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Country's Research Priorities to the Research Initiative towards a Developed Research Agenda

Gian S. Maneja, John Ryel M. Galang, Jherimie P. Cayanan, Lee Anne Kyra M. Roman, Alma L. Tanguangco, Armie N. Tolentino, Genesis C. Tiria*

Department of Electrical Engineering, Don Honorio Ventura State University, The Philippines
Correspondence: E-mail: gctiria@dhvsu.edu.ph

ABSTRACTS

This study used a survey research design to determine the relevance of the country's research priorities based on the Commission on Higher Education (CHED), Department of Science and Technology (DOST), and The National Economic and Development Authority (NEDA), to the research initiatives of a Higher Education Institution (HEI) and Bachelor of Science in Electrical Engineering (BSEE) department. It employed random sampling of enrolled students, parents, alumni, and faculty to analyze discrepancies in the perceptions regarding the degree of applicability, significance, and urgency of the country's research priorities to the department's research initiatives. The focuses include several aspects related to CHED; Technology and education, indigenous renewable energy sources in the domestic energy, program/curricular studies on higher education, disaster risk management (multidisciplinary/multisector), and the national science and technology plan, among others, DOST. The country's research priorities need to be emphasized in the BSEE department's research agenda and initiatives, as these are all for the sake of achieving their institutional learning outcomes towards developing a skilled and competent workforce in the country's electrical engineering industry.

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1. INTRODUCTION

A research agenda lays out a detailed structure for guided decision-making as well as a clear foundation in terms of future research activities, investigations, and projects (Hobbs & Aubry, 2007). Furthermore, a well-defined research agenda aids in the development of research activities for professors, graduate and undergraduate students, and researchers' academic writing performance, as well as understanding difficult information and translating it into simpler words to make it understandable for others. After analyzing the produced research agenda, it was possible and obvious to identify priority research fields and research-related activities on a long-term basis (Cash-Gibson et al., 2018).

A progressive society is dependent on scholars who conduct research that leads to the discovery of new knowledge, skills, and abilities that will generate or enhance productivity and even the invention of new knowledge to meet the needs and challenges of the present (Lane & Flagg, 2010). It was impossible to bridge the gap between research and practice without first seeing what current and future studies will create, as well as gathering university research and development priorities and integrating the studies with the thrusts of the produced research agenda. As a result, practice-influencing factors have no relationship with research findings or one another.

According to the National Higher Education Research Agenda 2 (NHERA 2), a research agenda was aimed at three core audiences, all of whom play important roles in defining Philippine higher education: state policymakers, institutional leaders, and academics. It was intended to assist researchers in determining which forms of research would contribute the most to national growth and the progress of disciplines, and hence should be promoted.

Furthermore, the National Economic and Development Authority's (NEDA) AmBisyon Natin 2040 and its three pillars: Malasakit, Pagbabago, and Kaunlaran lay the groundwork for more equitable growth, a trust-based and resilient society, and a globally competitive knowledge economy (NEDA, 2016). The Department of Science and Technology's (DOST) and Harmonized National Research and Development Agenda (HNRDA) in 2017-2022 (DOST – HNRDA 2017-2022) and NEDA's Philippine Development Plan 2017-2022 (NEDA – PDP 2017-2022) were geared on achieving the AmBisyon Natin 2040. One of the four areas of strategic action included in achieving the objective of PDP 2017 was the advancement of intelligence and innovation. Industry, Energy, and Emerging Technology are among the HNRDA's priority research areas, including the Alternative Energy Research Trends program (ALERT program), one of the six issues offered by the DOST's National Integrated Basic Research Agenda (NIBRA) and HNRDA's roadmap for research. Internationally, the Sustainable Development Goals (SDGs) include seventeen fundamental goals that were a must-achieve for all developed and developing countries. The SDG includes; the SDG7, which aims to "ensure access to affordable, reliable, sustainable, and modern energy for all.", as well as SDG9, which aims to "build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation".

Identified elements affecting the issues facing engineering education. To mention a few, one of the elements affecting the difficulties confronting engineering education is the management and goal systems used by professors, departments, professional societies, employers, accreditors, and other stakeholders. Which was addressed by large-scale research (approaches drawn from biology-based drug design), a framework for engineering education research (Engineering education research encompasses a diverse variety of subjects and areas of study. This is a substantial challenge, as these various research initiatives must be integrated into a broader research framework), and collaboration with the research

community (a deliberate and coherent research program will increase the significance of individual researchers' contributions).

Figure 1 presents the flow of the study, in the agenda-setting of an aviation institute (Ramoso & Ortega-Dela Cruz, 2019) evaluated research themes in terms of applicability, significance, and urgency, for the overall relevance of NHERA research themes for the said institute. These sub-variables were applied for this study. Feedback was expected after the formulation of the research agenda to test the overall sustainability of the crafted research agenda.

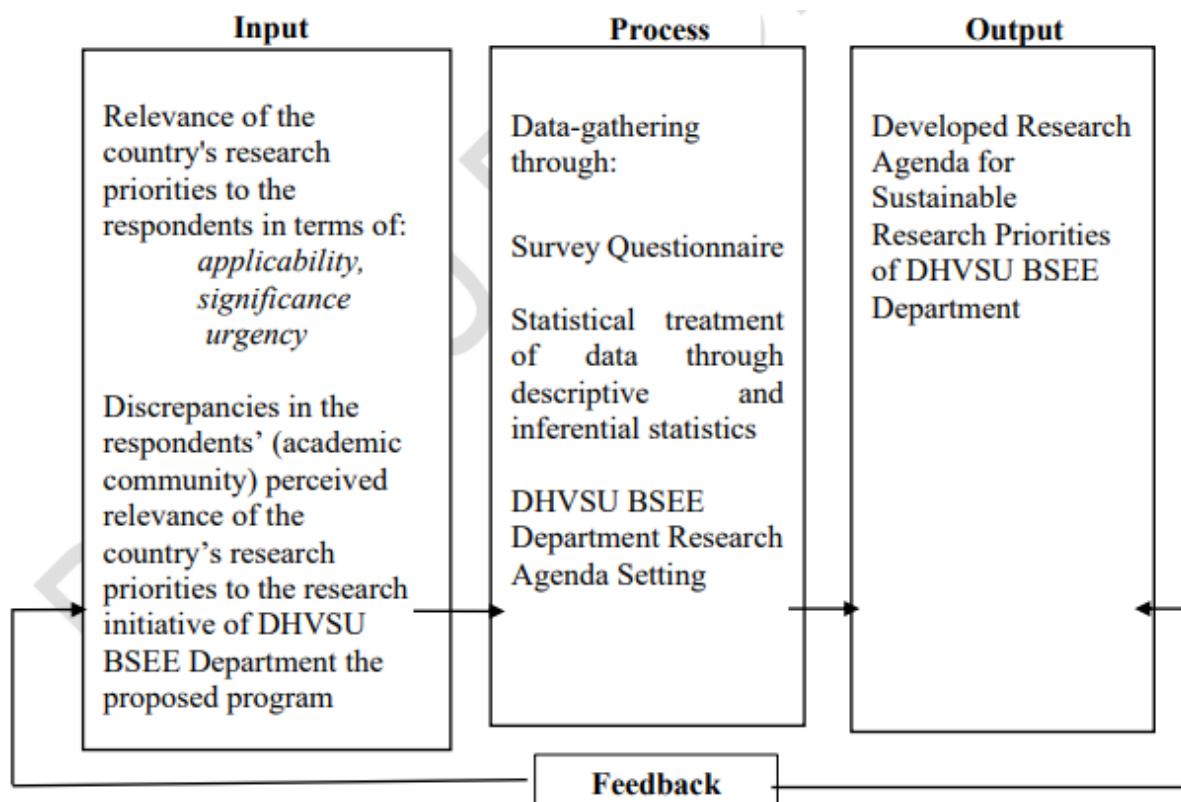


Figure 1. Process flow of the study.

Since research is a major function of higher education institutions (HEIs), HEIs must guarantee that the academic environment develops and supports the country's pool of researchers. Consequently, rules governing higher education must foster an individual's potential for doing autonomous and productive research. One of the universities that take care of this point is Don Honorio Ventura State University (DHVSU). DHVSU is a state university that offers a variety of engineering-related programs. DHVSU, being one of the Philippines' HEIs, is research-compliant. As a result, it must provide good research for the benefit of its institution as well as the entire nation. This in essence, as a member of the academe, provided the researchers to make further inquiries. Based on the DHVSU and Bachelor of Science in Electrical Engineering (BSEE) as well as Department Alumni and Faculty Research Output Data, the Industry, Energy, and Emerging Technology are mainly focused on both groups, the lack of focus on other fields of research areas is visible among the research output data of the alumni. Considering most of these researches also promote clean energy, the research theme Environment, and Climate Change Mitigation and Adaptation is the least focused on both groups.

Some educational institutions also based their research agenda on the country's research priorities, one of which was Tarlac State University (TSU). According to the TSU Research

Office (TSU Research Office, 2018), one of TSU's four (4) primary tasks is to ensure the quality of its education, as evidenced by generations of quality research that aided in provincial, regional, and national development. The following documents were reviewed to develop their research agenda: Sustainable Development Goals, National Harmonized Research and Development Agenda (2018-2022), NEDA's Ambisyon Natin 2040, National Unified Health Research Agenda (NUHRA), and National Higher Education Research Agenda.

Several documents were also reviewed to develop an extensive research agenda in the study, as well as laws implementing the intensification of science & technological research development and the creation of higher education institutes (Science Act of 1958) (Higher Education Act of 1994). However, the current study focuses on the formulation of a research agenda that considers long-term research priorities by determining the relevance of the country's research priorities to DHVSU AND BSEE Department research initiatives.

This exploratory study will provide an overarching research agenda for the DHVSU AND BSEE Department that will suffice as a tangible roadmap for research and development. Concentrating on the formulation of a research agenda for DHVSU's BSEE Department's sustainable research goals in a research-intensive institution in terms of several aspects:

- (i) the degree of relevance of the country's research priorities to DHVSU AND BSEE Department as perceived by; faculty and staff, enrolled students, alumni, and parents (respondents),
- (ii) discrepancies in the respondents' (academic community) perceived relevance of the country's research priorities to the research initiative of the DHVSU AND BSEE Department, and the proposed program
- (iii) a developed research agenda for sustainable research priorities towards improving the quality of DHVSU electrical engineering education.

2. METHOD

2.1. Research Design

This study is a quantitative form of research that utilizes a descriptive and inferential study method. Descriptive since it involves collecting quantifiable and systematic data that can be used for the statistical analysis of the research problem, and inferential to draw the basis of the overall research themes to be prioritized in the DHVSU AND BSEE Department. This study describes the prevailing situation of an organization or any program, which was optimal for the study to establish a scientific foundation for the conduct of research and formulation of a research agenda for sustainable research priorities at DHVSU's BSEE Department Bacolor Campus (Main).

2.2. Respondent of the Study

The population and sample of the study are presented in **Table 1**. The respondents of this research were divided into four (4) groups: employees which comprised faculty and staff, the enrolled students of DHVSU AND BSEE Department, alumni of the university, and parents. The random sampling technique was used, in this method, the sample was selected unit by unit, with an identical possibility of collection for each component at every draw. In this manner, the respondents were picked randomly without the intention of being biased. The researchers preferred to utilize the random sampling strategy to select respondents from the employees, students, alumni, and parents because they were the ones who could supply important information for the study.

To compute the required sample size, power analysis is utilized using the latest version of G Power Software (Faul *et al.*, 2009), to compute the minimum required many samples, input the desired significance level (α) and the number of groups to be surveyed on G power software. The computed minimum required number of samples is at 240 (effect size = 0.25; power = 0.90; α = 0.10; 4 groups). Considering the schedule and daily lives of the respondents, the researchers decided to abide by the computed minimum required the number of samples. From this number, the main respondents (45.39%) of the study belong to the enrolled students of DHVSU and the BSEE Department main campus as shown in **Table 1**. The 35.84% of the respondents belong to the parents of the enrolled students, the Alumni of DHVSU and the BSEE Department represent 14.33% of the respondents, and the faculty, which comprises instructors and staff represents 4.44% of the respondents.

Table 1. Distribution of respondents.

DHVSU AND BSEE Department	Population	Responses	Percentage
Academic Community			
Enrolled Students	667	132	45.39%
Parents	667	105	35.84%
Faculty	25	13	4.44%
Alumni	250	42	14.33%
Total	1609	292	100%

2.3. Instrumentation

This research gathered essential data through the use of a researcher-created survey questionnaire on relevance. Relevance refers to the degree to which the quality or status of the country's research priorities is related to or suited for the research endeavors of the existing higher education institution. Additionally, it relates to the degree to which each declaration about the country's research priorities is applicable, significant, and urgent (Ramoso & Ortega-Dela Cruz, 2019) concerning the HEI's research objectives.

The procedure of creating the survey questionnaire was allowed by educational authorities, including the research coordinator, research specialist, and validators. As a result, the educational authorities' observations and comments were incorporated into the survey questionnaire's final draft.

Then, the most relevant research agenda themes based on the feedback of the respondents will be evaluated for validation by the partner agencies, administration, and faculty of DHVSU AND BSEE.

2.4. Data Collection

The researchers secured consent, approving the letter containing that the researchers will conduct a study. Then the researchers individually gave the questionnaires to the respondents after obtaining their agreement and consent. The researchers gathered quantitative data from respondents via an online platform such as Google Forms.

Additionally, the researchers evaluated the possibility that respondents were unaware of the current research priorities established in our country, which were included in the survey questionnaire. That is why the researchers developed a video conferencing-based orientation session. The session was held anytime the EE Department held seminars or during the semesterly break. The pre-recorded video of the orientation session was also uploaded to

Google Drive. The video link was attached to the questionnaire so the respondents could watch the video independently.

2.5. Statistical Treatment of Data

The study used descriptive statistics such as means, frequency counts, and percentages to analyze the relevance of the country's research priorities to the respondents in terms of the three different variables of the study. In addition, computed means are interpreted in the four-point Likert Scale, which uses a rating scale ranging from not relevant (1) to very highly relevant (4) and the conversion of the qualified weighted mean into a descriptive rating. Also, a test of relevance using a licensed statistical package for social sciences (SPSS) particularly ANOVA, one way was also used for processing the quantitative data.

2.6. Research Agenda Setting

The creation of the suggested research agenda was formulated with the help of the published research outputs of DHVSU AND BSEE Department's faculty and alumni researches; these research outputs were reviewed to determine whether the suggested research agenda already has research outputs conducted by the department.

3. RESULTS AND DISCUSSION

This section presents the major findings of the study. The overall means given to each theme led to the determination of the suggested themes to be prioritized in the research agenda of the DHVSU and BSEE Department.

3.1. Degree of Relevance of NHERA to DHVSU and BSEE Department as Perceived by the Respondents

Table 2 presents the top five most relevant research agenda themes based on the perceptions of the respondents. These include themes related to the technology and education, priority themes enhancing indigenous renewable energy sources in the domestic energy mix (multidisciplinary/multisectoral), program/curricular studies on higher education, priority themes of disaster risk management (multidisciplinary/multisectoral), and the national science & technology plan.

3.2. Degree of the relevance of HNRDA to DHVSU AND BSEE Department as perceived by the respondents.

Table 3 presents the top five (5) most relevant research agenda themes based on the perceptions of the respondents. These include themes related to the HNRDA on industry, energy and emerging technology, industry, energy and emerging technology on renewable energy and energy storage solutions, NIBRA on clean energy (ALERT program), disaster risk reduction, and climate change adoption (DRR & CCA) on technology development and application for climate change mitigation and adaptation, and industry, energy, and emerging technology on countryside development (DOST, 2017).

Table 2. Degree of the relevance of the NHERA to DHVSU AND BSEE Department as rated by the respondents.

No	NHERA Research Themes	Students	Parents	Alumni	Faculty	Overall	Rank
1	Program/curricular studies on higher education	3.28	3.73	3.35	3.54	3.47	3
2	Policy oriented studies	3.24	3.13	3.10	3.54	3.25	9
3	Quality and standards	3.34	3.21	3.00	3.79	3.33	7
4	Technology and education	3.59	3.70	3.61	3.69	3.65	1
5	Model building studies	3.24	3.14	3.06	3.56	3.25	10
6	Institutional development studies	3.23	3.11	3.00	3.44	3.20	13
7	Manpower demand & supply studies	3.28	3.12	3.05	3.23	3.17	15
8	Graduate tracer studies	3.27	3.12	2.99	3.31	3.17	14
9	National science & technology plan	3.40	3.27	3.15	3.59	3.35	5
10	Recommendations of COMSTE on S&T (HEI research in support of R & D initiatives of other agencies/sectors)	3.24	3.09	3.02	3.44	3.20	12
11	Priority themes food and safety security (multidisciplinary/multisectoral)	3.24	3.08	3.14	3.46	3.23	11
12	Priority themes enhancing indigenous renewable energy sources in the domestic energy mix. (multidisciplinary/multisectoral)	3.56	3.30	3.58	3.59	3.51	2
13	Priority themes disaster risk management (multidisciplinary/multisectoral)	3.38	3.12	3.14	3.79	3.36	4
14	Priority themes pollution control (multidisciplinary/multisectoral)	3.39	3.20	3.06	3.41	3.26	8
15	Priority themes climate change specifically on the issue of global warming(multidisciplinary/multisectoral)	3.41	3.23	3.15	3.59	3.35	6

*Refer to appendix F for computation.

Table 3. Degree of the relevance of the HNRDA to DHVSU and BSEE Department as rated by the respondents.

No	HNRDA Research Themes	Students	Parents	Alumni	Faculty	Overall	Rank
1	NIBRA on Clean Energy (ALERT Program)	3.25	3.31	3.63	3.64	3.54	3
2	NIBRA on Sustainable Community (SAKLAW Program)	3.21	3.04	3.16	3.54	3.24	8
3	HNRDA on Industry, Energy, and Emerging Technology	.359	3.72	3.63	3.64	3.64	1
4	Industry, Energy, and Emerging Technology on Food and Nutrition Security	3.29	3.14	3.10	3.67	3.30	6
5	Industry, Energy and Emerging Technology on Countryside Development	3.30	3.24	3.21	3.64	3.35	5
6	Industry, Energy, and Emerging Technology on Delivery of Social Services	3.20	3.08	3.13	3.49	3.23	9
7	Industry, Energy, and Emerging Technology on Renewable Energy and Energy Storage Solutions	3.57	3.75	3.62	3.51	3.61	2
8	DRR & CCA on technology development and application for climate change mitigation and adaptation	3.30	3.61	3.11	3.62	3.41	4
9	Mitigation and Adaptation on DRR & CCA on Technology Development and Application for Disaster Risk Management	3.33	3.17	3.10	3.59	3.30	7

*Refer to appendix G for computation.

3.3. Degree of Relevance of PDP to DHVSU AND BSEE Department as Perceived by the Respondents

Table 4 presents the top five (5) most relevant research agenda themes based on the perceptions of the respondents. These include themes related to vigorously advancing science, technology, and innovation, expanding economic opportunities in industry and services through Trabaho at Negosyo, ensuring ecological integrity, a clean and healthy environment, building safe and secure communities, and accelerating infrastructure development.

There was a statistically significant difference between groups as demonstrated by one-way ANOVA ($F(3, 288) = 2.305695$, $p\text{-value} = 0.076932$). Since $F = 2.305695$ is greater than $F_{crit} = 2.102898$ at the 0.10 level of significance, this implies that there are significant differences in the mean scores of at least 2 (two) groups in their overall perceived relevance to the country's research priorities.

Table 4. Degree of the relevance of the PDP to DHVSU and BSEE Department as rated by the respondents.

No	PDP Research Themes	Students	Parents	Alumni	Faculty	Overall	Rank
1	Expanding Economic Opportunities in Agriculture, Forestry, and Fisheries	3.35	3.08	3.03	3.54	3.25	7
2	Expanding Economic Opportunities in Industry and Services through Trabaho at Negosyo	3.37	3.70	3.45	3.54	3.52	2
3	Accelerating Human Capital Development	3.19	3.08	3.02	3.51	3.20	8
4	Reducing Vulnerability of Individuals and Families	3.22	3.50	3.07	3.38	3.29	6
5	Building Safe and Secure Communities	3.37	3.26	3.10	3.67	3.35	4
6	Reaching for the Demographic Dividend	3.27	3.14	3.02	3.44	3.19	9
7	Vigorously Advancing Science, Technology, and Innovation 3	3.60	3.23	3.61	3.64	3.52	1
8	Ensuring Sound Macroeconomic Policy	3.19	3.05	3.02	3.33	3.15	11
9	Leveling the Playing Field through a National Competition Policy	3.18	3.01	3.06	3.41	3.16	10
10	Accelerating Infrastructure Development	3.38	3.26	3.13	3.54	3.33	5
11	Ensuring Ecological Integrity, Clean and Healthy Environment	3.63	3.32	3.17	3.59	3.43	3

*Refer to appendix H for computation.

This demonstrates that all respondents agreed with the institution's proposed research agenda themes. However, the result is specific to the stated DHVSU AND BSEE Department main campus and cannot be generalized to all other HEIs in the country.

Developed research agenda for sustainable research priorities – upon review of the top 5 rated research themes of the partner agencies (CHED, DOST, and NEDA) suggested research priority areas. Then, the DHVSU and BSEE Department's published research outputs were categorized based on the crafted research areas.

Table 5 revealed that the DHVSU and BSEE Department's Specific Published Research Output can be categorized into the suggested research priority areas for partner agencies CHED, DOST, and NEDA. Overlapping of partner agencies' research themes and research output of DHVSU AND BSEE Departments' published research outputs were visible, which led to the formulation of the suggested research areas for the said department.

Table 5. The published research output of DHVSU AND BSEE department under the new research agenda (2022-2027).

Suggested Priority Areas	Specific Partner Agencies/Government Agenda Parallel to the Suggested Priority Areas	DHVSU AND BSEE Department's Specific Published Research Output
Cost-effective, efficient, sustainable energy supply/source for Micro, Small, Medium, and Large Enterprises	CHED – NHERA 2 (#2) DOST – HNRDA (#2, 5) NEDA – PDP (#2)	<ul style="list-style-type: none"> • Design Mechanism of 80 rpm Speed Bump Energy Harvesting Device • A Dual 48Vdc - 220Vac Electrical System for E-Vehicle Charging Station • Arduino-Based Electronic Cash Loading with Monitoring System for Bulaon Resettlement E-Trike (ETODA) Incorporated Terminal • Water Pump with Automatic Water Level Controller Circuit for the Residence of Barangay Diaz Porac, Pampanga • Development of 150 Watts, 12V Hydraulic Wheel Dc Generator for a Farm at Brgy. Ligaya, Pulungmasle, Guagua, Pampanga • A Portable Waste-Energy Recovery System Using Plasma Technology
Efficient Management through Technological Innovation	CHED – NHERA 2 (#5) DOST – HNRDA (#1) NEDA – PDP (#1)	<ul style="list-style-type: none"> • Design and Analysis of Photovoltaic Panel Based Roofing for a TwoStorey Residential Building • Design and Development of Rotary Type Single-Phase to Three-Phase Converter for Electrical Engineering Laboratory • Participatory Ergonomics Approach as a Tool for Workstation Evaluation Towards Productive Manufacturing
Improvement of Electrical Monitoring and Forecasting through Modelling and Simulation	CHED – NHERA 2 (#2) DOST – HNRDA (#2, 3)	<ul style="list-style-type: none"> • Transformer Loading Management for Residential Transformers of a Barangay in Arayat, Pampanga • Prototyping of a Low-Cost AntiDrunk and Anti-Drowsy Driving Sensor Alert System • Energy Assessment for College Building of DHVTSU, Bacolor, Pampanga
Adaptive Waste to Energy Systems for Local Environment through Technology Development and application for Disaster Risk Managemen	CHED – NHERA 2 (#4) DOST – HNRDA (#3, 4) NEDA – PDP (#3, 4)	<ul style="list-style-type: none"> • Design Mechanism of 80 rpm Speed Bump Energy Harvesting Device • Waste Characterization and Composition Analysis at the University Campus for Sustainable Solid Waste Management System • An Investigation on Effects of Parameter Optimization in Recycled Plastics Utilization as Roofing Material • Foldable Evacuation Homes: An Efficient Response to Disaster • Water Pump with Automatic Water Level Controller Circuit for the Residence of Barangay Diaz Porac, Pampanga • Design and Development of Disaster-Use Converted Ketch (DUCK) • A Portable Waste-Energy Recovery System Using Plasma Technology • BEAMS

Table 5 (Continue). The published research output of DHVSU and BSEE department under the new research agenda (2022-2027).

Suggested Priority Areas	Specific Partner Agencies/Government Agenda Parallel to the Suggested Priority Areas	DHVSU and BSEE Department's Specific Published Research Output
Enhancing the Quality, Capability, and Productivity of Engineering Education in Higher Education Institutions	CHED – NHERA 2 (#1, 3 5) DOST – HNRDA (#3) NEDA – PDP (#5)	<ul style="list-style-type: none"> Transformer Loading Management for Residential Transformers of a Barangay in Arayat, Pampanga Assessment and Forecasting of Electric Load Demand of Don Honorio Ventura Technological State University Design and Development of Rotary Type Single-Phase to Three-Phase Converter for Electrical Engineering Laboratory

Some of the paralleled research outputs include;

- (i) Design mechanism of 80 rpm speed bump energy harvesting device for cost-effective, efficient, sustainable energy supply/source for micro, small, medium, and Large Enterprises,
- (ii) Design and analysis of photovoltaic panel-based roofing for a two-storey residential building under efficient management through technological innovation,
- (iii) Transformer loading management for residential transformers of a Barangay in Arayat, Pampanga below improvement of electrical monitoring and forecasting through modeling and simulation,
- (iv) Waste characterization and composition analysis at the university campus for sustainable solid waste management system underneath adaptive waste to energy systems for the local environment through technology development and application for disaster risk management, and
- (v) Design and development of rotary type single-phase to three-phase converter for Electrical Engineering Laboratory beneath enhancing the quality, capability, and productivity of engineering education in higher education institutions. This shows that the research initiative made by the state university BSEE department has relevance to the country's research priorities which is important for a developed research agenda for sustainable research priorities.

4. CONCLUSION

The study comprehensively discussed and analyzed the country's research priorities and their relevance to a particular department at a Philippine higher education institution department. It provided a concrete illustration of how the stakeholders' position will result in a positive shift in the BSEE department's research culture. The findings revealed a specific and fundamental concern regarding aligning the department's research initiatives with the national research agenda concerning its vision and mission as a higher education institution. The NHERA, HNRDA, and PDP themes that should be emphasized in the department's research agenda and initiatives were geared toward achieving the department's learning outcomes regarding developing a skilled and competent workforce for the nation's electrical engineering industry. This study also serves as a wake-up call to all other departments and HEIs beyond the Philippines regarding the significance of incorporating the perspectives of the major stakeholders when it comes to the pursuit of knowledge and the enhancement of research productivity. No matter how difficult the task of creating knowledge may be, as long

as it is accomplished properly, there is a strong guarantee that any research endeavor will never fail to achieve its ultimate goal of bringing about positive change in society.

Creating a culture of research within an institution is not a simple task. Research flourishes in an atmosphere characterized by the free flow of information, the open and analytical exchange of ideas, and administrative structures that provide support. Here are some suggestions that proponents may make:

- Any initiative must be nurtured and guided by a focused research agenda, policies, and guidelines that provide incentives, services, and facilities, resulting in a progressive research culture and publications.
- Separate respondents who know the country's research priorities, in this manner a more detailed comparison between the discrepancies of the perceived relevance by the respondents can be achieved.
- The proposed study is highly recommended for the review and approval of the DHVSU AND BSEE Department Administrative Staff and shall be endorsed to the partner agencies: CHED, DOST, and NEDA for its validation and immediate implementation.
- Cost-effective, efficient, sustainable energy supply/source for Micro, Small, Medium, and Large Enterprises
- Efficient management through technological innovation
- Improvement of electrical monitoring and forecasting through modeling and simulation
- Adaptive waste to energy systems for the local environment through technology development and application for disaster risk management.
- Enhancing the Quality, Capability, and Productivity of Engineering Education in Higher Education Institutions

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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