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Production and Enterprise Development: Its Perspectives towards Commercialization

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Abstract

In partnership with the government and industry, State Universities and Colleges (SUCs) could help provide access to entrepreneurial opportunities. The study evaluated the Production and Enterprise Development (PED) services' current system in one of the SUCs in the Bicol Region, Philippines. It aimed to develop a framework to help improve the system. The study adopted a descriptive – evaluative research design, employing several data gathering strategies, including a documentary survey, key informants' interviews, structured survey questionnaires, and secondary data analysis. The study was anchored on the systems theory. Descriptive statistic with in-depth analysis was used. The results of the study were presented using the five categories adapted from the star model approaches for strategic organization. The study concluded that this particular state college has the necessary facilities, technology, entrepreneurial skills, and academic programs supporting the PED services. The study revealed two primary weaknesses for PED services as a functional unit. The framework proposed in this study focuses on laying up a clear strategic direction for PED. This strategic direction proposes a comprehensive view of the PED as a unit that works towards the holistic development of students' knowledge, innovative skills and entrepreneurial competencies, and commercialization.

Keywords: Research Utilization, Star Model, Systems Theory, Technology Commercialization

1. Introduction

Technology commercialization activities in universities have emerged significantly around the globe, increasingly contributed to economic growth. [1].

In the Philippines, State Universities and Colleges (SUCs) are allowed to participate in commercial activities to generate income, as specified in the Republic Act 8292, also known as the Higher Education Act of 1997 [2]. The Commission on Higher Education (CHED) [3], emphasizes the role of universities as key drivers of economic growth, research and development laboratory, and instrument for building human capital that actively participates in the global economy. Involvement in entrepreneurial activities is highly encouraged because they aim to raise the number of scientific discoveries, commercialization, encourage the creation of jobs, thereby producing more significant returns to government investments on the researches of the universities [4]. Moreover, Higher Education Institutions (HEIs), including SUCs, are an excellent venue not only for instruction but also for innovation, research and development, and extension that may promote entrepreneurial undertakings, sustainable growth, and economic development. It is the goal of most universities and colleges to utilize and commercialize research output. However, not all universities have been successful in doing this. Previous study revealed that very few HEIs have benefited from the commercialization of research, which implies that there is a need to strengthen research utilization to have its impact among Philippine higher education institutions [5]. Evidence suggests that further research may provide opportunities for commercialization, and the goal of most universities and colleges is to utilize and commercialize research output [6][7]. However, research commercialization in universities is still minimal though there are adequate inventions and innovations; research results are used as bases for student development and community extension activities, but not so much in creating a niche in the market by commercializing research outputs [8] [5] [9] [10]. Universities may need to strengthen policies and review the commercialization process [9] [10].

Hence, this study looked into the current status of the Production and Enterprise Development (PED) services of one of the SUCs in the Bicol Region, particularly to investigate the commercialization status of the PED projects in the college, understand the current system and check if the system in place needs enhancement.

2. Objectives of the Study

This study aimed to contribute to the understanding of research utilization and technology commercialization by investigating the existing system of PED services. Specifically, the study aimed to determine the current system of the production and enterprise development services and propose a framework to address the weaknesses of the existing system.

3. Materials and Methods

Methods

The study adopted a descriptive – evaluative research design, which primarily aimed to describe the current system of the PED services and came up with a proposed framework to address the weaknesses of the current system. The descriptive – evaluative research design was also used to describe students' entrepreneurial competencies and the faculty's entrepreneurial and professional competencies.

Participants

There were sixty-nine respondents from the state college, broken down as follows: eight college officials and employees, fifty-three BS Entrepreneurship (BSE) students, and eight BSE faculty members. The study employed Slovin's formula for student respondents using a ten percent margin of error (10%).

Instrument

The study used a researcher-made documentary survey and employed a researcher-made semi-structured questionnaire for key informants interview (KII). A modified survey questionnaire for students [11] was used to determine the BSE students' entrepreneurial competencies. To assess the entrepreneurial and professional competencies of the faculty assigned in BSE, a modified survey questionnaire for faculty from varied sources [12], [13],[14] were also employed. The survey instruments for students and faculty were subjected to SPSS reliability analysis using Cronbach alpha.

Procedure

A documentary survey was administered using a documentary survey checklist. KII was employed, using a semi-structured guide questionnaire. The researcher conducted a one-on-one in-depth interview with the PED Coordinator, the Research, Extension, Production and Enterprise Development (REPED) Director, and the College Officials. The researcher also administered survey questionnaires to the fifty-three BSE students and eight BSE faculty, using different sets of questionnaires.

Data Analysis

The study used descriptive statistics with in-depth analysis, using qualitative techniques. The students' and faculty respondents' profiles were tabulated and analyzed using the frequency distribution table. A 5-point Likert scale was employed in determining the student's and faculty's entrepreneurial competencies, the motivation in the involvement in PED programs, as well as their commitment and motivation towards the entrepreneurial assignment.

Ethical Consideration

The researcher sought consent and approval before the conduct of this study. Respondents were informed of the purpose of the study before the actual conduct of the survey.

4. Results and Discussion

The PED is a unit under the REPED Office. The current PED system was presented using the five categories: strategy, structure, processes, rewards, and people, adapted from the star model approach for a strategic organization [15].

Strategy

The results of the documentary survey showed that the institutional strategic initiatives include "Innovation, Enterprise Development, and Extension Modalities Initiative" [16]; however, PED is not explicitly included in the targets of the college. Based on the documentary survey, there was no specific strategic plan for

PED. PED is not yet included in the primary target of the institution. REPED's quality objectives and targets are focused more on the research and extension functions since, as a state college, the production function is not yet mandatory.

This implies the need to establish the strategic direction for PED services, particularly that the institution is directing its initiatives towards innovation and enterprise development. This finding supports the previous study, which stated that it is vital to have strategic planning and come up with a strategic development plan to guide the business in its operation [17]. There is a need to prepare a strategy that considers the peculiarities of the organization, taking into consideration their resources, defines sustainable objectives, and analyzes their processes [18].

As of the conduct of the study, it was revealed that there was no approved PED manual. The PED, however, presented an initial draft of the production manual, which is still subject for review and refinement. The result of the study showed that in the absence of a PED manual, the College Code [19] serves as the guide for PED function.

Structure

PED as a unit is part of the organizational structure of the REPED Office. In the current set-up, the Institutional PED Coordinator reports to the REPED Director.

Concerning other resources as part of the existing PED system variables, the results showed that the school administration supports PED projects by providing the needed requirement in the form of financial assistance or use of facilities and equipment.

Processes

Aside from basing the PED operation from the College Code, the REPED usually has a REPED consultation meeting through an in-house review where other matters about PED operation could also be discussed.

The PED processes also include processing of production proposal, assistance and coordination for funding, assistance in Intellectual Property processing, and assistance during business incubation. PED's function is focused on the facilitation of PED proposal and coordination of requirements to provide support to proponents. PED also assists in the transfer of technology and commercialization of products, which is the output of the existing system.

The documentary analysis showed 15 project items filed at the Intellectual Property Office of the Philippines (IPOPHL). Out of the 15 items submitted for patenting, six were granted registration, as of the time of the study.

Further examination of data showed that there were production proposals, one of which is the water refilling station. However, the proposal is still under further study and has not reached commercialization yet. On the other hand, some projects are somewhat considered to have commercialized. One is the Computerized Test Checker and Item Analyzer designed to expedite checking of test results to help teachers and provide the Guidance Office staff a helpful tool for checking and analyzing the test items of the college entrance test. Another project was the Vegetable-flavored Ice Cream, which has participated in trade fairs, during the time of interview. This study implied that the production output is still very few, and commercialization is just starting. The study showed a similar result to the previously conducted study [5] [8]. Few HEIs had benefited from the commercialization of research; thus, there is a need to improve research utilization so that its impact is felt among HEIs [5]. Universities do not seem ready for research commercialization, given the low output [8].

Rewards

Findings showed that the PED Institutional Coordinator was granted a workload count equivalent to the teaching load for the position assigned to him.

People

Aside from the PED Institutional Coordinator, the four colleges have their own assigned college PED coordinators. However, faculty and students can be tapped to augment human resources with entrepreneurial capabilities to support the PED programs.

The Proposed Framework to Address the Weaknesses of the Existing System

The earlier part of the study presented the outcomes of the current system of PED. Specifically, it was found out that there were two main weaknesses in the existing system; these are: (1) the absence of a strategic direction for PED services as a functional unit, and (2) the absence of an approved PED services manual, which could have addressed all other issues related to the proper management of the PED services unit.

Strategic direction is an important variable which is necessary in the implementation and performance of the organization [20]. The documentary survey result showed that there is no existing strategic plan specifically for the PED services yet. However, the institution includes strategic initiatives which can serve as the springboard in developing a strategic direction explicitly for PED Services.

The second weakness is the absence of an approved PED services manual. Based on the documentary survey, there was no approved PED Manual yet. One of the key components needed in a successful business affairs/ production program is an approved implementing guidelines [21]. The initial draft of the Production manual was presented; however, it was partially done, and it was still subject for updating, review, and refinement.

After a series of review of the findings, the framework proposed to address the weaknesses of the PED existing system is presented in Figure 1.

The proposed framework aims to strengthen the role of PED services in the institution. It covers the holistic view of the PED services. The proposed framework is presented using the systems' four elements: input, transformation process, output, and feedback.

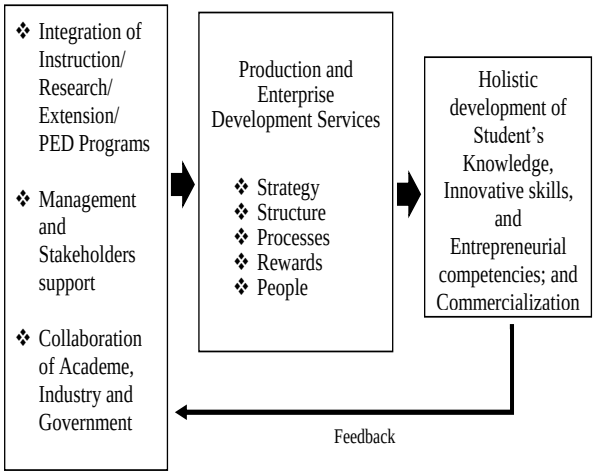

Fig. 1. Proposed Production and Enterprise Development Framework

Elements on the proposed framework

The proposed PED Framework starts with the input, which includes the integration of the instruction, research, and extension, wherein, from this joint function, projects may come up. These projects may have an innovative output that may have an impact on the institution as well as the community. This integration would involve the students, the Faculty, and other employees as the people behind the collaboration in instruction, research, extension, and PED. The College has ideal laboratories and facilities that can be utilized by the students and can be well managed by faculty managers. This can be explored for research and extension facilities, then eventually be turned as PED Proposal. It can serve as a venue for an internship or on the job training of students, where they can assist during the commercialization period of the PED outputs.

Management support could be the following: human resources, capital, and financial resources. The management can also support PED by improving the organizational structure, a strategic plan that includes PED initiatives, and providing motivation or incentives to faculty and employees assigned in the project. Motivation is a crucial support that the management can give, particularly in enticing faculty and students to participate in the PED programs. Management support and other stakeholders' support is needed in a smooth PED operation.

By strengthening the collaboration and linkages among government, industry, and service sector, and the higher education institution, the goal of promoting innovation and job creation will be facilitated. Linkages with industry and government agencies will help the PED services in widening its network and potential for growth. The output of research and extension could be processed through technology transfer or commercialization,

through PED unit, which also aims to help the community and have an opportunity to link or build partnerships with other agencies.

The second element, the "transformation process," is presented using the five categories: strategy, structure, process, rewards, and people.

Strategy

Strategic direction for PED

Based on the study, although the institution has its strategic initiative, the details on how PED will function to support this initiative is not evident in the documents presented. The PED unit should have its strategic direction to give focus on where it is heading, aligned to the institution's strategic initiative. There is a need to explicitly articulate PED's strategic direction as a unit and consider its vision, mission, goals, and objectives to align with the institutional strategic target. The PED strategies should aim to drive PED's function towards innovation, technology utilization, and commercialization using the college's existing resources.

Approved PED manual

The strategic direction for PED, the vision, mission, goals, and objectives of the PED services, the implementing guidelines and procedures for PED services should be considered in the development of the PED manual. The organization structure and the corresponding roles and functions should also be included, as well as monetary and non-monetary rewards and incentives, subject for approval and implementation.

The initial draft of the PED Manual should be revisited, reviewed, and refined. The inputs gathered in this study, including what is indicated in the College Code and documenting the PED actual practices, will enhance the content of the PED Manual.

Structure

The PED structure should support the interconnectedness of PED function with other subsystems. "The structure of the organization contributes to organizational effectiveness" [22]. With the institution's vision to be "The premiere college for creative and innovative applied sciences and technology," [23] calls for the active involvement of the PED services in its role towards promoting innovation and entrepreneurship.

A broader scope of PED services would mean a thorough review of the duties and functions, as well as the appropriate manpower requirements. The active role of PED in the institution would welcome the idea of having a center that would connect all other innovative and entrepreneurial endeavors of the institution, connecting the subsystems to form one extensive system promoting the institution's entrepreneurial environment. It supports the previous study that systems theory emphasizes the association among parts, and the integration of these parts should harmonize with other parts for a more efficient and effective organization [23]. For the resources and facilities, the college, in partnership with the Department of Science and Technology, has this Manufacturing and Fabrication Laboratory. According to the respondent, it is a shared facility. It can serve as a students' training laboratory at the same time it is also open to public or private sectors, which aims to help other micro, small and medium enterprises in Bicol Region or even the nearby regions. Aside from the digital manufacturing laboratory, the college also has the state-of-the-art Food Laboratory and Garments Laboratory.

Processes

The current system of the PED Unit usually includes the preparation of a production proposal. Business plans should also be included, particularly if it is intended for commercialization.

There must be a documented workflow during the production process, from planning and control, production equipment operations, production materials, tools and equipment, work orders, and documentation. These documented procedures and workflow should also be reflected in the PED Manual.

Rewards

Implementation of a reward and incentive scheme for the performance of the personnel and support staff would motivate them to work hard and increase productivity. Specific guidelines for the allocation and distribution of the profit sharing and incentives are necessary, subject to review and approval from time to time. The faculty members involved in the entrepreneurial activity should receive its corresponding equivalent teaching load, commensurate with their position in the PED projects. Should the PED services indulge in more

Production projects, the faculty and employees assigned to manage and man the projects should be given their corresponding incentives or at least its equivalent teaching load. Should there be income in the college's commercialization and enterprise development endeavors, the students, faculty, and employees involved in the project should also receive their corresponding incentives or profit-sharing. Profit-sharing scheme should also be included in the formulation of the PED Manual.

People

The functional organizational set-up includes the availability of required manpower expertise to manage the projects in line with their specialization, and it also pertains to the right number of heads manning the IGPs and production projects, grouped based on their specific skills and knowledge [21].

The College offers a BS Entrepreneurship Program that opened in 2018. The faculty and students of BSE are expected to play a significant role in the entrepreneurial environment, particularly on the school's PED and IGP activities. At the time of the study, there were 114 2nd year BSE students enrolled for 1st Semester 2019-2020; they were the first batch of enrollees for BSE under the College of Arts and Sciences and College of Trades and Technology. Since the study is geared towards commercialization, production, and enterprise development, further study was conducted to assess the students' entrepreneurial characteristics. The study implies that the BSE students, with their course program, have the traits, interest, and motivation to engage in PED or other College's entrepreneurial activities, which can potentially inspire them to pursue their interest in entrepreneurship after they earn their degree.

The BSE Students showed interest in developing entrepreneurial skills, and the majority of the students rely on higher education institutions for their future entrepreneurial exposure and experience.

As shown in Table 1, the results of the Personal Entrepreneurial Characteristics (PECs) of students show high results in "information seeking" with a mean of 4.17, "goal-seeking" with a mean of 4.06, and "opportunity-seeking" with a mean of 4.01. These are essential characteristics that showed the eagerness of the students to learn and practice their entrepreneurial skills while they are in the institution.

Table 1. Personal Entrepreneurial Characteristic of Students

Students n=53	**Mean**	**Rank**
Commitment to Work Contract	3.97	4
Demand for Quality and Efficiency	3.94	5
Goal Setting		
Information Seeking	4.06	2
Opportunity Seeking	4.17	1
Persistence	4.01	3
Persuasion and Networking	3.97	4
Risk Taking	3.79	7
Self-confidence	3.76	8
Systematic Planning and Monitoring	3.91	6
	3.71	9

Regarding students' motivation in the involvement and support to PED activities, the result of the study showed that the students support PED with a mean of 4.11. They are willing to accept an assignment in PED activity. This study supports previous research that stated that the business simulation laboratory plays a vital aid for training and learning; acts as a good surrogate for the real-world experience; therefore, it may be institutionalized to ensure sustainability [25]. A similar study supports the promotion of students' entrepreneurial activities by encouraging active learning through on-the-job-training or by operating mini-enterprise [26].

The faculty respondents were also assessed in terms of entrepreneurial competencies and behavior. The result showed that the faculty assigned in BS Entrepreneurship have high results in the concept of control over resources, with a mean of 4.50, and in the concept of management, with a mean of 4.31, as shown in Table 2.

Table 2. Entrepreneurial Competency/Behavior of Faculty, and Management Capability

Faculty n=8	**Mean**	**Rank**
Entrepreneurial Competency/Behavior		
Commitment to Opportunity		
Compensation Policy	3.75	5
Concept of Control Over Resources	4.06	4
Concept of management	4.50	1
Resource Commitment Process	4.31	2
Strategic Orientation	4.25	3
Management Capability	3.69	6
Vision, Strategy and Organization capability		
Leadership, Knowledge and Technology	3.96	2
Financial and Operations Management		
Innovation on products and services	3.79	5
Internal and External relationship		
	3.92	3
	4.12	1
	3.88	4
		3

The faculty respondents agreed that it is quite vital to have access to resources and maximize its use to the advantage of the College. The BSE faculty also have high results for management capability in terms of innovation on products and services, with a mean of 4.12. Next is the vision, strategy, and organization capability, with a mean of 3.96. The faculty strongly agreed that the management supports innovation by welcoming state-of-the-art concepts and investing in future research that would possibly lead to commercialization or business innovation and encourages the participation of faculty in the entrepreneurial undertakings of the College.

Based on the results presented, the BSE students and faculty have the necessary competencies and excellent traits that can be considered part of the inputs for human resources that could help improve the college's entrepreneurial environment. The college also has the BS in Entertainment and Multimedia Computing, then the Engineering and Technology programs, such as the mechanical, electrical, and others, that could be into product research and development. Hence, tapping potential entrepreneurial students in PED projects is an advantage. Tapping both the students and the faculty will strengthen the organizational set-up of the PED Services unit.

Holistic development of student's knowledge, innovative skills, and entrepreneurial competencies; and commercialization of PED output

The third element, the "output" of this proposed PED framework, is looking at the holistic development of student's knowledge, innovative skills and entrepreneurial competencies, and commercialization of PED output.

This output promotes a holistic approach to learning. This research, extension, and PED output can be turned into students' entrepreneurial ventures, where they could have their hands-on experience running the enterprise. This can also contribute to the realization of a business enterprise wherein students can be trained, at the same time, earn while learning and prepare them to become better entrepreneurs or employees in the future, living quality lives.

While the PED services' output would promote the application of knowledge, skills, and entrepreneurial competencies of the students, commercialization is also a suitable venue for students' hands-on learning. Moreover, it would help generate income not only to the college but also to the other stakeholders.

Feedback

Feedback, as the last element of the system, is essential because it is where improvements and realignment of tasks are determined in order to meet the target. Feedback refers to the information, reactions, comments, or opinion of the persons involved in the PED activities to improve the PED system. The feedback, which may include a review of the existing system by getting feedback from concerned personnel or students, is a welcome step in improving the current system, which could be positive or negative feedback.

5. Conclusion and Recommendation

It could be concluded that in the current system, the PED output is still very few, and commercialization has just started. The study also revealed that the absence of a strategic plan for PED services as a functional unit poses one of the primary weaknesses in the existing system, which could be addressed by explicitly articulating PED's strategic direction as a unit. The second one is the absence of an approved PED manual, documenting the general policies and implementing guidelines on the PED Services, the vision, mission, goals, and objectives of PED, and PED's strategic direction. The study concludes that the proposed framework can address the weaknesses of the current system. This framework proposes an all-inclusive view of the PED as a unit from its inputs, integrating instruction, research, extension and PED programs, management and stakeholders support, and collaboration of academe, industry, and government. Through its transformation process with the PED services strategy, structure, processes, rewards, and people, the goal of providing holistic development to students and the aim of successful commercialization will be achieved.

The school, having Entrepreneurship as one of its mandates, may consider institutionalizing the commercialization of the products and services of the students as part of the entrepreneurial activities and, at the same time IGP of the college.

To further support entrepreneurship and innovation, a research study may be considered to evaluate the institution's capability to operate a business center.

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