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Adrian P. Ybañez
Office of the Vice President for Research and Development, Cebu Technological University, M.J Cuenco Avenue Cor. R. Palma St., Cebu City, Philippines, adrian.ybanez@ctu.edu.ph

Siegfried D. Mendoza
Knowledge and Technology Transfer Office, Cebu Technological University, M.J Cuenco Avenue Cor. R. Palma St., Cebu City, Philippines

Cristina Caintic
Office of the Vice-President for Research, Development and Extension, Eastern Visayas State University, Salazar St, Downtown, Tacloban City, Leyte, Philippines

Mae S. Sabayton
Office of the Vice President for Research and Development, Cebu Technological University, M.J Cuenco Avenue Cor. R. Palma St., Cebu City, Philippines

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Perception and Challenges of Select Higher Educational Institutions on its Role in the Technology Business Incubation in the Visayas, Philippines

Adrian P. Ybañez*[1] and Mae S. Sabayton
Office of the Vice President for Research and Development, Cebu Technological University, M.J Cuenco Avenue Cor. R. Palma St., Cebu City, Philippines

Siegfried D. Mendoza [1]
Knowledge and Technology Transfer Office, Cebu Technological University, M.J Cuenco Avenue Cor. R. Palma St., Cebu City, Philippines

Cristina I. Caintic
Office of the Vice-President for Research, Development and Extension, Eastern Visayas State University, Salazar St, Downtown, Tacloban City, Leyte

Abstract

Research Aims: The present study aims to document perceptions and identify the challenges on the participation and role of technology business incubators (TBIs) of select academic institutions in Visayas, Philippines.

Design/methodology/approach: It is quantitative-qualitative research, which utilized survey questionnaires and focus group discussion of twenty-five (25) key informants (KIs) from nine higher education institutions (HEIs) in the Visayas. KIs include key officials and faculty who handled research, technology transfer, business incubation, intellectual property, and/or technology licensing functions in their respective HEIs.

Research Findings: All KIs were from state universities or colleges, and most KIs were female (64%), married (60%), and holders of a doctorate degree (72%). Results showed that most KIs had good knowledge of TBI operations and intellectual property rights, but acknowledged the need for developing capacities and facilities for the TBI operations.

Theoretical Contribution/Originality: This study identified key challenges and concerns of the HEIs that can affect the implementation and operations of the TBI program in the Philippines which include the training needs of the faculty, lack of manpower and budget, and the sustainability of the facility/operation. The HEIs also need support from government agencies and non-government organizations.

Managerial Implication in the South East Asian context: TBI can help in the improvement of the country's innovation index, technopreneurship, and value creation. Philippine HEIs should consider the cost and sustainability of setting up TBIs as well as how they benchmark their activities against other Southeast Asian countries.

Research limitation & implications: Although the sample appears to be limited, data was collected from key HEI managers and decision-makers. Therefore, this study can still provide insights for current and prospective TBIs to help address common concerns and formulate policies and strategies for the operations and sustainability of the program in their respective HEIs.

Keywords: academe-based business, commercialization technology transfer, technology business incubator (TBI), intellectual property, spin-off company

*Corresponding author: adrian.ybanez@ctu.edu.ph, dr.adrianpybanez@gmail.com
[1] Equal author

INTRODUCTION

The emergence of a knowledge-based economy is influenced by technology and creativity (Maljevic et al., 2019). The economy of a country can therefore be strengthened by encouraging new business development with innovation and technology transfer (Soetanto & Jack, 2018; Stokan et al., 2015). This process can be facilitated by the technology business incubators (TBIs), wherein the development of businesses (especially those in the early stages of growth and transition) are nurtured to accelerate their growth and success by providing a conducive environment for entrepreneurs through different support programs (Bismala et al., 2020; Reyani et al., 2018; Hong et al., 2017; Xiao & North, 2017; Mian et al., 2016; Pinto et al., 2019). TBIs help in the development of new and startup companies by providing several resources, including management training (business preparation, training, marketing), physical facilities, academics with technical support, educational seminars, conventions, legal aid, intellectual property licenses, technology commercialization, and networking with other incubators and government agencies (Hernandez et al., 2016; Mian et al., 2016; Wonglimpiyarat, 2016; Carvalho & Galina, 2015; Gerlach & Brem, 2015; Mahmood et al., 2015). The TBIs have played a critical role in promoting an entrepreneurial community, including those in Asian developed countries (Mahmood et al., 2015). Technology-based incubators are representing social capital's more significant role in regional economic growth (Soetanto & Jack, 2018).

The TBI model has expanded worldwide as it advances the development and sustainability of high-tech businesses (Hernandez et al., 2016). The leading TBIs have often been universities and other academic institutions (M'chirgui et al., 2018; Budi & Aldianto, 2020; Piterou & Birch, 2016; Soetanto & Jack, 2018; Kiran & Bose, 2016). TBIs include research centers, technical centers, accelerators, technology-based incubators, incubators, scientific parks, and technological parks (Al-Mubaraki & Busler, 2017; Budi & Aldianto, 2020). In the Philippines, TBIs are created to help build jobs, expand entrepreneurs, and encourage collaborations between the public and regional economic growth sectors. It aims to build businesses that would leave the incubation program financially stable and capable of continuing activities and business success (Mahmood et al., 2015). It minimizes unemployment in the region by enabling enterprises' startups to grow their stability and growth and encouraging companies interested in new technology or marketing or transferring research from universities, research institutes, and businesses (Gozali et al., 2020).

The wide coverage in business development has led some TBIs to several obstacles, including the lack of entrepreneurial expertise, lack of venture capital, low growth rate, declining productivity, aging population, and lack of actual entrepreneurship (Lamine et al., 2018; Al-Mubaraki & Busler, 2017; Gozali et al., 2017; Maraqa & Darmawan, 2016). Growth and creativity problems in developed countries have also been identified (Lose & Tengeh, 2015). In the Philippines, studies investigating the role of higher educational institutions in technology business development have been scant. As businesses from TBIs have shown better sustainability and greater success rates than off-incubator companies (Salamati et al., 2016), the TBI

programs in HEIs can be essential in further strengthening the business development and economy of the country. Hence, understanding the current issues and challenges faced by the TBIs in HEIs can be beneficial to address them better. This present study aims to analyze and identify the challenges and prospects of technology business incubators from ideation to development in the Philippines. Specifically, it also sought to know the profile of key officials involved in the TBI program of select HEIs and their knowledge and perception about TBIs.

RESEARCH METHOD

Research Respondents

A total of 25 key informants (KIs) from nine higher educational institutions (HEIs) in the Visayas, Philippines, participated in the study. KIs were key personnel or officials involved in the main management of the research, administration, courses, or programs dealing with academe-based business and technology business incubation in the institution. All higher education institutions in the Visayas were formally invited.

Research Design and Environment

The study was a mixed type, which utilised survey questionnaires (quantitative) and focus group discussions (FGD) (qualitative). It was conducted at the Eastern Visayas State University, Tacloban City, Leyte, Philippines, during the 1st Visayas Cluster Conference on Science and Technology-Based Business Development last January 29-31, 2020. Prior to conduct, letter requests were sent to the different HEIs in the Visayas to request participation. The questionnaire obtained the KIs profile and their knowledge and perceptions about technology business incubation. The KIs were subsequently invited to participate in the FGD, in which three groups were subsequently created. Two questions were asked about 1) the challenges and concerns of HEIs in promoting technology business incubation and about 2) the possible HEI interventions that can contribute to promoting technology business incubation.

Research Instrument

The questionnaire was face-validated and pre-tested (Cronbach'd alpha of 0.807). Part one contained items asking the profile of the respondents relating to their age, sex, highest educational attainment, and field of specialization. Part two contained 30 statements (on a four-point Likert scale) about the KIs knowledge about TBI, intellectual property, and select perceptions about the TBI-related operations in the HEI. Statements were formulated from different key literatures. The knowledge of a manager about TBI and intellectual property is critical to the successful management of TBI.

Data processing and analysis

Data from the questionnaires were encoded in Microsoft Excel and subsequently properly coded. The file was later imported into statistical software. Descriptive statistics were employed to present socio-demographic variables, including age,

experience, and educational attainment. Answers from the FGD were transcribed and processed qualitatively to determine the emerging themes from each question.

Ethical considerations

The study was conducted under the Helsinki declaration principles developed by the World Medical Association and the Philippine Health Regulations Ethical Board. Informed consent was obtained from the respondents. Ethical clearance was also acquired from the Cebu Technological University.

RESULTS AND DISCUSSIONS

Profile of the respondents and the select HEIs

Most of the respondents were female (64%), married (60%), doctorate degree holders (72%), and from State Universities and Colleges (SUC) Level 1 and 2 (60%). The average age was 41 years old (Table 1). Only six of them (25%) had actual experience in filing intellectual property (IP) rights applications. Only three HEIs had offices in ITSO, KTTO, and TBI, and only two HEIs claimed to have spin-off companies. Average annual IP applications per HEI ranged from seven to 150. Most of the HEIs had shared service facilities (1-10). One HEI claimed to have no ethical review offices (Table not shown). Educational attainment shows to be an important factor to be identified or designated as a key official to be involved in the TBI program of an HEI. Also, participating HEIs were all from the government. In the Philippines, public HEIs are given budget allocations in research, development, and extension regardless of the income from student tuition fees. Hence, they might have better access to funds for developing TBI programs in the institution than the private HEIs, which are highly reliant on income from tuition fees.

KI's knowledge relevant to TBI

The majority of them (76%) recognized that science parks, research parks, and technology parks could also be considered as technology business incubators (Ka-

Table 1
Profile of key informants involved in relevant technology business incubation activities from selected higher education institutions in the Visayas, Philippines (n=25)

Parameters	Frequency	Percentage
Sex		
Male	9	36.0
Female	16	64.0
Civil Status		
Single	7	28.0
Married	15	60.0
Age (Years)		
25-30	6	24.0
31-40	6	24.0
41-50	6	24.0
51-60	7	28.0
Highest Education Attainment		
Bachelor's degree	3	12.0
Master's degree	4	16.0
PhD or Equivalent	18	72.0
State University and College Level		
1-2	15	60.0
3	2	8.0
4	7	28.0

lidas & Mahendran, 2016), and all knew that TBIs are expected to create a knowledge-based entrepreneurial economy, develop new businesses, jobs and wealth by providing a subsidized environment for business startups until they become strong enough to spin-off and become viable small-medium entrepreneurs (Hernandez et al., 2016; Carvalho & Galina, 2015). However, the majority of them (72%) also showed unfamiliarity with the inclusion of the commercialization function of a TBI (Holgersson & Aaboen, 2019).

A majority (56%) perceived that a systematic framework to understand TBIs exists. However, due to its complexity, having a consistent, structured framework to understand TBIs can be difficult (Mian et al., 2016; Cruz et al., 2020). The majority of them (76%) also thought that janitorial services are not included in the offering of a TBI, when in fact it can be included together with technical assistance, analytical laboratory services, intellectual property management, legal counseling services, administrative services, business development, marketing services, business development, and marketing assistance.

Most of them (88-100%) correctly perceived that TBI is among the strategies to promote innovation and technopreneurship for a country's socio-economic development in a knowledge-based world economy (Al-Mubaraki & Busler, 2017), that the TBI's commonly available facilities include office space, internet access, business meeting/conference room, training room, and storage room (Ayatse et al., 2017; Wang and Lo, 2016), and that spin-off companies can be from the TBIs (Link & Scott, 2017; Meoli & Vismara, 2016).

Most of them (68-96%) correctly perceived that university spin-off companies represent a more significant proportion of companies in older parks and parks associated with more productive university research environments, that development of spin-off companies is the best way to analyze a functional product's complex development, that technology transfer involves developing technologies through research programs of universities, including research tools and formal licensing of inventions and software, that technology transfer is the successful learning of information and the know-how to use it by one party from another party, and that technology transfer can be unintentional and uncompensated, intentional, and fully compensated, or somewhere in between (Al-Mubaraki & Busler, 2017; Budi & Aldianto, 2020). However, the majority of them (56%) have wrong perceptions that spin-off companies from universities are not necessarily the most direct, at any rate, the most visible form of technology transfer from academia to industry (Guerrero & Urbano, 2019; Papageorgiadis et al., 2019).

Most of them (66-72%) correctly recognized that technology transfer could be unintentional and uncompensated, intentional, and fully compensated, or somewhere in between, that technology transfer will cost money, and that licensing of the firm in technology transfer does not lease rights to another, unrelated from to use the technology as patents and trade secrets protect it or produce and market a copyrighted or trademarked good or service (Ismail et al., 2020).

The results generally imply that the key informants still need further capacity building to enrich their knowledge about the TBI operations. As key officials tasked with the TBI operations, it is ideal that they have high functional knowledge about TBI operations so they can monitor and evaluate accordingly and implement strategies to better the management. Moreover, they can also better guide and interact with the incubatees.

KIs perception relevant to intellectual property rights

The majority of the KIs (68-100%) had correctly agreed about the definitions of the IPRs and IPs as reflected in statements 18, 20, 21,22, 23, and 24 (Glaeser et al., 2020; Ismail et al., 2020; Guo-Fitoussi et al., 2019; Engelmann et al., 2018; Ponomareva et al., 2019; Kumar and Das, 2016; Maresch et al., 2016; Papageorgiadis et al., 2019). However, the majority of them also thought incorrectly that IPRs do not necessarily extend to issues of possible investment protection, competition regulation, and environmental management (56%) and that IPRs are not significant on the costs of transferring technology (88%) (Table 2). Similar to the findings of the knowledge of the KIs to TBI operations, the results also generally imply that the key informants still need further capacity building to enrich their knowledge about IPRs.

KI's select perceptions related to TBI operations in the HEI

Most KIs disagreed (88%) that obtaining intellectual property rights for a product or innovation in the Philippines is difficult (Table 2). Application of patents or any other intellectual property right claims can be discouraging at times because of the cost and time needed for processing (Sterckx, 2011). KIs must have perceived it to be not that difficult as only 24% of them have actual experience in filing for IPRs of their own (Table not shown).

Most of them agreed (80%) that they are receiving great support from the institution for IPR until business development of faculty and researchers' products. However, the majority (52%) of them expressed that their HEIs do not have the full capacity yet to operate a TBI program (Table 2). It was further supported by a majority (52%) of them disagreeing that the involved personnel in their HEIs already have the necessary training and expertise to facilitate ideation to the business development of technological innovations by the faculty and researchers of the HEI. The involved personnel in the TBI program must be trained to give the entrepreneurs from the incubatees a unique opportunity to benefit from their skills and expertise (Hsu et al., 2015). The good support of the HEI must translate into a better capacity-building program for the faculty involved in the TBI activities and the development of facilities and programs to support TBI operations.

Most of the KIs (82%) disagreed that setting up TBIs and spin-off companies with the academe is not that difficult (Table 2). Among the primary functions of institutions is to create spin-off companies based on generated IPRs from the HEIs and startups. TBIs generally support these startups through their business development programs (Lamine et al., 2018). The development of TBIs and spin-off companies

Statements	I don't know/ Prefer not to say		Strongly disagree		Disagree		Agree		Strongly agree	
	n	%	n.	%	n.	%	n	%	n	%
1. Science parks, research parks, and technology parks can also be considered as technology business incubators (TBIs)	3	12	-	-	3	12	13	52	6	24
2. A technology business incubator (TBI) is a facility where startups are hosted, and business development services are provided to promote and support innovation except commercialization.	-	-	3	12	4	16	11	44	7	28
3. TBIs are expected to create a knowledge-based entrepreneurial economy, develop new businesses, jobs and wealth by providing a subsidized environment for business startups until they become strong enough to spin-off and become viable small-medium entrepreneurs.	-	-	-	-	-	-	12	48	13	52
4. A systematic framework to understand TBIs exists	3	12	-	-	8	32	10	40	4	16
5. Technology Business Incubation(TBI) is among the strategies to promote innovation and technopreneurship for a country's socio-economic development in a knowledge-based world economy	1	4	-	-	-	-	9	36	15	60
6. A TBI offers technical assistance, analytical laboratory services, intellectual property management, legal counseling services, administrative services, business development, marketing services, business development, and marketing assistance, except janitorial services.	1	4	1	4	4	16	12	48	7	28
7. The TBI's commonly available facilities include office space, internet access, business meeting/ conference room, training room, and storage room.	-	-	-	-	-	-	15	60	10	40
8. Spin-off companies from TBIs	3	0.12	-	-	-	-	16	64	6	24
9. The support of spin-off companies does not include the provision of science parks.	6	24	1	4	8	32	9	36	1	4
10. Spin-off companies from universities are not necessarily the most direct, at any rate, the most visible form of technology transfer from academia to industry	3	12	2	8	6	24	10	40	4	16
11. University spin-off companies represent a more significant proportion of companies in older parks and parks associated with more productive university research environments.	4	16	-	-	4	16	15	60	2	8
12. Development of spin-off companies is the best way to analyze a functional product's complex development.	2	8	-	-	6	24	13	52	4	16
13. Technology transfer involves developing technologies through research programs of universities, including research tools and formal licensing of inventions and software.	-	-	-	-	4	16	14	56	7	28
14. Technology transfer is the successful learning of information and the know-how to use it by one party from another party.	-	-	-	-	1	4	13	52	11	44
15. Technology transfer can be unintentional and uncompensated, intentional, and fully compensated, or somewhere in between.	2	8	1	4	4	16	12	48	6	24
16. Technology transfer may not cost money.	-	-	6	24	12	48	5	20	2	8
17. Licensing of the firm in technology transfer does not lease rights to another, unrelated from to use the technology as patents and trade secrets protect it or produce and market a copyrighted or trademarked good or service.	-	-	2	8	9	36	11	44	3	12

Table 2
Perceptions of key informants involved in relevant technology business incubation activities from selected higher education institutions in the Visayas, Philippines (n=25)

can be challenging, especially in the commercialization (Lai, 2018). While these are initiatives to boost regional economies (Xiao and North, 2017), developing TBIs and spin-off companies with the academe can be complex as HEIs emphasizes creation, marketing, and the transition of science and technical understanding between the academe and the industry (Mian et al., 2016).

Business assistance is an essential aspect and the most dynamic component of TBIs (M'chirgui et al., 2018). TBIs in the HEIs are good stimulators of creativity, technology development, and entrepreneurship that will strengthen the economy (Hernandez et al., 2016; Carvalho & Galina, 2015). The provision of relevant parks (Kalidas & Mahendran, 2016) may accelerate this process. Spin-offs may be created

Table 2 (continued)
Perceptions of key informants involved in relevant technology business incubation activities from selected higher education institutions in the Visayas, Philippines (n=25)

Statements	I don't know/ Prefer not to say		Strongly disagree		Disagree		Agree		Strongly agree	
	n	%	n.	%	n.	%	n	%	n	%
18. Intellectual Property Rights (IPRs) refers to patents, copyrights, trade-marks, and trade secrets, which provide the foundation for building and extending markets for new technologies.	-	-	-	-	1	4	11	44	13	52
19. IPRs do not necessarily extend to issues of possible investment protection, competition regulation, and environmental management.	2	8	4	16	10	40	8	32	1	4
20. IP is when such intellectual efforts create new technologies, products, and services that result in intellectual assets, a piece of information that may have economic value if put into use in the marketplace; hence to the extent that their ownership is recognized.	-	-	-	-	-	-	14	56	11	44
21. For IP the natural rights involve the rights of creators to control any reworking of their ideas and expressions and this view exists independently of any thoughts about the incentive effects or economic costs and benefits of regulation.	2	8	-	-	3	12	12	48	7	28
22. The strengths of IPRs depend on demand characteristics, market structure, and other forms of business and competition regulation.	2	8	-	-	3	12	15	60	5	20
23. Excessively weak property rights satisfy the static goal but suffer the dynamic distortion of insufficient incentives to create intellectual property.	2	8	1	4	5	20	14	56	3	12
24. IPRs are NOT defined as when owners may have the rights to exclude others from activities that infringe or damage the property.	1	4	5	20	17	68	2	8	-	--
25. IPRs are significant on the costs of transferring technology.	-	-	6	24	16	64	2	8	1	4
26. Obtaining IPR for a product or innovation in the Philippines is difficult.	-	-	5	20	14	56	5	20	-	-
27. We have great support from the institution for IPR until business development of faculty and researchers' product in the university/college.	-	-	1	4	4	16	17	68	3	12
28. Our HEI already has the necessary capacity to operate a TBI program.	1	4	5	20	8	32	9	36	2	8
29. The involved HEI personnel have the necessary trainings and expertise to facilitate ideation to business development of technological innovations by the faculty and researchers of the HEI	1	4	3	12	10	40	11	44	-	-
30. Setting up TBIs and spin-off companies with the academe is not that difficult.	1	4	6	24	17	68	1	4	-	-

from the incubatees, which also plays a significant role in the technology transfer (Lamine et al., 2018; Mian et al., 2016). HEIs may also fund start-ups and spin-offs (Fryges & Wright, 2014). In the build-up of these companies, IPs must be protected as they represent a significant component in a country's economic growth (Leonard-Barton & Sinha, 2017) and for long-term strategic growth of the business and innovators (Kashyap & Agrawal, 2019). For these to be realized, key officials must capacitate themselves on this information and processes.

Emerging themes from the FGD on key challenges and concerns of HEIs in the TBI program

KIs recognized the key challenges and concerns of the HEIs that can affect the implementation and operations of the TBI program in the Philippines. These included training needs of the faculty involved in the program, the collaboration between the industry and HEIs, lack of manpower and budget, the sustainability of the facility/operation, the support from the government agencies and non-government organizations, the agenda alignment, the filing of intellectual property rights, and the standardization of ITSO policies.

Faculty needs and concerns, including training. The conduct of relevant training on the faculty involved in the TBI program is important. Faculty must have the necessary competencies to handle the incubatees. Identified training included patent search or IP awareness, nature of TBI spin-offs, the relation of TBI to academe, enterprise development and entrepreneurial skills, and livelihood opportunity identification. On the other hand, faculty may have other challenges, including balancing faculty core functions, the ability to handle stakeholder concerns, and the conduct of scientific research and its needed skills and expertise. Faculty must stay current on scientific advancements to increase the quality of their research (Abouelenein, 2016). Research and extension are among the areas where the faculty can grow in their career, and their involvement in the TBI program must be harmonized with their professional growth and career path in the HEI.

Collaboration of HEIs with the industry companies, which can be more advanced than the HEIs. Some of the HEIs find it challenging that some industries are more advanced in terms of technology and practices than the academe. In other countries, HEIs are usually the source of knowledge and technology for the industry. In the Philippines, only a few HEIs can confidently fulfill this role. Hence, the HEI and the industry must collaborate (Kleibert & Mann, 2020) as both sectors can have similar aims in advancing technology and business and maximizing their resources. Both sectors can work together to address and solve specific real-world challenges (Guan & Zhao, 2013). The knowledge and technology that the HEI will learn or develop as a result of the collaboration can be extended to the incubatees of the HEIs.

Lack of manpower. Managing a TBI program entails several activities and will require manpower. KIs perceive that they lack personnel for the operation of the different involved offices, including the Innovation and Technology Support Of-

fice (ITSO), Knowledge and Technology Transfer Office (KTTO), and the Technology Business Incubation Office. This predicament can affect the consistency in stakeholder support and high-technology incubator models, which is supposed to contribute favorably to expand technology sectors through the introduction of new products and services (Al-Mubaraki et al., 2017). Faculty members also produce new technology that can be offered to the technology business incubatees, but the lack of manpower to assist them in the intellectual property right registration may preclude them from doing so.

Budgetary constraints. Operating a program in an HEI will always require a budget. In the Philippines, operating a TBI program in an HEI is usually anchored on a budget of the research, development, and extension functions. Budget is critical to sustaining the quantity and quality of operations (Argyres & Silverman, 2004). Activities, including regulatory requirements, product development, prototyping, and pilot production, are dependent on the type of technology. The time, resources, and complexity of the involved processes will impact the budget that will be needed to successfully transfer technology to the incubatees (Liberatore & Titus, 1983). Hence, the HEI management must be ready to allocate the needed budget to operate the TBI program.

Sustainability of the TBI facility and operation. The TBI program itself should be a model of a sustainable and efficient business operation for its incubatees, but it can have various problems in the process (Lose & Tengeh, 2015). In the Philippines, the HEI management usually changes over a specified time depending on the term of its President. The TBI operations must be envisioned to sustain across different presidential terms, and this can be made possible by formally instituting it through the highest governing body of the HEI, which is usually the Board of Regents. Budget allocation and the priority areas or technologies must be considered.

Support from government and non-government agencies. The university budget may not be sufficient if it aims to widen its coverage or increase its incubatees in the TBI program. More support and assistance will be needed, including office spaces and other management training (Wang & Lo, 2016). Support from other agencies (government and non-government) can help augment the operations (Yang et al., 2016) of the HEI. In the Philippines, programs from the Department of Science and Technology and the Department of Trade and Industry can be supportive of the TBI program, and HEIs must strive to harmonize with the directions of these agencies.

Standardization of ITSO policies in the different Philippine HEIs. The Intellectual Property of the Philippines (IPoPhi) is the agency authorized to recognize ITSOs in the country. The ITSO in the HEI is usually under its research and development function. As more activities in research, innovation, technology transfer, and commercialization are conducted, the greater would be the need to disseminate the ITSO policy on IP, technology transfer, technology business incubation, commercialization, and research cooperation (Sheth et al., 2019). Policies that will support, encourage or facilitate financial assistance from the government, as well as local and foreign organizations, must be in place (Cai et al., 2015).

Alignment of research agenda to regional and national goals and to the United Nations - Sustainable Development Goals. University programs are funded based on their alignment with the institutional goals. For government HEIs, these goals should be aligned with the regional and national goals, which are already inclusive of the UN-SDGs. For private HEIs, seeking external funding from government agencies will require that the proposed projects are aligned with the national priorities. Hence, to ensure that operations of the TBI will also be sustainable, its agenda should be aligned to the regional and national goals as well as the UN-SDGs so it can secure funding from various sources. The agenda of the TBI must also be aligned with such goals (Ogrean & Herciu, 2020), and its research component must establish a clear framework for making future research decisions (Welter & Gartner, 2016).

Encouragement of filing for intellectual property rights. Patenting is essential for technology development and deployment. It fosters invention and innovation for the betterment of society (Bloom et al., 2019). It helps inventors prevent others from profiting from their innovation without their permission (Aldieri et al., 2020). However, applying patents or other intellectual property rights claims can be expensive and time-consuming (Sterckx, 2011). Hence, the TBI program must offer services that will assist innovators and incubatees in the application of intellectual property rights to mitigate these negative perceptions. Moreover, the HEIs need these applications as a form of output by their respective institutions.

Emerging themes from the FGD on the possible HEI interventions that can contribute to promoting technology business incubation

Encouraging the involvement of faculty in TBI activities. The TBI program can be new to most faculty in the HEIs. They should be educated and encouraged to be involved in the program. They can be exposed to activities involving interventions in new venture development in the setting of business incubation (York et al., 2013; Dew et al., 2008). The TBI program will require more assistance from different expertise as the activities would become more expansive, and the faculty will be a good source of help to address this need.

Organizational structure and the creation of ITSO, KTTO, and/or TBI in the HEI. HEIs can create or sustain an organizational structure that facilitates the operation of the TBI within the institution (Nair & Blomquist, 2019). This structure will outline how various activities are directed to achieve the goals of an organization with the involvement of the TBI program and what are the possible resources needed to carry out the operations (Ajagbe et al., 2016; Wittneben et al., 2012). Within the organizational structure of the HEI, the key offices that will participate in the TBI program include ITSO, KTTO, and TBI. However, some of the HEIs in the study have not yet established some of these offices. ITSOs help acquire the knowledge and skills needed to offer technology and innovation support services (Barrett et al., 2015). It searches for specific technologies to determine their originality and patentability. It may also do a state-of-the-art search to see what patents are already out there in a particular industry or technology (Pozo et al., 2019). The

Knowledge and Technology Transfer Office (KTTO) creates a pathway for essential components of the innovation process to communicate and complete the technology transfer processes (Fritzgeraldd & Cunningham, 2016). Finally, the technology business incubation (TBI) will effectively link the technology and capital and the know-how to leverage entrepreneurial talent and accelerate emerging businesses (Fernández et al., 2015).

Creation of supportive institutional policies. Policies are important to support the technology business incubation activities involved in innovation and technology-oriented entrepreneurial growth (Hanssesn et al., 2016). It can help shape the organizational identity and character and the deployment of resources for achieving goals (Hanssens et al., 2016). Specific policies can be created or sustained by the HEIs to support the TBI program. It can include awards and incentives (faculty, staff, or incubatee), which can be a unique marketing tool and a motivation to enhance excellence in the industry and TBI services offered (Khan, 2015; Aminlou & Yaghoubi, 2019). Awards also give recognition to those creating innovative and creative solutions and to those who are dedicated to advancing innovation and technology (Czarnitzki et al., 2015). Another is the provision of equivalent workloads in teaching units to faculty handling the TBI program, which would encourage innovation and creativity through access to different business technologies that increase the productivity and efficiency of the TBI (Clougherty, 2010).

Harmonization of the policy manual of the HEIs (IP, ITSO, KTTO, TBI). As policy manuals provide an overview of an organization's standard operating rules and procedures (Cothran, 2019), operations involved in IP, ITSO, KTTO and TBI must be well crafted in these documents for ease of operations in the HEI. In terms of the intellectual property policy, the country's applicable IP laws will cover all forms of IP rights, including copyright and associated rights (research and theses), trademarks and service marks, industrial designs, patents, utility models, and inventions, among others (Menell, 2019). On the other hand, ITSOs must have policies to support in-house patent libraries (Pathak et al., 2013).

Creation of linkages. Establishing linkages with the community, local governments, and industry is among the mandates of an HEI. With its intellectual capital and role as core knowledge generators, the HEI is one of the most important intellectual development and technical knowledge (Limones et al., 2021). On the other hand, academe-industry linkage can assist both HEIs and businesses in gaining and maintaining competitive advantages in today's dynamic global environment (Carayol, 2003). Countries that have encouraged this relationship dynamics have seen positive results, including patents, blueprint models, and partnerships, all of which have benefited the economy (Filippetti & Savona, 2017; Franco & Haase, 2015). This built strong partnerships and foretell successful stories that helped inspire start-up businesses to push through. However, these dynamics can be influenced by how aggressively the government promotes, supports, and sustains open innovation adoption (Kerry & Danson, 2016).

Curricular modification. Modifying the curriculum to encourage student en-

gagement in intellectual property innovations, TBI-related activities, and entrepreneurship was perceived to strengthen the TBI operations. Pursuing academic entrepreneurship and the university model of technology business incubation has advantages for the country, the surrounding community, and the university in pursuit of economic growth, diversifying, creating jobs, technological development, viable firms, successful products, and increased university income and prestige (Lyken-Segosebe et al., 2020). To guarantee that HEIs appropriately prioritize, resource, and develop essential elements of entrepreneurial capacity-building, more rigorous strategic planning is needed at the institutional, national, and policy levels (Towers, 2020). Some of these initiatives are embedding entrepreneurial learning in curriculum design and personal development frameworks, creating a university-enterprise partnership for applied knowledge, and developing company incubation capability (Towers et al., 2020).

Capability Building. As managing the TBI will require several competencies and skills, faculty and staff involved in its operations must undergo continuous capability building. This approach enhances an individual's or organization's ability to generate and perform (Donada et al., 2016). It helps organizations see previous problems and opportunities, evolve new approaches to increase impact, support incubators to continuously adapt and acquire skills, expand horizons, and create a new environment where incubators can better grow and develop (Lee & Rha, 2016). It may also involve seeking the most effective incubatees to focus on sustaining skills and linking learning to business performance (Čirjevskis, 2019).

Creation of TBI website. The HEIs can invest in creating a TBI website. Websites are an effective platform for easy provision of information by the host and fast distribution or ease of access of information by the intended stakeholders (Bai et al., 2008; Sterne, 2002). As a promotional medium, web-based promotion has been a dominant technique to reach target markets. It ranks ahead of TV, radio, and print as the preferred promotional method (Gide & Shams, 2011). This platform can be effective in reaching out to potential incubatees (Masutha & Rogerson, 2015).

Budget allocation. The budget determines the breadth of development of the different areas in an organization (Boss & Wanyoike, 2018). The HEIs need to allocate an annual budget to the TBI program, and the amount allocated will determine the extent of the activities. Planning will be very important to prepare for a sound budget for sustainable operations (Konina, 2019).

Logistics support. Provision of logistics support to the TBI and its incubatees is critical to the start-up ecosystem's success (Matveeva & Khomeko, 2018). The HEIs must ensure that the TBI program will integrate smooth logistics to meet consumer needs and surpass competition (Lin, 2015). With proper logistics, operations of the TBI and its incubatees will be well facilitated.

Internationalization. Philippine HEIs are also mandated to forge linkages with international institutions. Through these partnerships, the TBI program may be able to expand the business market or enter new markets in other countries (Baraldi &

Havenvid, 2016; Pettersen et al., 2015). Moreover, technology and expertise from the foreign partners may also be shared with the TBI program of the concerned Philippine HEI.

Strengthening student organizations related to the promotion of research and development. Students are a good source of ideas, information, and innovations. These are later converted into local industrial goods if properly facilitated, leading to industrialization and economic growth (Padul, 2019). In a knowledge-based world economy, it is important to encourage innovation and technopreneurship for its socio-economic growth. TBI is part of an ecosystem that promotes and supports the commercialization of new ideas (Bailey et al., 2019). Hence, students can be involved in the TBI program in different capacities, and their involvement can be facilitated through the activities in the different relevant student organizations in the HEI.

Research agenda alignment. Most HEIs perceive that the alignment of the TBI program to the research agenda will facilitate the harmonization of the priority technologies and outputs. This can consist of strategic activities that promote capacity building and are linked with business goals, such as assisting leaders in developing high-performing teams or launching a new product (Roessler et al., 2019). The strategies that are aligned to the priorities can support a business's growth ambition (Baraldi & Havenvid, 2016).

MANEGRIAL IMPLICATIONS IN THE SOUTH EAST ASIAN CONTEXT

HEIs in Southeast Asia can have similar conditions and challenges. It is well recognized that HEIs can perform a critical role as drivers of technology and innovation to boost a country's economy. Key managers and leaders in the HEIs must be aware of how technology business incubation can help in the improvement of the country's innovation index, technopreneurship, and value creation. They can benchmark the activities of several other Southeast Asian countries.

In this study, KIs agreed that one of the major challenges of managing technology business incubation in the HEIs is the ease of setting it up, although they also perceived that their respective institutions already have the expertise and resources to manage the program. Common challenges can also include budgetary constraints. These challenges can be true in several Southeast Asian HEIs, and they must secure long-term funding for the operation of TBIs.

The Philippine HEIs, including the other Southeast Asian HEIs, should consider the cost and sustainability of setting up technology and business incubation centers. Managers or administrators can benefit by forging alliances with the local and international industry, the government units and agencies, and other important stakeholders because they may provide additional funding and investments. Capability building and balancing of faculty researchers' tasks and teaching loads and their prospective involvement in TBI activities should be seriously considered by the HEI management. Finally, management can gain a competitive advantage if it

harmonizes its research agenda and TBI agenda with the country's long-term plans. It can also align these agendas with international agendas, including those of the ASEAN and the United Nations, for possible collaboration and grant opportunities.

THEORETICAL IMPLICATIONS

Implementing a technology business incubation program in an HEI can have several challenges, including issues and concerns relative to its current operations and the interventions that can be implemented to better its operations. These challenges can be similar in several HEIs in the country, most especially in their roles in providing technology and business incubator services. Knowledge and perceptions of the key implementers in the HEI will be crucial. The TBI program must be perceived as an important university activity to promote innovation and value creation. Although the sample appears to be limited, data was collected from key HEI managers and decision-makers in the Visayas region in the Philippines. Future research may be conducted in other contextual settings. Further studies are recommended to expand the study.

CONCLUSION

The select HEIs in the Visayas, Philippines, need to strengthen or sustain their capacities, facilities and initiatives in technology business incubation in the region to contribute to value creation and innovation in the knowledge-based economy. The implementation of the TBI program of the select HEIs had several challenges, including the readiness of their HEIs to operate and sustain the TBI program, lack of training, lack of manpower and budget, harmonizing and strengthening policies on the research agenda, intellectual property protection through licensing and patenting, and sustainability concerns. The select HEIs have identified several possible interventions to these challenges. In view of the findings, collaborating and forging linkages with the industry and the government will be beneficial for the TBIs and their incubatees. However, while the study maybe limited to in the Visayas Region, it can still provide good insights for current and prospective TBIs in the country to help address common concerns and formulate policies and strategies for the operations and sustainability of the program in their respective HEIs. Concerned government agencies and non-government organizations may also be encouraged to provide the needed additional support for the TBI operations in the HEIs.

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REFERENCES

Ajagbe, M. A., Cho, N. M., Udo, E. E. U., & Peter, O. F. (2016). How organizational structure aids

business performance. *International Journal of Research in Commerce & Management*, *7*(8), 64-68.

Aldieri, L., Kotsemir, M., & Vinci, C. P. (2020). The role of environmental innovation through the
technological proximity in the implementation of the sustainable development. *Business strategy and the environment*, *29*(2), 493-502.

Al-Mubaraki, H. M., & Busler, M. (2017). Challenges and opportunities of innovation and
incubators as a tool for knowledge-based economy. *Journal of Innovation and Entrepreneurship*, *6*(1), 1-18.

Abouelenein, Y. A. M. (2016). Training needs for faculty members: Towards achieving quality of
university education in the light of technological innovations. *Educational Research and Reviews*, *11*(13), 1180-1193.

Aminlou, M., & Yaghoubi, M. (2019). The policies of intellectual property system for innovation
development. *Journal of Science and Technology Policy*, *12*(2), 269-284.

Argyres, N. S., & Silverman, B. S. (2004). R&D, organization structure, and the development of
corporate technological knowledge. *Strategic Management Journal, 25*(9), 929-958.

Ayatse, F. A., Kwahar, N., & Iyortsuun, A. S. (2017). Business incubation process and firm
performance: an empirical review. *Journal of Global Entrepreneurship Research*, *7*(1), 1-17.

Bai, B., Law, R., & Wen, I. (2008). The impact of website quality on customer satisfaction and
purchase intentions: Evidence from Chinese online visitors. *International Journal of Hospitality Management, 27*(3), 391-402.

Bailey, D., Glasmeier, A., Tomlinson, P. R., & Tyler, P. (2019). Industrial policy: new technologies
and transformative innovation policies. *Cambridge Journal of Regions, Economy and Society, 12(2), 169-177.*

Baraldi, E., & Havenvid, M. I. (2016). Identifying new dimensions of business incubation: A multi-
level analysis of Karolinska Institute's incubation system. *Technovation, 50*(1), 53-68.

Barrett, M., Davidson, E., Prabhu, J., & Vargo, S. L. (2015). Service innovation in the digital
age. *MIS quarterly*, *39*(1), 135-154.

Bismala, L., Andriany, D., & Siregar, G. (2020). Development strategy analysis of technology
business incubator in small medium enterprises accompaniment. *Journal of Critical Reviews*, *7*(1), 221-225.

Bloom, N., Van Reenen, J., & Williams, H. (2019). A toolkit of policies to promote
innovation. *Journal of Economic Perspectives*, *33*(3), 84-163.

Boss, E. K., & Wanyoike, D. (2018). Effects of user perceptions and budgetary al-

location on
adaptation of information communication technology in participatory monitoring and evaluation of government funded projects in Baringo country. *International Journal of Business Management and Processes, 4*(2), 10-10.
Budi, A. A., & Aldianto, L. (2020). Research and development–commercialization bridge: A
refined model. *The Asian Journal of Technology Management*, *13*(1), 47-62.
Cai, L., Liu, Q., Zhu, X., & Deng, S. (2015). Market orientation and technological innovation: the
moderating role of entrepreneurial support policies. *International Entrepreneurship and Management Journal*, *11*(3), 645-671.
Carayol, N. (2003). Objectives, agreements and matching in science–industry collaborations:
reassembling the pieces of the puzzle. *Research Policy, 32*(6), 887-908.
Carvalho, L. M. C., & Galina, S. V. (2015). The role of business incubators for start-ups
development in Brazil and Portugal. *World Journal of Entrepreneurship, Management and Sustainable Development*, *11*(4), 256-267.
Čirjevskis, A. (2019). The role of dynamic capabilities as drivers of business model innovation in
mergers and acquisitions of technology-advanced firms. *Journal of Open Innovation: Technology, Market, and Complexity, 5*(1), 1-2.
Clougherty, J. A. (2010). Competition policy trends and economic growth: Cross-national
empirical evidence. *International Journal of the Economics of Business, 17*(1), 111-127.
Cruz, C., O'Loughlin, T., & Loreto, A. (2020). Technology business incubation in a Philippine
State university: Lesson learned from South Australia based leading technology business incubator. *Review of Socio-Economic Research and Development Studies*, *4*(1), 1-19.
Czarnitzki, D., Hussinger, K., & Schneider, C. (2015). R&D collaboration with uncertain
intellectual property rights. *Review of Industrial Organization, 46*(2), 183–204.
Dew, N., Read, S., Sarasvathy, S. D., & Wiltbank, R. (2008). Outlines of a behavioral theory of the
entrepreneurial firm. *Journal of Economic Behavior & Organization, 66*(1), 37-59.
Donada, C., Nogatchewsky, G., & Pezet, A. (2016). Understanding the relational dynamic
capability-building process. *Strategic Organization, 14*(2), 93-117.
Engelmann, F., Holland, M., Nigischer, C., & Stjepandić, J. (2018). Intellectual property protection
and licensing of 3d print with blockchain technology. *Transdisciplinary Engineering Methods for Social Innovation of Industry*, *4*(2), 103-112.
Fernández M. T., Blanco Jiménez, F. J., & Cuadrado Roura, J. R. (2015). Business
incubation: Innovative services in an entrepreneurship ecosystem. *The Service Industries Journal, 35*(14), 783-800.

Filippetti, A., & Savona, M. (2017). University–industry linkages and academic engagements:
individual behaviors and firms' barriers. Introduction to the special section. *The Journal of Technology Transfer, 42*(4), 719-729.
Fitzgerald, C., & Cunningham, J. A. (2016). Inside the university technology transfer office:
Mission statement analysis. *The Journal of Technology Transfer, 41*(5), 1235-1246.
Fryges, H., & Wright, M. (2014). The origin of spin-offs: A typology of corporate and academic
spin-offs. *Small Business Economics*, *43*(2), 245-259.
Franco, M., & Haase, H. (2015). University–industry cooperation: Researchers' motivations and
interaction channels. *Journal of Engineering and technology Management*, *36*(2), 41-51.
Gerlach, S., & Brem, A. (2015). What determines a successful business incubator? Introduction to
an incubator guide. *International Journal of Entrepreneurial Venturing*, *7*(3), 286-307.
Gide, E., & Shams, S. R. (2011). The role of web-based promotion on the development of a
relationship marketing model to enable sustainable growth. *Procedia Computer Science*, *7*(3), 1060-1073.
Glaeser, S., Michels, J., & Verrecchia, R. E. (2020). Discretionary disclosure and manager horizon:
Evidence from patenting. *Review of Accounting Studies*, *25*(2), 597-635.
Gozali, L., Masrom, M., Haron, H. N., & Zagloel, T. Y. M. (2017). Research gap of
entrepreneurship, innovation, economic development, business incubators studies in Indonesia. *International Journal of Economics and Financial Issues*, *7*(2), 24-30.
Gozali, L., Masrom, M., Zagloel, T. Y., Haron, H. N., Garza-Reyes, J. A., Tjahjono, B. & Marie,
I. A. (2020). Performance factors for successful business incubators in Indonesian public universities. *International Journal of Technology*, *11*(1), 155-166.
Guan, J., & Zhao, Q. (2013). The impact of university–industry collaboration networks on
innovation in nanobiopharmaceuticals. *Technological Forecasting and Social Change*, *80*(7), 1271-1286.
Guo-Fitoussi, L., Bounfour, A., & Rekik, S. (2019). Intellectual property rights, complementarity
and the firm's economic performance. *International Journal of Intellectual Property Management*, *9*(2), 136-165.
Guerrero, M., & Urbano, D. (2019). Effectiveness of technology transfer policies and legislation in
fostering entrepreneurial innovations across continents: An overview. *The Journal of Technology Transfer*, *44*(5), 1347-1366.
Hanssens, J., Deloof, M., & Vanacker, T. (2016). The evolution of debt policies: New evidence

from business startups. *Journal of Banking & Finance, 65*(5), 120-133.
Hernandez, R., & Carrà, G. (2016). A conceptual approach for business incubator interdependencies
and sustainable development. *Agriculture and Agricultural Science Procedia*, *8*(2), 718-724.
Holgersson, M., & Aaboen, L. (2019). A literature review of intellectual property management in
technology transfer offices: From appropriation to utilization. *Technology in Society*, *5*(9), 101-132.
Hong, J., Chen, M., Zhu, Y., & Song, G. (2017). Technology business incubators and regional
economic convergence in China. *Technology Analysis & Strategic Management*, *29*(6), 569-582.
Hsu, D. W., Shen, Y. C., Yuan, B. J., & Chou, C. J. (2015). Toward successful commercialization
of university technology: Performance drivers of university technology transfer in Taiwan. *Technological Forecasting and Social Change*, *9*(2), 25-39.
Ismail, N., Kot, S., Abd Aziz, A. S., & Rajiani, I. (2020,). From innovation to market: Integrating
university and industry perspectives towards commercialising research output. *Forum Scientiae Oeconomia*, *8*(4), 99-115.
Kalidas, K., & Mahendran, K. (2016). Review paper on business incubation: A way for sustainable
entrepreneurship development. *International Journal of Business and General Management*, *5*(4), 25-32.
Kashyap, A., & Agrawal, R. (2019). Scale development and modeling of intellectual property
creation capability in higher education. *Journal of Intellectual Capital*, *21*(1), 115-138.
Kerry, C., & Danson, M. (2016). Open innovation, triple helix and regional innovation systems:
Exploring catapult centres in the UK. *Industry and Higher Education*, *30*(1), 67-78.
Khan, B. Z. (2015). Inventing prizes: A historical perspective on innovation awards and technology
policy. *Business History Review, 89*(4), 631-660.
Kleibert, J. M., & Mann, L. (2020). Capturing value amidst constant global restructuring.
information-technology-enabled services in India, the Philippines and Kenya. *The European Journal of Development Research*, *32*(4), 1057-1079.
Kiran, R., & Bose, S. C. (2020). Stimulating business incubation performance: Role of networking,
university linkage and facilities. *Technology Analysis & Strategic Management*, *32*(12), 1407-1421.
Konina, O. V. (2019). Scientific and methodological foundations of an innovative company
management. *Institute of Scientific Communications Conference, 91*(2), 495-502.
Kumar, R., & Das, A. J. (2016). Scenario of intellectual property right on microor-

ganism and
microbiological research: An imperative need to amend. *International Journal of Intellectual Property Management*, *9*(1), 1-4.
Lai, P. C. (2018). Research, innovation and development strategic planning for intellectual property
management. *Economic Alternatives*, *5*(3), 303-310.
Lai, W. H., & Lin, C. C. (2015). Constructing business incubation service capabilities for tenants at
the post-entrepreneurial phase. *Journal of Business Research, 68*(11), 2285-2289.
Lamine, W., Mian, S., Fayolle, A., Wright, M., Klofsten, M., & Etzkowitz, H. (2018). Technology
business incubation mechanisms and sustainable regional development. *The Journal of Technology Transfer*, *43*(5), 1121-1141.
Lee, S. M., & Rha, J. S. (2016). Ambidextrous supply chain as a dynamic capability: Building a
resilient supply chain. *Management Decision*, *54*(1), 2-23.
Leonard-Barton, D., & Sinha, D. K. (2017). Developer-user interaction and user satisfaction in
internal technology transfer. *Academy of Management Journal*, *36*(5), 1125-1139.
Liberatore, M. J., & Titus, G. J. (1983). The practice of management science in R&D project
management. *Management Science, 29*(8), 962-974.
Limones Meráz, T. F., Amador, J. F., & Reaiche, C. (2021). Linking HEIs with the production
sector: A communication approach between key actors in Ciudad Juárez, Mexico. *Industry and Higher Education, 35*(1), 46-60.
Lin, C.-Y. (2015). Conceptualizing and measuring consumer perceptions of retailer innovativeness
in Taiwan. *Journal of Retailing and Consumer Services, 24*(2), 33–41.
Link, A. N., & Scott, J. T. (2017). Opening the ivory tower's door: An analysis of the determinants
of the formation of US university spin-off companies. *Universities and the Entrepreneurial Ecosystem*, *34*(7), 37-43.
Lose, T., & Tengeh, R. K. (2015). The sustainability and challenges of business incubators in the
Western Cape Province, South Africa. *Sustainability, 7*(10), 14344-14357.
Lyken-Segosebe, D., Montshiwa, B., Kenewang, S., & Mogotsi, T. (2020). Stimulating academic
entrepreneurship through technology business incubation: Lessons for the incoming sponsoring university. *International Journal of Higher Education, 9*(5), 1-18.
M'chirgui, Z., Lamine, W., Mian, S., & Fayolle, A. (2018). University technology
commercialization through new venture projects: An assessment of the French regional incubator program. *The Journal of Technology Transfer*, *43*(5), 1142-1160.
Mahmood, N., Jianfeng, C., Jamil, F., Karmat, J., & Khan, M. (2015). Business incubators: Boon
or boondoggle for SMEs and economic development of Pakistan. *International*

Journal of u- and e- Service, Science and Technology, 8(4), 147–158.
Maljevic, I., Alsohaily, A., Brenner, D., & Tong, W. (2019). The evolution of telecom business,
economy, and policies. *IEEE Communications Magazine*, *57*(12), 14.
Maraqa, A., & Darmawan, A. (2016). Enhancing the role of networked business incubators as a
catalyst of promoting trading business among OIC. *International Journal of Islamic Business*, *1*(1), 29-49.
Maresch, D., Fink, M., & Harms, R. (2016). When patents matter: The impact of competition and
patent age on the performance contribution of intellectual property rights protection. *Technovation*, *57*(2), 14-20.
Masutha, M., & Rogerson, C. M. (2015, June). Business incubation for small enterprise
development: South African pathways. *Urban Forum, 26*(2), 223-241.
Matveeva, I., & Khomenko, E. (2018). Formation of support for small enterprises in the process of
business incubation with the application of logistic chains. *Acta logistica, 5*(1), 15-18.
Menell, P. S. (2019). Economic analysis of network effects and intellectual property. *Research*
Handbook on the Economics of Intellectual Property Law, *1*(2), 165-230.
Meoli, M., & Vismara, S. (2016). University support and the creation of technology and non-
technology academic spin-offs. *Small Business Economics*, *47*(2), 345-362.
Mian, S., Lamine, W., & Fayolle, A. (2016). Technology Business Incubation: An overview of the
state of knowledge. *Technovation*, *50*(2), 1-12.
Nair, S., & Blomquist, T. (2019). Failure prevention and management in business incubation:
practices towards a scalable business model. *Technology Analysis & Strategic Management, 31*(3), 266-278.
Ogrean, C., & Herciu, M. (2020). Business models addressing sustainability challenges-towards
a new research agenda. *Sustainability*, *12*(9), 34-35.
Padul–Dauz, L. (2019). Assessment of the implementation of community-based projects of the
Department of Science and Technology, Eastern Visayas, Philippines. *Asian Journal of*
Governance and Education, *2*(1), 1-25.
Papageorgiadis, N., Wang, C., & Magkonis, G. (2019). Factors contributing to the strength of
national patent protection and enforcement after trips. *Transnational Corporations*, *26*(1), 87-107.
Pathak, S., Xavier-Oliveira, E., & Laplume, A. O. (2013). Influence of intellectual property, foreign
investment, and technological adoption on technology entrepreneurship. *Journal of*

Business Research, *66*(10), 2090-2101.

Pettersen, I. B., Aarstad, J., Høvig, Ø. S., & Tobiassen, A. E. (2015). Business incubation and the
network resources of start-ups. *Journal of Innovation and Entrepreneurship, 5*(1), 1-17.

Ponomareva, N., Zvereva, A., Golubtsova, E., Novikova, E., & Maximov, D. (2019). Approaches to
the improvement of tax auditing for operations with intellectual property in the Russian Federation. *Espacios*, *40*(10), 10-24.

Pozo, H., Akabane, G. K., & Tachizava, T. (2019). Innovation and technology processes in micro
and small business. *Cogent Business & Management*, *6*(1), 1-20.

Pinto, M. M. A., Kovaleski, J. L., Yoshino, R. T., & Pagani, R. N. (2019). Knowledge and
technology transfer influencing the process of innovation in green supply chain management: A multicriteria model based on the dematel method. *Sustainability*, *11*(12), 34-85.

Piterou, A., & Birch, C. (2016). The role of higher education institutions in supporting innovation
in SMEs: University-based incubators and student internships as knowledge transfer tools. *The Journal of Innovation Impact*, *7*(1), 72-105.

Roessler, M., Velamuri, V. K., & Schneckenberg, D. (2019). Corporate entrepreneurship initiatives:
Antagonizing cognitive biases in business model design. *R&D Management*, *49*(4), 509-533.

Salamati, T., Vaezi, E., Memarpour, M., & Rajabzadeh, A. (2016). Commercialization model
design and presentation of proposed algorithm of knowledge commercialization for the higher education. *Knowledge Studies*, *2*(8), 61-80.

Sheth, B. P., Acharya, S. R., & Sareen, S. B. (2019). Policy implications for the improvement of
technology transfer and commercialization process in the Indian context. *Journal of Science and Technology Policy Management*, *10*(1), 214-233.

Soetanto, D., & Jack, S. L. (2018). Slack resources, exploratory and exploitative innovation and the
performance of small technology-based firms at incubators. *The Journal of Technology Transfer, 43*(5), 1213–1231.

Sterckx, S. (2011). Patenting and licensing of university research: Promoting innovation or
undermining academic values. *Science and Engineering Ethics*, *17*(1), 45-64.

Stokan, E., Thompson, L., & Mahu, R. J. (2015). Testing the differential effect of business
incubators on firm growth. *Economic Development Quarterly*, *29*(4), 317-327.

Towers, N., Santoso, A. S., Sulkowski, N., & Jameson, J. (2020). Entrepreneurial capacity-building
in HEIs for embedding entrepreneurship and enterprise creation a tripartite approach. *International Journal of Retail & Distribution Management, 48*(8), 881-

899.
Wang, H. J., & Lo, J. (2016). Adoption of open government data among government agencies.
Government Information Quarterly, 33(1), 80-88.
Welter, F., & Gartner, W. B. (2016). Advancing our research agenda for entrepreneurship and contexts. In F. Welter & W.B. Gartner (Eds.), *A research agenda for entrepreneurship and context*. Cheltenham: Edward Elgar Publishing.
Wittneben, B. B., Okereke, C., Banerjee, S. B., & Levy, D. L. (2012). Climate change and the
emergence of new organizational landscapes. *Organization Studies, 33*(11), 1431-1450.
Wonglimpiyarat, J. (2016). The innovation incubator, university business incubator and technology
transfer strategy: The case of Thailand. *Technology in Society*, *46*(2), 18-27.
Xiao, L., & North, D. (2017). The graduation performance of technology business incubators in
China's three tier cities: The role of incubator funding, technical support, and entrepreneurial mentoring. *The Journal of Technology Transfer*, *42*(3), 615-634.
Yang, T. M., Pardo, T., & Wu, Y. J. (2014). How is information shared across the boundaries of
government agencies. An e-Government case study. *Government Information Quarterly, 31*(4), 637-652.
York, J. G., Sarasvathy, S. D., & Wicks, A. C. (2013). An entrepreneurial perspective on value
creation in public-private ventures. *Academy of Management Review, 38*(2), 307-309.

APPENDIX

Challenges and prospects of academe-based business and technology business incubators: from ideation to commercialization

I. Profile (Please provide check ✓ to applicable answers)

Respondent: ☐ Vice-President ☐ ITSO Head ☐ KTTO Head ☐ Innovator ☐ Others (please indicate)_____

Age : _____years Sex:☐ Male ☐ fema1e Civil Status:☐ single ☐ married ☐ widowed

Highest Educational Attainment: ☐ Bachelor ☐ Master or Equivalent ☐ PhD or Equivalent

☐ Others (please specify)_____

Field of specialization: _____

HEI Category: o Private o SUC SUC/HEILevel,Accreditation of Equivalent:

Presence of functional ITSO in the HEI: ☐ Yes ☐ No

Presence of functional KTTO in the HEI: ☐ Yes ☐ No

No. of Technology Business Incubators produced by the HEI:

No. of Spin-Off Companies produced by the HEI: _____

No. of Shared service facilit es or equivalent in the HEI: _____

Annual average of patents, utility models or industrial designs(or equ va ent) filed by HEI:: _____

Ethical Review Bodies in HEI: ☐ ERC (humans) or equivalent ☐ IACUC or equivalent (animals)
☐ Biosafety Committee or equivalent ☐ Others: _____

Personal experience by the respondent with applying filing patents, utility models or industrial designs (or equivalent): ☐ Yes ☐ No

Personal experience by the respondent with technology transfer: ☐ Yes ☐ No

Personal experience by the respondent operating own business or HEIIGP: ☐ Yes ☐ No

Related trainings attended: _____

II. Please check accordingly (part 1).

Statement	0 Idon't know	1 Strongly disagree	2 Disagree	3 Agree	4 Strongly agree
1. Science parks, research parks, and technology parks can be also considered as technology business incubators (TBIs).					
2. A technology business incubator (TBI) is a facility where start-ups are hos1ed and business development services are provided to promote and support innovation except commercialization.					
3. TBIs are expected to create a knowledge-based entrepreneurial economy to develop new businesses, jobs and wealth by providing a subsidized environment for business start-ups until they become strong enough to spin-off and become viable small-medium entrepreneurs.					
4. A systematic framework to understand TBIs exists.					
5. Technology Business Incubation (TBI) is among the strategies to promote innovation and technopreneurship for a country's socio-economic development in a knowledge based world economy.					
6. A TBI can offer technical assistance, analytical laboratory services, intellectual property management, and legal counseling services, administrative services, business development and marketing assistance, except janitorial services."					
7. The common available facilities of TBI include are office space, internet access, business meeting/conference room, training room, and storage room.					
8. Spin-off companies can arise from TBIs.					
9. The support of spin-off companies does not include provision of science parks.					
10. Spin-off companies from universities is not necessarily the most direct or, at any rate, the most visible form of technology transfer from academia to industry.					
11. University spin-off companies represent a greater proportion of companies in older parks and parks associated with more productive university research environments.					
12. Development of spin-off companies are the best way to analyze the complex development of a functional product.					
13. Technology transfer involves the development of technologies through research programs of universities including research tools and formal licensing of inventions and software.					
14. Technology transfer is the successful learning of information and the know-how to use it by one party from another party.					
15. Technology transfer can unintentional and uncompensated, intentional and fully compensated or somewhere in between.					

II. Please check accordingly (part 2).

Statement	0 Idon't know	1 Strongly disagree	2 Disagree	3 Agree	4 Strongly agree
16. Technology transfer may not cost money.					
17. Licensing of the firm in technology transfer does not lease rights to another, unrelated firm to use the technology as it is protected by patents and trade secrets or produce and market a copyrighted or trademarked good or service.					
18. Intellectual Property Rights (IPRs) refers to patents, copyrights trade-marks, and trade secrets-which provide the foundation for building and extending markets for new technologies.					
19. IPRs does not necessarily could extend to issues of possible investment protection, competition regulation, and environmental management.					
20. IP is when such intellectual efforts create new technologies, products, and services that result in intellectual assets, a piece of information that may have economic value if put into use in the marketplace hence to the extent that their ownership is recognized.					
21. For IP, the natural rights view involves the rights of creators to control any reworking of their ideas and expressions and this view exists independently of any thoughts about the incentive effects or economic costs and benefits of regulation.					
22. The strength of IPRs depends on demand characteristics, market structure, and other forms of business and competition regulation.					
23. Excessively weak property rights satisfy the static goal but suffer the dynamic distortion of insufficient incentives to create intellectual property.					
24. IPRs does NOT define as when owners may exclude others from activities that infringe or damage the property.					
25. IPRs is insignificant on the costs of transferring technology.					
26. Obtaining IPR for a product or innovation in the Philippines is difficult.					
27. We have great support from the institution for IPR until business development of faculty and researchers' product in the university/college.					
28. Our HEI already has the necessary HEI to					
29. We already have the necessary trainings and expertise to facilitate ideation to business development of technological innovations by the faculty and researchers of the HEI.					
30. Setting up of TBIs and spin-off companies with the academe is not that difficult.					