to gain greater benefits through the crafting of a strategic development plan. Likewise, it can also serve as a benchmark for other state universities and colleges that intend to establish their own business incubators.

METHODS

The descriptive method of research was used in this study. The purpose of descriptive research is to precisely and thoroughly characterize a population, circumstance, or phenomena. It can provide answers to what, where, when, and how, but not to why. A descriptive study plan may use a range of different research approaches to examine one or more variables. Unlike in experimental research, the researcher does not influence or change the variables; instead, they are observed and measured.

There were two main groups of respondents in the study; the Technology Business Incubator Managers and the clients or the incubatees. The major tools of the research were a structured interview guide and a survey questionnaire. During the in-depth interview with the TBI management or head, the interview guide was employed. The questionnaire, on the other hand, was sent out in an electronic format to TBI customers and incubatees.

For the business incubator managers, an interview guide was used. There were two main parts of the instrument which sought answers to the first and second statement of the problem. The first part focused on the profile of the business incubator; organization and management, programs, products, and services; strategies; SWOT analysis/competitive advantage; linkages, collaborations, initiatives, government support; key performance indicators; and service requirements. The next part identified the challenges encountered in the operation of the business incubators. Another instrument was intended for the TBI clientele, which answered the services availed in the incubator and the challenges they encountered in the operation. This answered the third statement of the problem.

The researcher made certain that the equipment to be utilized went through the proper construction and validation procedures. To grasp the available material connected to the issue statement, the researcher did an extensive examination of related literature. Similarly, they provided the researcher with suggestions for further conceptualizing the study's instrument. After that, the researcher developed a draft of the questionnaires, which were then face validated by two (2) specialists from the Department of Science and Technology-PCIEERD who had sufficient knowledge and involvement in the management of business incubators. The results of the validation performed by the two experts that were contacted

are included in the study's appendices. The feedback, thoughts, and recommendations from the consultation were integrated into the instrument for future modifications..

Data Gathering Procedure

Interviews, document reviews, and field observations were used to acquire primary data on the functioning of TBIs. Concerned university authorities were contacted for permission to use these data gathering techniques, and responses were identified. The TBI's manager or any comparable position, as well as three (3) incubatees from each TBI, were the responses.

Interview and survey are the main data gathering techniques used in this study. A request for data gathering was sent to each university president or in-charge of the business incubator stating the request to gather data. Upon approval, the instrument for the incubator manager and incubatees was sent in advance via electronic mail. Afterwards, the researcher and TBI managers agreed on the schedule of the interview. However, due to limitations on physical data gathering brought by the health restrictions, the researcher was only to conduct a virtual interview and data gathering. There was only one TBI where the researcher was able to conduct an in-person interview. Adequate documentation of these activities can be seen in the appendices of this study. For the incubatees, the researcher asked for the assistance from the TBI managers to identify and distribute the electronic questionnaire (google form) based on the criteria. To supplement the primary data gathered, secondary data were obtained through related documents and articles on the operation of the business incubators.

RESULTS AND DISCUSSION

The data obtained from the study's principal instrument is presented in this chapter. Statistical methods were used to organize, quantify, and interpret the responses. The presentation followed the order of the statement of the problem of this study.

I. Profile of the Technology Business Incubators

The profile of the technology business incubators is described in terms of organization and management, programs, products, and services; strategies; SWOT analysis/competitive advantage; linkages, collaborations, initiatives, government support; key performance indicators; and service requirements.

1.1. Organization and Management

1.1.1. Year of Establishment and Field of Specialization

The researcher gathered data on the critical aspect of the organization and management of the TBIs. Table 3 shows the year of establishment of the TBIs.

TABLE 1
YEAR OF ESTABLISHMENT AND FIELD OF SPECIALIZATION

TBI	Year Established	Specialization
1. TBI 1	2010	Agriculture and Food
2. TBI 2	2018	Information and Communications Technology, Engineering
3. TBI 3	2014	Information and Communications Technology, Engineering
4. TBI 4	2018	Information and Communications Technology, Engineering
5. TBI 5	2010	Agriculture and Food

As can be seen in the table, most of the respondents have existed for more than five (5) years, with TBI 1 as the oldest existing TBI. Furthermore, most of the TBIs existing specialize in Information and Communications Technology and Engineering while two are into agriculture and food technology. During the interview with the TBI managers, they mentioned that it is essential that the TBI be focused on the university's strengths to ensure the availability of experts in the field and mastery of the needed assistance of the clientele.

1.1.2. Main Objectives of the TBI

The Department of Science and Technology has its own objective in its TBI program. These are the creation of jobs, the development of entrepreneurs and the promotion of public-private partnerships in regional economic development. (DOST-PCIEERD, 2014). However, universities with TBI may have other objectives aside from what DOST has. For this reason, the researcher also identified the following objectives that the TBI-respondents have.

TABLE 2
MAIN OBJECTIVES OF THE TBI

Objectives	f	%
1. To contribute to competitiveness and local job creation	5	100%
2. To promote public-private partnerships in regional economic development	5	100%
3. To help researchers, faculty and students commercialize their technologies	5	100%
4. To help the startups, micro, small and medium enterprises in product and business development	5	100%
5. To promote intellectual property protection and management	5	100%

*Multiple Responses

As demonstrated in Table 2, every responder said that they had completed the pre-determined goals. This will add to the body of knowledge on the goals of business incubators. TBI's main goal is to make knowledge transfer and development easier, resulting in more product dissemination

(EU, 2010). Another goal is to help start-ups by developing connections that will allow them to survive, grow, and thrive (Mian, et.al, 2016). Its methods are also viewed as important governmental tools for supporting technology-focused innovation and entrepreneurship. (Mian and colleagues, 2016).

Furthermore, the majority of the TBIs have also objectives of conducting capacity building workshops and trainings, organizing start up summit, and exploring possible funding support to their incubatees. The primary objective of business incubators is to develop self-sufficient, profitable businesses (Elmansor & Arthur, 2015). The incubator offers a variety of services to incubated businesses, including providing a suitable and adequate atmosphere for their growth, business plan counseling, marketing, business management, and associated material boosting the company's image (Moraru & Rusei, 2012). Through a combination of resource and service assistance, the central incubator program aims to expedite the growth of successful young entrepreneurs and their firms (Elmansor & Arthur, 2015). Industry incubators offer a variety of services through forming relationships with a variety of stakeholders, including academia, business, and government, to accelerate businesses.

1.1.3. Partner/Collaborating Agencies in the Establishment of TBI

TABLE 3
PARTNER/COLLABORATING AGENCIES IN THE ESTABLISHMENT OF TBI

Name of the TBI	Public/Government Agency	NGO/Private Agency
1. TBI 1	DOST- PCAARD	None
2. TBI 2	DOST- PCIEERD	None
3. TBI 3	DOST- PCIEERD	None
4. TBI 4	DOST- PCIEERD	None
5. TBI 5	DOST- PCAARD	None

As illustrated in Table 3, all respondents indicated that they collaborated with a partner agency to establish their technology business incubators. Specifically, the Department of Science and Technology through its Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) and the Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD). These are two of the Department of Science and Technology's three sectoral planning councils, together with the Philippine Council for Health Research and Development (PCHRD). The incubator managers said during the interview that DOST provided funding and assistance for the establishment of their TBIs. The Department of Science and Technology has a dedicated initiative for establishing Technology Business Incubators. TBI is one of the approaches used by the Department of

Science and Technology (DOST) to promote innovation and technopreneurship in support of the country's socioeconomic progress in a knowledge-based global economy (DOST-PCIEERD, 2014).

1.1.4. Duration and Costs of Setting Up and Operating the TBI

Table 7 shows the duration of establishing the TBI and the costs of setting up and operating the TBI. The prices are divided into three (3) main aspects, namely, Personnel Services (PS), Capital Outlay, and Maintenance and Other Operating Expenses (MOOE).

TABLE 4
DURATION AND COSTS OF SETTING UP AND OPERATING THE TBI

Name of the TBI	Duration (in months)	Costs of Setting Up (in thousand pesos)			
		*PS	Capital Outlay	MOOE	Total
1. TBI 1	8	840	3,400	620	4,860
2. TBI 2	10	720	2,200	650	3,570
3. TBI 3	6	920	3,600	570	5,090
4. TBI 4	8	1,100	2,950	400	4,450
5. TBI 5	6	645	4,200	380	5,225

*Personnel Services

Table 4 shows the duration and costs of setting up and operating the technology business incubators. The duration of the establishment of the TBIs includes the time needed for major preparations after the project proposal was approved and funds were already downloaded to respective university. These activities include organization of the TBI team, capacity building of the TBI personnel, procurement of the equipment and supplies, and promotion of the TBI to the stakeholders.

All TBIs are funded by Department of Science and Technology. However, TBI 1 and TBI 5 are funded by DOST-PCAARD while TBI 2, TBI 3, and TBI 4 are funded by DOST-PCIEERD. There are three main costs of setting the project, personnel services, capital outlay, and maintenance and other operating expenses.

Setting up a TBI requires series of planning and adequate resources according to one interviewee. For TBI 1 the total project cost is Php 4,860,000 divided into Php 840,000 for personnel services, Php 3,400,000 for capital outlay, and Php 620,000 for maintenance and other operating expenses. For TBI 2, establishing the facility required them a total of Php 3,570,000 distributed as follows; Php 720,000 for personnel services, Php 2,200,000 for capital outlay, and Php 650,000. Furthermore, setting up TBI 4 required the university a total of Php 5,090,000. Out of the total project cost, Php 920,000 went to personnel

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services, Php 3,600,000 to capital outlay, and Php 570,000 to maintenance and other operating expenses.

Lastly, for TBI 5 the total project cost was Php 5,225,000 divided as follows; Php 645,000 allocated for personnel services, Php 4,200,000 for capital outlay, and Php 380,000 for maintenance and other operating expenses.

1.1.5. TBI Personnel

The following table shows the different types of personnel the TBIs have.

TABLE 5
TBI PERSONNEL

Name of the TBI	M	AA	TE	Total
1. TBI 1	2	2	3	7
2. TBI 2	2	2	5	9
3. TBI 3	1	3	4	8
4. TBI 4	2	1	5	8
5. TBI 5	2	8	4	14

Note: M= Manager, AA= Administrative Assistant, TE= Technical Expert

As shown in Table 5, TBI 5 has the most number of employees with 14. Followed by TBI 2 with nine personnel. TBI 3 and TBI 4 have eight personnel and TBI 1 has the least number of personnel at 7.

1.1.6. Nature of Employment of TBI Personnel

Aside from the number of employees, the researcher also identified the nature of employment or engagement of the TBI personnel. The nature of employment can be categorized as full-time/permanent employee, contractual, designated faculty, and consultant/visiting staff.

TABLE 6
NATURE OF EMPLOYMENT OF TBI PERSONNEL

Name of the TBI	*PE	**C	***DF/P	****C	Total
1. TBI 1	1	2	4	1	8
2. TBI 2	1	4	4	2	11
3. TBI 3	2	3	4	2	11
4. TBI 4	1	2	5	4	12
5. TBI 5	0	10	4	1	15

*Permanent Employee, **Contractual, ***Designated Faculty/Personnel, ****Consultant

As indicated in Table 6, the researcher determined the nature of employment of TBI personnel. The data indicates that the majority of personnel in all TBIs are designated, faculty members. This implies that in addition to the

responsibilities they undertake in the TBI, they also conduct instruction, research, extension, and production functions. According to one respondent, they may also be allocated extra responsibilities such as those associated with accreditation, quality management system audits (ISO 9001 audits), and other tasks as determined by the university's administration. Regrettably, this impairs their ability to execute their tasks in the TBI. Additionally, another respondent noted that although these specialized faculty members like teaching deloading, they still often struggle to execute their job in the TBI.

1.1.7. TBI Management Team Functions

The success of any organization relies on its management. For this reason, this study also identifies the primary managerial functions that are being carried out by the management of TBIs.

TABLE 7
TBI MANAGEMENT TEAM FUNCTIONS

Functions	f	Percentage
1. Planning of programs, projects, and activities	5	100%
2. Public relations management	5	100%
3. Startup and community development	5	100%
4. Fundraising activities	3	60%
5. Monitoring and evaluation of incubator's performance	5	100%
6. Networking with other incubators and business support organizations	5	100%
7. Providing advice and assistance to tenant (incubatees) companies	5	100%
8. Providing directions to TBI personnel	5	100%
9. Recruiting and staffing of TBI personnel	5	100%
10. Serve as resource person in training and seminars	5	100%

*Multiple responses

As shown in Table 7, the management team of the TBIs performs nine (9) out of ten (10) of the mentioned duties. According to respondents, they are obliged to design TBI programs, initiatives, and events annually. The proposals will be reviewed by University administration and funding organizations. Certain TBIs are required to provide two- to three-year plans that detail the financial needs for the programs, initiatives, and activities they propose.

Additionally, according to respondents, TBI management teams engage in actions that benefit the manager's public relations. As one TBI said, this enhances the TBI's excellent public image and enables them to be responsive to community needs. Several of the actions they did in this regard include media exposure, public events, and

the organization of a start-up week accessible to the general public, particularly SMEs.

Incubators aid entrepreneurs in three ways: through buffering, bridging, and curating. By buffering developing enterprises from competition and external threats, incubators protect them. For example, sharing vital company services can save costs. Bridging enables firms to connect with external resources, knowledge, and social capital. This often requires establishing relationships with mentors, industry-savvy investors, as well as early consumers and suppliers (Amezcuca, 2013). When companies want help navigating through a sea of publicly available materials, curating directs them to the most relevant.

The success of business incubators varies significantly by community. As one research states, "merely replicating successful incubators in one location does not guarantee success in other places." (2019, Amezcuca) To begin, an incubator's capacity to support enterprises may be contingent on the sort of neighborhood and the demands of the firms located inside. Incubators are most likely to promote business survival in highly specialized metropolitan locations or diverse rural areas, according to research. Firms gain from knowledge spillovers, resource sharing, more cheap office space, and better resource matching in metropolitan regions with significant sector specialization. Due to the high level of competition and congestion in these locations, incubators can assist safeguard small businesses and create vital business contacts. In rural economies, the reverse is often true. In rural locations with limited industry expertise, incubator-based enterprises have a greater chance of survival than non-incubated firms. In this scenario, the buffering and bridging support systems are critical.

Another function that all TBI managers are performing is monitoring and evaluating of incubator's performance. According to two (2) TBI respondents they need to conduct perioding monitoring with corresponding reports to be submitted to oversight agencies. The respondent from TBI 5 said:

"Since the projects are funded by the government, regular reporting is necessary. There is a need to submit quarterly, semiannual, and annual reports." Moreover, the submitted reports are the basis for continuous funding by the government according to the respondents. Evaluation is being done by the university administration and funding agencies based on the key performance indicators of the projects.

All respondents also mentioned that they also conduct networking with other incubators and business support organizations as one of their functions. Technology Business Incubators under the DOST TBI program is like a network. One respondent mentioned that:

"There is an avenue where we can exchange our ideas and experiences in the operation. We also holding annual events where TBIs share their best practices in managing their operation."

Providing advice and assistance to tenants/incubatees/companies is also a function that all TBIs

are performing. During the interview, respondents mentioned that the TBI management team members are typically providing advice and assistance on business operations including business plan and preparation of financial reports.

Other functions that the TBI management team members are performing are providing directions to the TBI personnel, recruitment and selection of staff, and serving as resource persons during trainings and other capability building activities.

1.1.8. TBI Line of Coordination

Different institutions have unique structures and strategies for how they will operate their own TBI. One of the most significant elements of the structure is the line of coordination. Table 10 shows the line of coordination of the TBIs.

TABLE 8
LINE OF COORDINATION

Office/Department	Frequency	Percentage
1. University President	0	0
2. Vice President for Research	4	80%
3. Vice President for Academic Affairs	0	0
4. Vice President for Business Affairs	1	20%

The result shows that 4 out of 5 respondents said that the operation of their TBI is under the Vice President of Research. They mentioned that the nature of operation of the TBI is basically research and development. Moreover, the accomplishments of their TBIs are credited to the research targets and outputs. Only one respondent mentioned that their TBI is under their Vice President for Business Affairs.

1.1.9. Qualifications of the TBI Managers

Having competent leaders is also essential to the success of the TBI. Table 11 presents the qualifications of the TBI managers as to their formal education, related experiences, and training and seminars.

TABLE 9
QUALIFICATIONS OF THE TBI MANAGERS

Incubator Manager Qualifications	Formal Education		Related Experience		Training/ Seminars	
	f	%	f	%	f	%
1. Higher Education or academe	0	0	5	100%	5	100%
2. Accounting, banking, finance, etc.	1	20%	1	20	3	60%
3. Sales, trade, marketing	0	0	0	0	3	60%
4. Real estate, property	0	0	0	0	0	0

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management, etc.						
5. Personnel Management, education/training	0	0	0	0	4	80%
6. Legal qualifications	0	0	0	0	0	0
7. Information and communication technology	0	0	0	0	2	40%
8. Engineering technology	3	60%	3	60	3	60%
9. Architecture						
10. Agriculture and Food technology	1	20%	1	20	2	40%
11. Medical and health technology	0	0	0	0	0	0

1.2. Services

1.2.1. Services

Technology Business Incubators are expected to provide a wide variety of services to their clientele (incubatees). Table 12 shows the TBIs' professional services to their clients. The Society for Innovation and Entrepreneurship defines a technology Business Incubator as an organization that provides technology-based start-up enterprises with all of the tools and assistance they need to adapt and grow into mature companies. TBIs often give fledgling entrepreneurs all of the necessary infrastructure, technology/prototype development support, research aid, financial assistance, business advising assistance, marketing assistance, and anything else required to make the start-up a success.

TABLE 10 SERVICES

The credentials of the TBI managers are shown in Table 9. The majority of TBI executives have formal training in engineering technology. One person indicated that he has a degree in computer engineering, while another mentioned that he holds a degree in mechanical engineering. Additionally, one respondent said that he had a formal education in agriculture and another stated that he has a degree in business administration.

All responders have experience in higher education or academe. This is because each TBI manager is also a member of the faculty at their respective colleges. Three respondents have worked in the engineering technology operations and manufacturing sectors. One respondent said that he had accounting and business management expertise. Finally, there was one respondent with experience in agricultural and food technologies.

This section also includes a list of pertinent trainings and seminars. According to Table 10, all respondents have received training in higher education and academe. Four respondents have received personnel management training. Three (3) responders had accounting, marketing, or engineering technology backgrounds. Finally, two responders have received training in information and communication technologies, as well as agricultural and food technology.

During the interview with the TBI managers, they noted that TBIs participating in the DOST program are obliged to attend a series of capability-building training sessions on managing the TBI. Several subjects are included in the TBI management training curriculum, including the following:

1. Business Incubator Models and Success Factors
2. Planning the business incubator operation
3. Marketing and stakeholder management
4. Monitoring and evaluation of the operation
5. Implementing a mentoring program
6. Technology commercialization
7. Intellectual property management

Services	f	Percentage
<i>Organization and Management Services</i>		
1. Business Pre-Incubation Services	5	100%
2. Business Counseling	5	100%
3. Business Training	5	100%
4. Ideation and Start-up Bootcamps	5	100%
5. Legal Counseling	3	60%
6. Mentoring and coaching	5	100%
<i>Technical Services</i>		
7. Production Development Assistance	5	100%
8. Intellectual Property Services	5	100%
9. Analytical Laboratory Services	1	20%
10. Technical Assistance on Business Processes and Operations	5	100%
11. Incubation Process Assistance	5	100%
<i>Marketing Services</i>		
12. Marketing and promotion assistance	5	100%
13. Market and Business Research	5	100%
<i>Financial Management Services</i>		
14. Accounting and other related services	5	100%

*Multiple responses

Table 10 shows the professional services that TBIs are offering to their clientele. Almost all listed services are being offered by the TBIs. The TBI offers business pre-incubation services. These include orientation and creating a positive mindset of the incubatees toward the incubation program. Product development assistance of the TBI includes support in the development of the prototype which most of the TBIs interviewed provide access to the equipment and facilities needed for the prototype. For TBI 1 they provide access to food laboratory equipment needed for the production of food products. That equipment the incubatees do not have the ability to buy.

Other services that the TBIs are offering are business counseling, marketing, and promotion assistance, business training, ideation, and start-up boot camps, market and business research, intellectual property services, mentoring and coaching, technical assistance on business process and

operations, incubation process assistance, and accounting and other related services.

Adegbite (2001) described business incubation as a way of establishing new small enterprises via the provision and nurturing of SMEs in the following areas:

- Flexible and reasonable conditions for space in fully constructed manufacturing buildings.
- Provision of a wide variety of shared services, including company counseling and training, shared secretarial support, start-up finance, and product development and marketing aid.
- Strict entrance and departure criteria, which are intended to focus the incubator's efforts on creative, fast-growing businesses that have the potential to make a substantial influence on the local economy. Incubation guidelines often restrict leases to three to five years, providing a healthy tenant turnover. Assistance with hands-on activities, including research and development (R&D), counseling, and risk capital, often through a network of external suppliers. Professional management, whtails carefully monitoring tenant enterprises against their business plans and ensuring that the incubator works in a business-like manner with the potential to become financially self-sufficient (Mutambi, 2010). Thus, incubation ideas seek efficient and effective methods of connecting entrepreneurial potential and accelerating the development of a new developing firm (Schwartz, 2008).

Business incubators are often thought of as organizations that aid SMEs in developing and growing via the provision of different services such as access infrastructure, marketing, financial assistance, and networks. While it has been established that business incubators in poor nations face a variety of obstacles related to sustainability and innovation, there has been little coverage of these issues.

Despite these reservations, technology company incubators are now largely acknowledged as a key component of establishing an innovation-driven economy and a highly effective instrument for economic growth in both developed and developing countries. Incubators aid new start-up businesses in increasing their physical footprints (Allen & Mccluskey, 1991).

Counseling and business aid include a variety of services geared toward company success. These services include assistance with strategic planning, business plan creation, financial management, sales and marketing, accounting, and legal services, as well as education on government rules, employment, and product development. Additionally, incubators provide lectures, as well as brief educational and training courses. Additionally, incubators support tenants in obtaining funding by serving as intermediaries between the tenant and a prospective investor, financial institution, or government development agency. The advantages of these services may include an improvement in entrepreneurial and managerial abilities, a

shorter learning time, increased access to business information, increased confidence, cost savings, and, most importantly, an acceleration of the firm's growth (Lalkaka, 2002; Abduh et al., 2007).

1.2.2. Pricing Policy

Technology Business Incubators here and in other countries are established to help startups and small enterprises in the form of public services. However, it does not mean that all services are free of charge to the clients. The following table shows the pricing policy of the TBI for its services.

TABLE 11
PRICING POLICY FOR TBI SERVICES

	Policy	Frequency	Percentage
1.	Services are mostly free to clients	3	60%
2.	Clients are charged partly to cover the cost of services	2	40%
3.	Clients are charged to cover the entire cost of services	0	0

Table 11 details the TBIs' pricing policies for the services they give to TBIs. According to the interview, three of the TBIs said that their services are mostly provided for free to consumers. According to them, they give incubation services for free since the initiative is financed by the government.

On the other hand, two TBIs charge a portion of their services to support their costs. However, respondents said that the cost of services is intended to pay a portion of operating expenditures (e.g. utilities and maintenance expenses). Additionally, incubatees pay rent for the office and workspace they utilize at the TBI. Additionally, the respondents stressed that the revenue produced by customer payments is insufficient to continue the initiative without additional support from other organizations.

1.2.3. Facilities and Equipment Provided for Incubatees

Aside from intangible services, TBIs commonly provide their clients access to their facilities and equipment. The following table shows the TBIs' different incubator facilities and equipment.

TABLE 12
FACILITIES AND EQUIPMENT PROVIDED FOR INCUBATEES

	Facilities and Equipment	Frequency	Percentage
1.	Building and office spaces	5	100%
2.	Meeting and conference rooms	5	100%
3.	Laboratory equipment	2	40%
4.	Computer and office equipment	5	100%

*Multiple responses

Technology Business Incubators normally have office space, internet access, business meeting/conference room, training room, and storage room DOST (2014). Table 15 shows the facilities and equipment that the incubators have.

All incubatees have their dedicated building and office space, meeting and conference rooms, and office equipment. However, laboratory equipment is only available to two TBIs.

Affordable rent, adaptable space, and shared office equipment and services are all examples of facility-related services. Rent and office equipment and services at an affordable price are the initial start-up expenses for SMEs and are a significant investment for every new firm (Hannon & Chaplin, 2003; Xu, 2010). The greatest distinguishing feature of incubators is their ability to provide facilities at a cheaper cost than the market. Incubators give tenants rents that are below market rates and flexible space as needed. Additionally, tenants get shared office services and equipment that they would be unable to buy as a start-up, which is vital to their survival. This practice of offering services at a discount creates the potential for cost savings (Porter, 1985; Govindaranjan & Fisher, 1990; Abduh et al., 2007).

1.3. Promotional Strategies of Incubator Services

Promotional strategies are essential for any organization to increase its target market awareness of products and services. This is true for technology business incubators that need to have as many clients as possible. The following table shows the different promotional strategies that the TBIs have.

TABLE 13
PROMOTIONAL STRATEGIES

Promotional Strategies	Weighted Mean	Verbal Interpretation
1. Print advertisements (e.g., flyers, banners, newspapers)	3.80	Always
2. Business events, conferences, exhibitions, etc.	3.40	Always
3. Referrals from other agencies	3.80	Always
4. Direct emails	2.60	Often
5. Social media marketing	4.00	Always
6. Word of mouth	4.00	Always

*Multiple responses

Technology business incubators use promotional strategies to advertise, promote, and sell their goods, services, and programs to potential customers. The promotional strategy of a firm is governed by factors such as the kind of product being promoted, the marketing budget available, the target demographic, and so on. It is an essential action for improving consumer awareness of products and services.

The promotional techniques used by the TBIs are shown in the following table. With a weighted mean of 4, social media marketing and word of mouth had the largest number of answers out of all of the mentioned promotional tactics, according to the results. This implies that these are the

techniques that they use consistently. Print ads such as posters, banners, and news sheets, as well as recommendations from other government agencies, come in second and third place, respectively, with a weighted mean of 3.80. Other techniques include attending business events, conferences, and exhibits, as well as sending direct emails, which have a weighted mean of 3.40 and 2.60, respectively, according to the data.

1.4. Active Linkages and Partnerships

One of the DOST's TBI program's major objectives is to promote public-private partnerships in regional economic development. It only means that the agency recognizes the importance of linkages and partnership in the success of the program. For this reason, this study also identified the active linkages and partnerships of the TBIs. It also determined the nature of the partnership and project activities conducted relevant to the partnerships. The results are as follows:

TABLE 14
ACTIVE LINKAGES AND PARTNERSHIPS

Name of the TBI	No. of Private Institution Partners	No. of Government Institution Partners
1. TBI 1	13	2
2. TBI 2	11	5
3. TBI 3	11	6
4. TBI 4	14	6
5. TBI 5	15	3

All interviewed TBI managers answered that through establishing strong networks and collaborating with many government and non-government groups, the incubation center will thrive and be able to continue its activities for a long period of time. Indeed, the government and other organizations contributed and supported TBI 4's buildings and equipment, which serve as the center's revenue-generating mechanism. The manager was trained and assigned the duty of conducting benchmarking on different TBIs throughout Asia as part of a government-sponsored and other funding agency initiative. According to one interviewee, the benchmarking efforts foster collaboration and links between TBIs and companies, as well as increase awareness of the center throughout Asia. Additionally, best practices included (1) involving management (university) in center activities, (2) providing continuous mentoring and coaching to startup partners, and (3) providing continuous training, seminars, and other relevant classes to the community to assist them in starting their own business.

The literature reviewed focuses mostly on entrepreneurial networks and network resources in general, but ignores the fact that many entrepreneurs are incubated and therefore benefit from incubator-provided network resources. As a result, academic research must examine both networks associated with startup incubation and "private" external networks that extend outside the incubator. As a result, we will focus on research relating to incubation and incubator network resources in the following review.

Cooper et al. (2012) state that "business incubators attempt to build solid business and social networks in order to provide intellectual and material resources to their resident enterprises." According to Sá and Lee (2012), "one of the essential characteristics of incubators is the availability of possibilities for tenants to form collaborative links with other companies." Hansen et al. (2000) state that "the majority of business incubators give office space, money, and basic services." Additionally, the better ones provide an enormous network of significant commercial contacts, which enables fledgling start-ups to get an advantage over their rivals in the market."

1.5. Accomplishment based on the Key Performance Indicators

Business incubators promote entrepreneurs and their enterprises by providing inexpensive workspace, strong community relationships, and vital business consulting services. Firms often seek to join the incubator and engage in it for a certain period of time before moving into the community. Different incubator models with varied amounts of space allocated to different tasks, services, and forms of business aid might fit under this concept. According to studies, business incubators have a favorable impact on employment development in participating businesses and that firms in incubators obtain more business services than enterprises that are not affiliated with one. (Stokan, E., Thompson, L., & Mahu, R. J. 2015).

Despite the many success stories of technology company incubators, many are struggling to meet their key performance objectives. Their oversight agencies, such as the Department of Science and Technology, evaluate these important performance measures. As a result, the researcher additionally identified the TBI-respondents' successes over the last five (5) years using their key performance indicators (KPIs). As a consequence, the following is true: Despite the many success stories of technology business incubators, many are struggling to meet their key performance objectives. Their oversight agencies, such as the Department of Science and Technology, evaluate these important performance measures. As a result, the researcher additionally identified the TBI-respondents' accomplishments over the last five (5) years using their key performance indicators (KPIs). As a consequence, the following is true.

TABLE 15
ACCOMPLISHMENTS OF THE TBI FROM THE LAST 5 YEARS

KPI	TBI1	TBI2	TBI3	TBI4	TBI5
No. of assisted startups/MSMEs	53	32	59	31	115
No. of assisted spin-offs	0	0	2	2	0
No. of technologies supported for commercialization	8	8	25	16	11
Established linkages and partnerships	15	16	17	20	18
Capacity-building activities	13	11	18	7	9

No. of persons trained	392	570	650	320	545
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The table 15 shows the accumulated accomplishments of TBI 1 for the last five years based on its Key Performance Indicators (KPIs). TBI 1 is a business incubator focusing in agriculture and food technologies. It is one of the first batch of TBIs assisted by Department of Science and Technology-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development. As can be seen in the table, TBI 1 had assisted 53 startups/MSMEs from the last 5 years. However, the data shows that the number of assisted startups and MSMEs significantly decreased in 2020 and 2021 leading to 2 and 6 startups/MSMEs, respectively. During the interview, the TBI manager mentioned that it can be attributed to the limitations brought by the pandemic.

It can also be noted that for the last five years, there is no spin-off company established by the TBI. As defined in Technology Transfer Act (RA 10055), a spin-off firm or company refers to a juridical entity that is an independent business technology taker with a separate legal personality from the GFA, RDI and researcher created through the initiative of the researcher-employee who generated the technology.

The TBI was able to support technologies generated by their university for commercialization. Based on the data gathered, TBI 1 was able to support 8 technologies for the last five years. It is also noteworthy that this accomplishment helps the entire university in attaining its target on research commercialization which is also a requirement by other oversight agencies.

Another performance indicator is established partnerships and linkages. TBI 1 was able to organized partnerships and linkages with other private and government institutions for a total of eight for the last five years. According to the TBI manager, partnerships and linkages plays a significant role in the operation of the TBI since other services that the incubates need may not be available in the TBI they can refer them to other partner institutions. Moreover, partnerships and linkages offer opportunity for continuous funding for the TBI.

Capacity building activities are also common with business incubators. These activities may include startup bootcamps, trainings, and seminars on business processes. TBI 1 was able to conduct a total of 13 related activities. However, the TBI encountered difficulties in conducting these activities during the pandemic specially in-person training. But they were able to conduct virtual training activities in a total of one and two in 2020 and 2021, respectively.

Table 15 also shows the number of persons trained in the capacity building activities which is part of performance indicators of TBIs. TBI 1 was able to train 392 participants for the last five years including amidst COVID 19.

The Department of Science and Technology- Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD) has its own TBI program aside from DOST-PCAARD. One of the first batch of TBIs assisted by the said agency is the TBI 2 focusing on

engineering, information and communications technology established in 2018. Same as the previous TBI, it has performance indicators that are being monitored by its oversight agencies.

As shown in Table 15, TBI 2 aided 32 MSMEs in the last five years. Additionally, no spin-off firm has been developed by the TBI in the recent five years same as the previous TBI. The TBI was able to commercialize innovations developed at their institution. TBI 2 was able to support eight technologies throughout the previous five years based on the data acquired. Additionally, this achievement aids the whole institution in achieving its goal of research commercialization, which is also mandated by other monitoring organizations. Another metric of success is the number of developed relationships and connections. TBI 2 has formed 16 collaborations and alliances with different business and public organizations during the previous five years. According to the TBI management, collaborations and connections are critical to the TBI's functioning because they enable the TBI to refer incubates to other partner institutions for services that are not offered at the TBI. Additionally, collaborations and connections provide a means of sustainable financing for the TBI. Business incubators often engage in capacity development initiatives as well.

These activities may include startup bootcamps, business process training, and lectures. TBI 2 was able to complete 11 associated tasks. However, the TBI experienced problems performing these programs, particularly in-person training, during the epidemic. However, in 2020 and 2021, they were able to undertake virtual training activities in a total of one and two. Additionally, Table 18 illustrates the number of individuals trained in capacity building activities, which is included in the performance metrics for TBIs. For the previous five years, TBI 2 has been able to teach 570 people, including during COVID 19.

Another grantee of DOST PCIEERD TBI program is TBI 3. It was founded in August 2014 as a university-based technology business incubator with the mission of transferring university-based research to the real world and establishing a sustainable entrepreneurial ecosystem among faculty, staff, and students. TBI 3 aims to revitalize the innovation ecosystem by providing support to local entrepreneurs with great ideas that have the potential to serve as a solid investment and foundation for nation-building.

TBI 3 is one of the first TBI focusing on technopreneurship same with TBI 2 and TBI 4. Table 20 shows that they were able to assist 59 startups and MSMEs for the last five years. Moreover, they were able assist in organizing two spin-offs with personnel of their university with matured technology for commercialization. Furthermore, TBI 3 was able establish partnerships and linkages in 17 private and government institutions. They were also able to organize 18 capacity building activities including one during COVI 19 surge in 2020 and three in the following year. From the eighteen capacity building activities, they were able to gather 650 participants.

In partnership with and support of the Department of Science and Technology (DOST), TBI 4, together with other three TBIs on other campuses of the university, was successfully established to generate new knowledge and technologies, promote innovation and entrepreneurship, and develop human resources for science and technology.

Table 15 also shows the accomplishments of TBI 4 from 2018 to 2021. There are 31 startups and MSMEs assisted and two (2) spin-off companies established by researchers of the university. Among the other TBIs, TBI 4 has the most assisted technologies for commercialization. They were able to assist 16 technologies. Furthermore, there are 20 established partnerships and linkages by the TBI with private and government institutions. TBI 4 was also to perform in conducting capacity building activities in collaboration with its partner institutions. They were able to organized seven activities with 320 participants for the last four years.

Similar to TBI 1, TBI 5 is one of the TBIs under the first batch of the DOST-PCAARD's TBI program. It was established 2010 as agri-based technology business incubator. The data in Table 24 shows that there were 115 startups/MSMEs assisted by TBI 5. Among the five TBIs, they have the most number of assisted incubatees. During the interview with the TBI personnel, majority of their clients are fruits and vegetable farmers in the province. They allow the farmers to rent a certain portion of the TBI facilities for farming especially strawberries. Furthermore, during the actual visit in the facilities, the researcher observed that the TBI was able to create market and attract tourist for their incubatees. However, the TBI is having difficulties in establishing spin-off companies with the researchers of the university.

The TBI 5 was able to support the commercialization of the 11 technologies generated from the research projects of the university. Most of this researchers are agriculture and food research and development projects.

The TBI is performing well at establishing partnerships and linkages with other private and government institutions. The data shows, that they were able to organize 18 partnerships and linkages in the last 5 years.

Moreover, they were also able to organize capacity-building activities such as training, seminars, and workshops to 545 participants under their nine (9) organized capability-building activities from 2017 to 2021 despite the limitations brought by the pandemic.

1.6. Service Requirements

As mentioned earlier in the discussion, technology business incubators are established for public service. However, it does not mean that all requests will be accepted by them. Each TBI has its own requirements before they provide assistance to startups, entrepreneurs and researchers. Based on the data gathered, the following are the requirements that the TBI are being implemented.

TABLE 16
REQUIREMENTS TO AVAIL TBI SERVICES

Items	f	Percentage
1. A business plan must have been prepared	4	80%
2. Financing must be in place	3	60%
3. Innovative idea/project	3	60%
4. Businesses must demonstrate high growth potential	3	60%
5. Business is registered to relevant agencies/offices/authorities	2	40%

*Multiple responses

Table 16 shows the requirements of the TBI for their services. Based on the result of the study, four out of five respondents answered that they are requiring that business plan must have been prepared prior to application. Three of the respondents answered that they want also to see if the applicants have already financed the part of its operation. Same number of respondents answered that an innovative idea and potential for high growth are also their requirements. Two TBIs are having requirements that applicants shall register to relevant agencies prior to their application.

2. Challenges Encountered in the Operation

2.1. Encountered by Technology Business Incubators

In analyzing the literature, facts on the hurdles that incubators face were discovered like any other firm. Incubators encounter challenges in both developed and developing nations that hinder them from fully contributing to the development of incubated startups and MSMEs. Based on the interviews, one of the business incubators was confronted with issues such as production space, finance, equipment maintenance, and technical and entrepreneurial skills. The conclusions are supported by the results presented here. "...Our primary difficulty is the growth to various locations. It is expensive to set up a new site, and individuals may not join," Incubator 1 stated, emphasizing the hurdles that incubators face. As a result, this phrase highlights the obstacles that incubators confront, such as expanding into new sectors."

"Apart from getting our clients' thinking correct, our toughest problem is opening doors and connecting these entrepreneurs with corporate organizations," stated another respondent (Incubator 2). In addition, we must ensure that the incubatees provide high-quality goods or services. Finally, the incubator's first difficulty was that the previous manager had no prior experience operating a firm and was not an entrepreneur...there were operational systems that were not functioning, such as quality process systems, and processes were jeopardized." As a result, this phrase emphasizes the need of having the necessary expertise to operate an incubator with entrepreneurial characteristics."

TABLE 17
CHALLENGES ENCOUNTERED BY THE TBIS

Challenges Encountered	Frequency	Percentage
1. Self-Sufficiency and Funding Support	5	100%
2. Inadequate Entrepreneurial Skills	2	40%
3. Presence of the other incubators with more advanced facilities	2	40%
4. Strict compliance with government accounting and auditing regulations	5	100%
5. Pressure from other oversight agencies	5	100%
6. Presence of the other incubators with more advanced facilities	2	40%
7. Funds for operational activities are limited	2	40%
8. Outdated equipment and machines	2	40%
9. Limited flexibility on the resources due to government regulations	4	80%

*Multiple responses

According to Nowak and Grantham (2000), for-profit incubators will account for almost half of all business incubators in the following years instead of non-profit incubators. This sub-major theme's goal was to see whether incubators get funding from private and public firms. One of the issues confronting business incubators, according to the literature, was finance and support mechanisms. The findings show that all respondents get assistance from government institutions, whereas none have obtained aid from commercial organizations. The present study's results are congruent with Akcomak (2009), who discovered that government agencies mainly assist business incubators in developing nations.

The findings revealed that all of the business incubators in the sample are reliant on government assistance and are not self-sufficient. This study supports the findings of Tamasy (2007) and Acknomak (2009), who concluded that business incubators should not rely on government assistance and should instead build a self-sustaining model. "...We are a recognized training facility," one incubator said, encouraging self-sufficiency and sustainability. Yes, the incubator is supported by a variety of government agencies. "Funding for the program of incubation." As a result, this suggests that public university incubators are not self-sufficient."

During the interview two respondents (40 percent) believe that lack of access to advanced technology facilities limits their ability to provide efficient and reliable services to clients (MSMEs). On the other hand, technologically based business incubators are drivers of entrepreneurship, economic development, innovation, and R&D in industrialized nations (Ozdemir and Sehitoglu, 2012). This research will be compared to Buys and Mbewana (2007). They discovered that having access to technical facilities and technical expertise creates an environment beneficial to business incubators.

"...Not essential, but yes to high-tech facilities," Incubator 1 stated, based on the interviews. We have facilities, but not improved facilities; we don't need much technology; all we want is to connect to the internet and platforms we have and purchase." As a result, the absence of sophisticated technical facilities is a big obstacle.

"The difficulty is that people don't know where to go," said another responder (Incubator 2). As a result, the business incubator's job is to determine where MSMEs may get these services. An incubator requires a genuine understanding of the industry." On the other hand, this comment shows that a lack of technical capability is not a severe issue to other incubators.

This study's findings will now be compared to those of earlier investigations. There is compelling evidence that business incubators in developing nations lack the management and entrepreneurial skills necessary to contribute to incubating success properly. The majority of incubation managers surveyed agreed that a lack of entrepreneurial skills hampered their capacity to nurture incubated companies and MSMEs properly. Two of the business incubator managers, on the other hand, said that having entrepreneurial abilities is not required and that the formal qualification needed to operate an incubator is enthusiasm and tenacity in expanding incubated MSMEs. These findings are likely to back up those of many earlier studies in this sector. "As much as entrepreneurs should have entrepreneurial skills and an entrepreneurship background to develop their businesses, incubation management must understand what these entrepreneurs are going through," Incubator 2 said, citing the participants' emphasis on the importance of entrepreneurial skills. As a result, this phrase emphasizes the significance of entrepreneurial abilities in the self-sufficiency of MSMEs.

Furthermore, most respondents had professional credentials, and several had business histories. Both fostered MSMEs, and the organizations that assist them should have an entrepreneurial mindset; it was also noted. As a result, it is critical to developing a growth mindset among SME entrepreneurs to foster MSMEs' success (Neneh 2012)." "I am now creating a model of the range of abilities to be mentored in the management department, such as human resource, finance, marketing, and so on," another interviewee (Incubator 2) remarked. As a result, this phrase emphasizes the significance of providing incubated with various abilities.

2.2. Challenges Encountered by the Incubatees

The researcher decided to use open-ended questions to determine the challenges encountered by the incubatees. With this, respondents' answers were not limited on the pre-listed answers. Results are presented and discussed in thematic form in the succeeding sections.

TABLE 18
CHALLENGES ENCOUNTERED BY THE INCUBATEES

Challenges Encountered	Frequency	Percentage
1. Limited access to financing	12	80%
2. Poor market conditions	8	53%
3. Inadequate staff	9	60%
4. Lack of institutional support	8	53%
5. Lack of networking	11	73%
6. Obsolete technology and lack of innovation	6	40%
7. Lack of entrepreneurial qualifications	10	67%
8. Poor management strategy and vision	5	33%

*Multiple response

In general, the empirical data indicates that more than half of the fifteen startups and MSMEs surveyed identified barriers to financing, weak market circumstances, insufficient employees, a lack of institutional support, and a lack of networking. Take note that respondents did not clearly rank the things they listed (in terms of significance). The poor levels of performance were mostly caused by or were a result of the business's financial and commercial issues. Additionally, non-economic factors were cited in a few instances. However, it is important to note that the primary obstacles were discovered during the enterprises' growth and development, rather than at their establishment.

External variables were more often reported by incubatees than internal ones at first look and from a strictly quantitative perspective. Thus, the majority's recognized difficulties are not new; nonetheless, evaluating the causes of problems only quantitatively is insufficient. Indeed, the researcher takes a more qualitative approach in this portion in order to acquire a more detailed knowledge of the issues faced by the incubatees.

Within external issues, all respondents identified and highlighted *limited access to financing* as the primary constraint on their businesses. According to respondents, even with extensive preparation, their businesses' start-up periods proved to surpass financial projections. While some SME owner-managers received financial assistance and other forms of assistance from local and national government agencies, the primary sources of financing for starting and growing their businesses were personal savings, credit from suppliers and/or clients, and loans from family and friends. A actual quotation from one incubatee's answer is as follows:

"The very limited use of external financing is due to the fact that supply of funds does not meet the demand... I prefer to maintain control of my business, I do not want to assume disproportionate risks, and lack confidence in the financial institutions"

According to one respondent, financing companies need considerable collateral, including private and commercial property, which hinders credit raising. In summary, it might support Storey's (1994) and Winborg and Landström's (2001) observations that acquiring equity and debt funding are significant challenges for startups and MSMEs.

Additionally, respondents listed poor market conditions and high competition as the primary reasons. In general,

insufficient product development, a lack of market awareness, and difficulties with product commercialization were commonly mentioned as justifications for suboptimal market placement. The latter is entirely dependent on internal elements, which may undoubtedly be modified and represented by the incubatees themselves.

Apart from the high level of competition, the majority of incubatees identified *inadequate employees* as a barrier for their enterprises. Consistent with our theoretical assumptions (see, for example, Bosworth 1989; Gallup Organization 2007), respondents often reported recruiting concerns. Due to limited financial resources, employing experienced or specialized staff was deemed problematic. Despite their academic degrees, individuals often lack the requisite professional experience. Indeed, the latter seems to be the fundamental criterion for qualifying for human resource positions. Thus, one corporation said that it prioritizes experience above education when recruiting. This is why they started in-house educating their personnel using a specific curriculum focused on quality and business concepts.

The responses of respondents showed an extraordinary insight. Although the majority discussed the importance of education, remarks from others indicate that small enterprises do not always need a high degree of education.

Lack of institutional support was also a challenge commonly mentioned as a source of difficulties. Concerning internal problems, we discovered that five organizations referred to a 'lack of collaboration and networking.' The primary reason for this was that collaboration and information sharing resulted in some friction and disagreement amongst partners. Another issue that several incubatees encountered was obsolete technology and a lack of creativity. Ten respondents cited a 'lack of entrepreneurial credentials' as a barrier to launching and operating their businesses.

Another aspect of their operation that is strongly connected to the variables highlighted before is a lack of management plan and vision. Due to their size and human resource constraints, SME often lack the middle managers or functional experts that play a critical role in formulating and executing organizational strategy in big organizations. As a result, incubatees' managers perform a variety of functions (Jennings and Beaver 1997), complicating and focusing strategic management on the owner.

3. Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

Incubators may function as catalysts for economic growth in poor nations by promoting an entrepreneurial culture, technology transfer, and job creation. (Al-mubarak, H. M., & Busler, 2015). Identifying the strengths, weaknesses, threats, and opportunities can help the organization identify high-performing aspects of the operation. These are the crucial success elements, and they

are what provide the organization competitive advantage. Identifying these assets may assist you in ensuring that they are maintained so that the organization does not lose its competitive advantage. These statements are likewise similar in the operation of the TBIs. With this, the researcher also gathered data on the strengths, weaknesses, opportunities, and threats of the TBIs. The results are shown in the table below.

The researcher performed a focus group discussion with the incubator manager and other members of the team in order to conduct a SWOT analysis and determine the future development potential for business incubators. The researcher was able to gather the following strengths, weaknesses, opportunities and threats of the TBIs:

TABLE 19
IDENTIFIED STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS OF THE TBIS

Strengths	Weaknesses
<ol style="list-style-type: none"> 1. Strong commitment from the university (All TBIs) 2. Availability of required expertise in the university. (All TBIs) 3. Research outputs ready for technology transfer. (TBI 3 and 4) 4. Adequate physical resources and facilities (TBI 3,4, and 5) 5. Highly trained management team in major TBI functions (All TBIs) 	<ol style="list-style-type: none"> 1. Limited funds for operational activities (TBI 2 and 5) 2. Outdated equipment and machines (TBI 1 and 5) 3. Limited flexibility on the resources due to government regulations (TBI 1, 2, 3, and 5) 4. Some members of the TBI team are designated faculty members with other functions in the university (All TBIs) 5. Inadequate entrepreneurial skills (TBI 4 and 5)
Opportunities	Threats
<ol style="list-style-type: none"> 1. Presence of different funding institutions. (All TBIs) 2. Support from other government agencies (All TBIs) 3. Linkages with the private sector (TBI 2, 3, and 4) 4. Demand for TBI Services (TBI 1, 3, and 5) 	<ol style="list-style-type: none"> 1. Presence of the other incubators with more advanced facilities (TBI 2 and 3) 2. Strict compliance with government accounting and auditing regulations (All TBIs) 3. Pressure from other oversight agencies (All TBIs)

Table 19 shows the identified strengths, weaknesses, opportunities, and threats of the technology business incubators based on the interview. All respondents from the TBIs mentioned that one of the strengths of their TBI is having a strong commitment from the university administration in their projects and activities. They have also the required expertise to perform different functions in the project. TBI 3 and TBI 4 mentioned that one of their strengths is they have research outputs and matured technologies available for technology transfer and commercialization. Adequacy of the physical resources and facilities are also strengths of the TBI 3, 4, and 5. During the interview with TBI 3, the project leader mentioned that their university allocated designated building with required facilities such as conference room, office space, and training room for the TBI apart from the funding they got from the

government particularly DOST. On the other hand, TBI 5 mentioned that they have 50 current tenants (incubatees) occupying their facilities to grow strawberries and other fruits which the land is part of the TBI. Moreover, the all respondents from the TBIs also mentioned that they have trained management to perform the major functions for TBI. TBI 2 manager mentioned that it is part of the DOST TBI program that they should undergo a preparatory program to understand the functions of a TBI and the duties and responsibilities of the TBI team members.

As to the identified weaknesses of the TBIs, TBI 2 and TBI 5 mentioned that despite of the funding they are receiving from the government, they also experiencing difficulties in the limitation of the funds they may use in different projects and activities. TBI 2 mentioned that as a state university they are covered by government accounting rules and regulations. This gives them limitation on executing new ideas and projects that they want to implement on the current year since it is required that all plans shall be approved during the prior year and they cannot implement other project activities that are not included in the approved project proposal. Furthermore, the two (2) TBIs funded by DOST PCAARD are encountering challenges of having outdated equipment and machines for their operation. They mentioned that if compared to other TBIs and private industries some of their equipment and machines are considered outdated which are important in providing the required services for the incubatees. Limited flexibility on the resources due to government regulations is also a weakness identified by TBI 1, 2, 3, and 5. It is also considered as a weakness by all TBIs that some of the project team members are also designated faculty members. This means that the other members are performing functions aside from their role in the TBI. According to the respondents, sometimes they are experiencing conflict in the schedule since other members have teaching loads and there are also other university activities that coincide with the TBI activities. For TBI 4 and 5, they considered inadequacy on entrepreneurial skills is also a weakness. Since the majority of the TBI members do not have formal education and experience in business management and entrepreneurship.

Table 19 also shows the identified external factors affecting the operation of the TBI in terms of opportunities and threats. Despite of the limitation on the flexibility of funds due to government rules and regulations, all TBIs mentioned that there are different funding institutions in the government and international organizations that may help them in providing the necessary funds. TBI 5, mentioned that they were able to receive funding not only from the national government but also from Japan International Cooperation Agency. All TBIs also recognize that they are receiving support from the other government institutions aside from DOST. Meanwhile, TBI 2, 3, and 4 mentioned that they have existing linkages in the private section in their region which is a good opportunity to explore partnerships in different projects and activities. TBI 1, 3 and 5 mentioned

that they can observe that there is a significant demand for TBI services which is a good opportunity for them.

External factors also includes threats that if left unattended might have negative consequences to the TBI. TBI 2 and 3 considered a threat the presence of other TBIs which more advanced facilities and technologies to offer in their clientele. In addition, all TBIs considered the strict compliance with government rules and regulations and pressure from oversight agencies as a challenge to their operation.

4. Strategic Action Plan for Continuous Improvement of the Technology Business Incubators

This section presents the most important objective of the study which is to develop a strategic action plan based on the results of the study, especially on the identified strengths and weaknesses of the study. The first part of this section presents the strategies based on SWOT analysis. The latter part presents the development of a strategic action plan for the business incubators. The matrix of the action plan is presented in the appendices. Other state universities planning to establish their own business incubators may also use the same for their own.

After determining the strengths, weaknesses, opportunities, and threats of the TBIs, the researcher conducted an analysis to determine the potential strategies. Internal and external influences are quantified via a SWOT analysis. Additionally, all data is organized into a matrix and then examined to determine the most effective ways for achieving effective, efficient, and sustainable performance. The SWOT analysis is designed to evaluate four current ways for firms to advance. It might be a strategy based on Strength-Opportunity (SO), Weakness-Opportunity (WO), Strength-Threat (ST), or Weakness-Threat (WT). Following that, a review of four strategies was conducted during the analysis stage, and a judgment was reached about the organization's most lucrative, successful, and efficient strategy based on the SWOT matrix. Finally, a strategic plan may be developed, which will serve as the foundation for subsequent actions. (Azimi et al. 2011)

The incubator may offer entire company space, including infrastructure and supporting technologies, and can charge rent to tenants as a source of income. The availability of complete infrastructure and technologies will facilitate the business development of the incubatees. Assistance should also be provided in the development of a business plan, business model canvas, and financial management, since many start-ups and MSMEs are unaware of the value of these documents, which will be used to evaluate funding alternatives.

Investors will review the tenant's business plan and business model canvas in order to evaluate the incubatees's chances. Through business matching, the incubator will assist incubatees' access to capital, market access, and technology. This will connect incubatees with investors, banks, suppliers, distributors, consumers, and communities.

This is critical and directly tied to sales growth, which must be preceded by capacity expansion. When it comes to business matching, renters must be able to guarantee that they can fulfill all expectations from partners. The incubator assists incubatees in forming relationships via business matchmaking. Throughout the incubation phase, regular monitoring and assessment are conducted to ensure that the whole process goes well and to quickly resolve any issues that arise.

Intangible factors will be just as critical as physical infrastructure, since dedication, consistency, and entrepreneurial passion will be the primary drivers of success, alongside the availability of necessary infrastructure. The incubation procedure is not simple and will last three years prior to graduation. As an inwall tenant, the start-up will utilize the incubator's business space. The amount of mentorship activities, tenant training and capacity development, business matching, and other activities will divert tenants' time and attention away from production and marketing. Renters must have a strong commitment to finishing the incubation process and a high level of desire to graduate, demonstrating that tenants can be self-sufficient without the need of incubators. Even after graduation, a post-incubation method will be in place to oversee the tenant business's continuance. Consistency, dedication, and motivation are shown by the tenant's sincerity and devotion to the incubation process; each action carried out by the incubator is supported by the implementation. While the incubator offers the tenant a comprehensive company space, infrastructure, and technology, if the tenant lacks the constancy of commitment and drive to follow through on the incubation process, it may have a negative influence on the tenant's business development.

However, the incubator's management must undoubtedly supply qualified human resources, who can interact with academics and practitioners. Academics will gain from technology advancement and innovation, while practitioners will be able to provide practical aid. Participation in organizations is also important since it allows for the acquisition of networking opportunities that will be utilized maximally for tenant business growth.

The difficulties associated with operating business incubators may stem from a variety of sources, including tenants, incubators themselves, academics, institutions, government, and industry. To be incubated, tenants must be prepared, agree, demonstrate commitment, and consistency in the process' execution. In fact, renters are often unable to split their time and effort as directors and operational managers. As stated in the SWOT analysis, institutional support is critical, but sometimes the portion of funding allocated to tenants is excessive, particularly in the provision of infrastructure and technology, causing the institution to be unable to meet the tenant's needs and instead focus on other priorities.

As a result, the incubator must be self-sufficient in terms of finance. In terms of suppliers of innovation and

inventions, inventors often decline to give their innovations or inventions to potential start-ups for a variety of reasons.

The study on the five technology business incubators have identified a number of key dimensions affecting the design and implementation of an action plan, i.e.:

1. Objectives for business incubation and service mix;
2. Wider business environment;
3. Funding strategies and sustainability
4. Ownership and management
5. Monitoring and appraisal

In the following sections presents the action plan based on the results of the literature review, SWOT analysis, and study on the five business incubators. In the final section, the researcher includes an indication of key recommendations that emerged from the study, which can contribute to the successful design and implementation of the action plans.

Small and medium businesses (MSMEs) are important for economic and social development in both established and developing nations, and their growth is aided by a variety of policies, as stated above. In both established and emerging countries, the failure rate of tiny new enterprises in their first years is significant. This is due in part to the competitive climate in which the enterprises are established, as well as the viability of the unique company concept. It is also a result of the entrepreneur's lack of expertise and environmental shortcomings while starting a firm (i.e. shortage of capital, legal difficulties, lack of information, etc). Governments support a variety of initiatives aimed at reducing business failure rates by addressing environmental issues (e.g., special loan funds, removing legal barriers, reducing government administrative procedures and speeding up their operations) and assisting new entrepreneurs in overcoming their lack of experience (training programs, advisory and support services, etc).

MSMEs are crucial for economic and social development in both developed and developing countries, and their growth is helped by a range of policies, as mentioned above. The failure rate of small new businesses in their initial years is high in both developed and developing nations. This is due in part to the competitive environment in which the businesses operate, as well as the feasibility of the distinctive business model. It's also due to the entrepreneur's lack of experience and environmental issues while launching a business (i.e. shortage of capital, legal difficulties, lack of information, etc). Governments fund a variety of initiatives aimed at lowering business failure rates by addressing environmental issues (e.g., special loan funds, removing legal barriers, reducing government administrative procedures, and speeding up operations) and assisting new entrepreneurs in overcoming their lack of experience (training programs, advisory and support services, etc).

In the provision of direct support services to start-ups and MSMEs, all of these various techniques have a role. Government is responsible for the creation and management of the legal and administrative framework that controls the performance of enterprise⁸ and encourages entrepreneurship, in addition to direct service programmes,

many of which may be backed by the national government. All of the aforementioned possible business support schemes, including business incubation, require some degree of co-location and take place within the environment created for business growth, so their relative success is heavily influenced by the strengths and weaknesses present in this larger environment. Business Incubators have attracted significant support from governments throughout the world and in a wide variety of developmental contexts. The following goals will be the main focus of the action plan:

1. Improve the network for regional innovation system
2. Improve TBI Facilities towards a state-of-the-art technology
3. Ensuring the provision of human resources with adequate skills and competencies
4. Empowerment and self-sustainability of startups and MSMEs in order to foster an entrepreneurial environment
5. Streamline the TBI operation and monitoring

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TABLE 20
PROPOSED STRATEGIC ACTION PLAN FOR THE BUSINESS INCUBATORS

Focus Area	Objectives	Strategies	Activities	Time Frame	Responsible Person	Resources Needed
Marketing Aspect	To create awareness on the services of TBI	Information and Education Campaign	<ol style="list-style-type: none"> Promotion of the TBI services thru social media Design and development of print ads (e.g. brochures, flyers, banners) Campaign in the different media platforms 	1 st Quarter Each Year	TBI Marketing Head	Internet Subscription (Php 2,000/month) Printing Expenses (Php 10,000) Travel Expenses (Php 5,000/month)
Improve the network for regional innovation system	To strengthen the Government-Academe-Linkages of the TBI and the University	Create a regional committee composed of representatives from government, private industries, and the academe. (Strategy S-O)	<ol style="list-style-type: none"> Identify possible members in the region and send an invitation letter. Initiate the creation of a regional committee for government-industry-academe linkages. Lead the created committee Conduct periodic meetings for plans, projects and activities of the committee Conduct regular monitoring of the implemented PPAs 	1st Quarter for the Creation of the Committee Meeting shall be conducted Quarterly	TBI Team	Travel Expenses (Php 12,000) Food Allowances (Php 5,000/month)
	To promote technology transfer of matured technologies	Identify private institutions to organize partnerships with the intention of technology transfer of the matured technology or research of the University (Strategy S-O)	<ol style="list-style-type: none"> Identify potential private companies in related industry Identify matured technology within the university for technology transfer Executing a memorandum of agreement or memorandum of understanding with private companies 	One Year	TBI Team	Travel Expenses (Php 12,000) Food Allowances (Php 5,000/month)
	To explore possible funding opportunities for the sustainability of the TBI	Submit proposals to funding institutions (Strategy W-O)	<ol style="list-style-type: none"> Identify government and private institutions that offer grants for business incubators Prepare the requirements for proposal Submit the proposal 	3 rd Quarter/ Depending on the call for proposals of GFAs	Project Team	none
Improve TBI Facilities towards a state of the art technologies	To improve TBI facilities through state-of-the-art technologies and latest equipment	Provision of the latest equipment and machines that can be funded by the university funds (Strategy W-O) Ensure the commitment of the university to provide advanced facilities for the TBI (Strategy W-T)	<ol style="list-style-type: none"> Conduct benchmarking activities to relevant institutions on the latest equipment, machines and facilities Submit a proposal to the university for internal funding 	1 st Quarter	Project Team	For Benchmarking Activities: Gasoline Expenses (Php 4,000) Per Diem (Php 1,200/pax/day)

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Ensuring the provision of human resources with adequate skills and competencies	To ensure availability of adequate human resources and talents for the TBI	Recruit and develop full-time personnel for the TBI (Strategy W-O) Recruit professional staff for the TBI to gain competitive advantage towards other existing TBIs (Strategy W-T)	<ol style="list-style-type: none"> 1. Identify the specific specialization and skills needed for the TBI 2. Submit a request for recruitment 3. Call for application 4. Interview and screen applicants 5. Orient and train new personnel 	1 st Quarter	HR Department TBI Manager	Php 12,000/month for newly hired personnel
Empowerment and self-sustainability of startups and SMEs in order to foster an entrepreneurial environment	To improve the current service offerings to the incubatees	Improve the instruments (programs, products, services) to support the growth of startups and TBI (Strategy S-T)	<ol style="list-style-type: none"> 1. Conduct benchmark activities in local and international business incubators 2. Conduct planning and workshop on the improvement of program portfolio of the TBI 3. Prepare operational guidelines for new program and product offerings 4. Implement the new programs and products 5. Providing the limited space for production plant or office, with low ren 6. Design effective entrepreneurship training system, cooperated with multi-stakeholders, for agribusiness products/services 	1 st Quarter	Project Team	For Benchmarking Activities: Gasoline Expenses (Php 4,000) Per Diem (Php 1,200/pax/day)
Streamline the TBI operation and monitoring	To prevent any problems that might result to the delays in the implementation of the TBI's PPAs	Explore possible ways to streamline the processes of the TBI while remaining compliant to the applicable statutory and regulatory requirements. (Strategy S-T)	<ol style="list-style-type: none"> 1. Conduct a dialogue with other relevant offices and agencies to clarify the applicable regulations affecting the TBI 	1 st Quarter	Project Team Relevant Offices	none
	To ensure that all activities are appropriately monitored and evaluated for continual improvement	Enhance monitoring and evaluation of the performance of the TBI against set KPIs of the oversight agencies (e.g. DOST, DBM, and CHED) (Strategy S-T)	<ol style="list-style-type: none"> 1. Assign specific personnel, aside from the TBI manager, to monitor and prepare a report on the status of accomplishments of the TBI 2. Conduct periodic assessments of the accomplishments 3. Prepare catch up plans, if necessary 	Quarterly	TBI manager TBI Staff	Meals and snacks allowances for quarterly assessment (Php 5,000 per quarter)

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