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Research-to-Industry Innovation Framework

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ABSTRACT: The study examined faculty productivity, research and innovation outputs, academe–industry collaboration, challenges, and priority areas for technology enhancement and commercialization among faculty members involved in or preparing for reclassification under Joint Circular No. 3 (JC 3). A descriptive research design was employed with 60 faculty respondents from Cebu Technological University (CTU), Sultan Kudarat State University (SKSU), and Jose Rizal Memorial State University (JRMSU). Data were collected through a structured questionnaire addressing professional profiles, faculty productivity, research and innovation outputs, academe–industry collaboration, challenges in translating research into industry applications, and priority areas for technology enhancement and commercialization. The data were analyzed using frequency, percentage, weighted mean, standard deviation, and one-way analysis of variance (ANOVA). The findings showed that respondents generally had low professional profile ratings and low faculty productivity levels for reclassification, although instruction received the highest productivity rating. Research and innovation outputs were also rated low. Research presentations were comparatively stronger, while patents, utility models, technology transfer, and commercialization remained limited. Academe–industry collaboration was likewise low, particularly in technology transfer and commercialization partnerships. Serious challenges included limited research funding, inadequate prototype development facilities, insufficient industry partnerships, limited commercialization knowledge, and restricted access to investors and commercialization funds. Meanwhile, research and technology development funding, prototype development, industry partnerships, intellectual property support, technology transfer, industry validation, and commercialization assistance were rated as very highly prioritized areas. The ANOVA results indicated significant differences among the assessed areas. The study concludes that stronger institutional mechanisms are needed to connect faculty development and reclassification with research productivity, innovation, intellectual property protection, prototype development, industry validation, technology transfer, and commercialization. Such mechanisms can strengthen academe–industry linkages and improve the translation of faculty research into practical and market-oriented technologies.

INTRODUCTION

Faculty members in Philippine State Universities and Colleges (SUCs), particularly those in the Cebu Technological University (CTU) System and other SUCs, are expected to demonstrate productivity not only in instruction but also in research, extension, innovation, and professional development (Commission on Higher Education [CHED], 2023). Faculty reclassification under the DBM–CHED Joint Circular No. 3, Series of 2022, considers documented qualifications, accomplishments, and professional outputs in evaluating faculty advancement (Department of Budget and Management [DBM] & CHED, 2022). The evaluation framework therefore places importance on faculty accomplishments that extend beyond classroom teaching and include research, publications, intellectual property, innovation, and other scholarly and professional activities (DBM & CHED, 2022).

The development of research outputs into technologies and practical applications is also recognized as an important component of strengthening university research and innovation systems (Bazan, 2019).

Research productivity, however, does not automatically lead to technology transfer or commercialization because the transition from research findings to marketable products and services involves additional processes, resources, industry engagement, and institutional support (Bazan, 2019; Ravi & Janodia, 2022). University–industry collaboration can facilitate knowledge exchange, innovation, and the practical utilization of academic research, but differences in objectives, capabilities, and expectations may create barriers to effective collaboration (Alexander et al., 2020; O'Dwyer et al., 2023). Research commercialization therefore involves more than producing scholarly publications because research findings must be translated into technologies, products, services, or other applications that can generate economic and societal value (Bazan, 2019; Ravi & Janodia, 2022).

The study, "Research-to-industry innovation framework," examines the alignment of academic knowledge, research outputs, technological innovations, and student-developed competencies with industry needs and commercialization opportunities. Such alignment is important because university–industry collaboration can provide mechanisms for connecting academic research with industry needs, innovation activities, and technology development (Atta-Owusu et al., 2021; Isaeva et al., 2022). University–industry partnerships can also facilitate the development and commercialization of new knowledge when universities, industry, and government work together through coordinated innovation activities (Ranga & Etzkowitz, 2019).

The study seeks to develop an innovation framework that enables research to progress from knowledge development and technology creation to research dissemination, scholarly publication, intellectual property protection, technology enhancement, industry validation, technology transfer, and commercialization. A systematic pathway from university research to commercial outcomes is important because significant challenges may arise between the discovery of an innovation and its transformation into a commercially viable product or service (Bazan, 2019). Technology transfer and commercialization may also require appropriate intellectual property mechanisms, technical capabilities, industry partnerships, funding, and institutional support (Ravi & Janodia, 2022).

The framework further aims to strengthen the research and innovation ecosystems of the CTU System and other Philippine SUCs by establishing stronger linkages among faculty researchers, technology students, communities, industries, and micro, small, and medium enterprises (MSMEs). Collaboration among universities, industry, and other stakeholders can facilitate knowledge exchange, innovation development, and the practical application of research outputs (Isaeva et al., 2022; O'Dwyer et al., 2023). Student participation in university–industry innovation activities can likewise contribute to venture development and the creation of pathways through which academic knowledge may be transformed into entrepreneurial and commercial applications (2021).

Such collaboration is particularly relevant to MSMEs and industries because university–industry partnerships can provide access to research knowledge, technical expertise, innovation capabilities, and collaborative resources that may support organizational development and competitiveness (Atta-Owusu et al., 2021; O'Dwyer et al., 2023). Effective collaboration can also strengthen the movement of knowledge and technology from academic institutions toward practical applications and industry use (Alexander et al., 2020; Ravi & Janodia, 2022).

However, despite increasing attention to research commercialization and university–industry collaboration, research publication, patenting, technology transfer, industry collaboration, and commercialization are frequently examined as related but distinct activities (Ravi & Janodia, 2022; O'Dwyer et al., 2023). The literature indicates that successful university–industry collaboration requires mechanisms that address coordination, trust, institutional support, funding, and the differing objectives of academic and industry partners (Alexander et al., 2020; Isaeva et al., 2022). Establishing an integrated framework that connects faculty expertise, classroom learning, student innovation, community engagement, research dissemination, intellectual property protection, technology enhancement, industry validation, technology transfer, and commercialization may therefore provide a more systematic approach to research utilization (Bazan, 2019; Ravi & Janodia, 2022).

This research is important because it may provide a systematic pathway for translating academic research into measurable industry impact. The development of such a pathway is consistent with the growing emphasis on university–industry collaboration as a mechanism for generating economic, technological, and social benefits (Secundo et al., 2021). It may also support universities in addressing barriers related to funding, facilities, intellectual property, industry partnerships, technology validation, and commercialization capability (O'Dwyer et al., 2023; Ravi & Janodia, 2022).

Ultimately, the proposed framework envisions a sustainable research-to-industry process in which knowledge is developed and taught, research is conducted, innovations are protected, technologies are enhanced, industry partners participate in validation and adoption, and research outputs are transformed into practical applications with economic and societal value (Bazan, 2019; Ravi & Janodia, 2022). Such an integrated approach may strengthen faculty readiness for reclassification while simultaneously enhancing the capacity of SUCs to generate, transfer, and commercialize research-based innovations (DBM & CHED, 2022; CHED, 2023).

REVIEW OF RELATED LITERATURE

Faculty members in Philippine State Universities and Colleges (SUCs) are increasingly expected to demonstrate productivity not only in instruction but also in research, innovation, extension, professional development, and other scholarly activities (International Labour Organization, 2020; UNESCO, 2021). Faculty research productivity increasingly includes research dissemination, scholarly publication, intellectual property protection, technology development, and other forms of innovation output (OECD, 2018; World Intellectual Property Organization [WIPO], 2020). Research institutions are also encouraged to transform research findings into innovations, technologies, products, and services that can provide economic and societal value (European Commission, 2020; WIPO, 2024). However, the transition from research production to intellectual property protection, technology transfer, and commercialisation remains a continuing challenge for higher education institutions (Sjöö & Hellström, 2019; Rybnicek & Königsgruber, 2019). The challenge involves not only producing research but also converting research outputs into practical technologies, products, services, and applications that can generate sustainable economic and societal benefits (OECD, 2018; WIPO, 2024).

The study, "Research-to-Industry Innovation Framework", examines the alignment of academic knowledge, research outputs, technological innovations, and student competencies with industry needs and commercialisation opportunities (Etzkowitz & Leydesdorff, 2000; European Commission, 2020). Innovation systems become more effective when universities, industries, and other stakeholders establish mechanisms for knowledge exchange, research collaboration, technology development, and practical application (Etzkowitz & Leydesdorff, 2000; Sjöö & Hellström, 2019). Research commercialisation requires a systematic process that may involve research dissemination, scholarly publication, intellectual property protection, technology enhancement, industry validation, technology transfer, and market application (WIPO, 2020, 2024; OECD, 2018). Stronger university–industry linkages can facilitate the movement of knowledge and research outputs from academic institutions toward industry applications and commercialisation (Rybnicek & Königsgruber, 2019; Sjöö & Hellström, 2019). Such collaboration may also support industries and micro, small, and medium enterprises (MSMEs) in improving their products, processes, productivity, competitiveness, and market performance (European Commission, 2020; OECD, 2018).

Despite these developments, research publication, patenting, technology transfer, university–industry collaboration, and commercialisation are often addressed as related but distinct activities within innovation systems (Rybnicek & Königsgruber, 2019; WIPO, 2020). A more integrated approach is needed to connect faculty expertise, classroom learning, student innovation, community engagement, research dissemination, intellectual property protection, technology enhancement, industry adoption, and commercialisation (Etzkowitz & Leydesdorff, 2000; Sjöö & Hellström, 2019). An integrated research-to-industry pathway can strengthen the utilisation of research findings by connecting knowledge creation with technology development, validation, transfer, and market application (OECD, 2018; WIPO, 2024). This approach may provide a systematic mechanism for translating academic research into measurable industry and societal impact (European Commission, 2020; WIPO, 2020). A sustainable innovation system therefore requires continuous interaction among knowledge producers, technology developers, industry users, and other stakeholders to ensure that research outputs create practical and long-term economic and societal value (Etzkowitz & Leydesdorff, 2000; Rybnicek & Königsgruber, 2019).

DEFINITION OF TERMS

Academe–Industry Collaboration. Academe–industry collaboration refers to cooperation between higher education institutions and industry organizations through joint research, industry projects, technology testing, training, technology transfer, and commercialization activities (Rybnicek & Königsgruber, 2019; Sjöö & Hellström, 2019).

Commercialization. Research commercialization is the process of converting research findings, innovations, and developed technologies into products, services, or applications that can be adopted by industry, utilized in the market, or generate economic and societal value (European Commission, 2020; World Intellectual Property Organization [WIPO], 2024).

Faculty Productivity. Faculty productivity refers to the outputs produced by faculty members through instruction, research, extension, innovation, professional development, scholarly publication, intellectual property, and technology-related activities (International Labour Organization, 2020; UNESCO, 2021).

Faculty Reclassification. Faculty reclassification refers to the formal evaluation and advancement of a faculty member to a higher academic rank or position based on established qualifications, accomplishments, productivity, and professional achievements (UNESCO, 2021).

Industry Validation. It refers to the process through which industry partners assess and test research outputs, prototypes, or technologies to determine their feasibility, functionality, usability, market relevance, and potential for adoption (Rybnicek & Königsgruber, 2019; Sjöö & Hellström, 2019).

Innovation. Refers to the creation, improvement, or application of products, services, processes, technologies, or practices that provide new or improved value to users, institutions, industries, or communities (OECD, 2018; European Commission, 2020).

Intellectual Property (IP). It refers to original creations of the mind, including inventions, artistic and literary works, designs, symbols, names, and other intellectual outputs that may qualify for legal protection (WIPO, 2024).

Intellectual Property Protection. It refers to legal and institutional measures used to safeguard inventions, technologies, creative works, designs, and other intellectual outputs through patents, utility models, copyrights, trademarks, and other applicable forms of protection (WIPO, 2020, 2024).

JC 3 Reclassification. Joint Circular 3 reclassification refers to the faculty advancement process examined in this study, in which faculty members are evaluated according to specified academic, professional, research, innovation, and productivity qualifications (UNESCO, 2021).

Research and Innovation Outputs. It refer to documented and tangible results produced through faculty research and innovation activities, including research presentations, scholarly publications, intellectual property registrations, patents, utility models, prototypes, developed technologies, and technology transfer activities (OECD, 2018; WIPO, 2020).

Research Presentation. It refers to the formal sharing and dissemination of research findings through conferences, forums, colloquia, symposia, and other academic or professional platforms (International Labor Organization, 2020; UNESCO, 2021).

Scholarly Publication. It refers to the dissemination of research findings through peer-reviewed journals, academic books, conference proceedings, and other recognized academic publications (OECD, 2018; WIPO, 2020).

Technology Development. It refers to the systematic design, creation, improvement, testing, and refinement of technologies or prototypes based on research findings and identified user or industry needs (OECD, 2018; European Commission, 2020).

Technology Transfer. It refers to the movement of knowledge, research outputs, inventions, or technologies from academic researchers or institutions to industry, government agencies, communities, or other intended users for practical application and use (Rybnicek & Königsgruber, 2019; Sjöö & Hellström, 2019).

Technology Validation. It refers to the systematic assessment of a technology or prototype to determine whether it meets technical, functional, user, industry, and market requirements (OECD, 2018; European Commission, 2020).

Technology Enhancement. It refers to improving, upgrading, modifying, or refining an existing technology or prototype to increase its functionality, reliability, efficiency, usability, performance, or market potential (OECD, 2018; European Commission, 2020).

OBJECTIVES

1. Determine the demographic profile of the faculty respondents in terms of age and gender, academic rank, highest educational attainment, length of service, and employment status;
2. Assess the professional profile of the faculty in terms of teaching experience, professional licenses and certifications, trainings and seminars attended, memberships in professional organizations, and awards and recognitions;

3. Determine the level of faculty productivity for reclassification in terms of instruction, research, extension and community involvement, innovation and technology development, and professional development;

4. Assess the faculty's research and innovation outputs in terms of research presentations, scholarly publications, intellectual property registration, patents and utility models, prototypes and developed technologies, and technology transfer and commercialization;

5. Determine the extent of academe–industry collaboration in terms of joint research and development, industry-based projects, technology validation, industry training and extension, technology transfer, and commercialization partnerships;

6. Identify the challenges encountered by faculty members in transforming research outputs into industry applications and commercialization;

7. Determine the priority areas for technology enhancement and commercialization based on faculty, industry, and institutional needs; and

8. Develop an Academe–Industry Innovation Framework for Technology Commercialization and Enhancement that may support faculty reclassification, research utilization, technology transfer, industry collaboration, and commercialization in the CTU System and other SUCs.

MATERIALS AND METHODS

Design

The study employed a descriptive-developmental research design using a quantitative approach. The descriptive component was used to describe the characteristics, conditions, and experiences of the respondents and to examine existing practices and outcomes within the study setting (Creswell & Creswell, 2018). The quantitative approach involved the systematic collection and analysis of numerical data to measure faculty productivity, research and innovation outputs, academe–industry collaboration, commercialization activities, and related challenges (Creswell & Creswell, 2018). The developmental component focused on using the findings of the study to formulate a practical framework or model that could address identified needs and improve existing practices (Gall et al., 2016). In this study, the developmental process was used to develop the proposed Academe–Industry Innovation Framework for Technology Commercialization and Enhancement based on the empirical findings of the research (Gall et al., 2016). The framework is intended to provide an institutional basis for strengthening faculty productivity, research utilization, technology transfer, industry collaboration, and commercialization (OECD/Eurostat, 2018). The integration of descriptive and developmental approaches is appropriate because the study not only describes the current conditions of faculty research and innovation activities but also uses the results to develop an intervention-oriented framework for improving research-to-industry outcomes (Creswell & Creswell, 2018; Gall et al., 2016).

Environment

The study was conducted at the Cebu Technological University (CTU) System and selected State Universities and Colleges (SUCs) in the Philippines, considering the important role of higher education institutions in research, innovation, knowledge development, and collaboration with external organizations (OECD & Eurostat, 2018). Selected campuses or institutions were included based on their active academic, research, innovation, extension, and industry partnership activities, consistent with the view that innovation is strengthened through collaboration and knowledge exchange among higher education institutions, businesses, government, and other organizations (OECD & Eurostat, 2018). The study considered faculty members involved in instruction, research, extension, technology development, intellectual property generation, and related professional activities because these activities contribute to the generation, development, transfer, and application of knowledge and innovation (OECD & Eurostat, 2018). The research environment was therefore considered appropriate for examining faculty productivity, research and innovation outputs, academe–industry collaboration, technology development, technology transfer, and commercialization because innovation involves the interaction of knowledge, research activities, intellectual property, collaboration, and technology application (OECD & Eurostat, 2018).

Respondents

The participants of the study consisted of 60 faculty members who were involved in or preparing for Joint Circular No. 3 (JC 3) faculty reclassification from selected higher education institutions. The selection of these participants was appropriate because descriptive research is intended to document and analyze characteristics and conditions within a defined population, particularly when respondents possess direct knowledge of the phenomenon being investigated (Kosie & Lew-Williams, 2024). The respondents included 40 faculty members from Cebu Technological University (CTU), 10 from Sultan Kudarat State University (SKSU), and 10 from Jose Rizal Memorial State University (JRMSU), thereby providing perspectives from different state university contexts and faculty members engaged in academic, research, innovation, and professional activities. This approach is consistent with descriptive-developmental studies in Philippine higher education, wherein participants are selected based on their direct connection to the educational setting and to the development or assessment of the intended output (Madrazo & Dio, 2020). The faculty members were selected based on their involvement in instruction, research, extension, innovation, professional development, and other activities relevant to faculty reclassification, consistent with the descriptive purpose of examining characteristics, practices, and conditions within a specific population (Kosie & Lew-Williams, 2024). Their direct involvement in research and innovation activities was particularly relevant because the proposed framework sought to address actual institutional conditions and developmental needs related to research utilization, technology development, technology transfer, and commercialization. The total sample of 60 faculty respondents served as the primary source of quantitative data concerning their demographic and professional profiles, faculty productivity, research and innovation outputs, academe–industry engagement, technology commercialization activities, and challenges encountered in meeting reclassification requirements. The use of quantitative data from identified respondents enabled the researchers to describe existing conditions and generate empirical inputs for developing the proposed Academe–Industry Innovation Framework for Technology Commercialization and Enhancement, consistent with the descriptive-developmental research approach that combines assessment of existing conditions with the development of an intervention, model, material, or framework based on empirical findings (Jalmasco et al., 2025). The respondents were therefore considered appropriate sources of information because their professional responsibilities and experiences were directly aligned with the major variables examined in the study, particularly faculty productivity, research and innovation outputs, academe–industry collaboration, technology transfer, and commercialization.

Instrument

A researcher-developed questionnaire was used as the primary data-gathering instrument, consistent with the recommendation of Taherdoost (2021) that a structured questionnaire is appropriate for systematically collecting quantitative data on defined research variables. The instrument contained sections covering (1) demographic profile, (2) professional profile, (3) faculty productivity for reclassification, (4) research and innovation outputs, (5) academe–industry collaboration, (6) technology commercialization activities, and (7) challenges and priority needs, following the principle of organizing questionnaire items according to the specific constructs and objectives of the study (Taherdoost, 2021). A five-point Likert scale was used to measure the extent or level of the identified indicators because Joshi et al. (2015) explained that Likert-type scales are commonly used to measure respondents' perceptions, attitudes, and levels of agreement with structured statements. Selected open-ended questions were also included to obtain recommendations from respondents because Braun and Clarke (2021) emphasized that qualitative responses can provide contextual information and more profound insights that complement structured quantitative findings.

Validation and Reliability of the Instrument

The questionnaire was submitted to experts in research, technology management, innovation, higher education, and academe–industry collaboration for content validation because Boateng et al. (2018) emphasized the importance of expert evaluation in establishing the content validity of researcher-developed instruments. The experts' comments and recommendations were incorporated into the questionnaire before its final administration to improve the clarity, relevance, and appropriateness of the instrument items, consistent with the instrument-development procedures described by Boateng et al. (2018). A pilot test was conducted among respondents who were not included in the actual study because Taherdoost (2021) recommended pilot testing as an important procedure for identifying ambiguous items, assessing the suitability of questionnaire administration, and improving the reliability and usability of a research instrument. The pilot-testing process also provided an opportunity to determine whether the questionnaire items were understandable and aligned with the intended constructs before the final data collection, as recommended by Boateng et al. (2018).

Data-Gathering Procedure

Prior to data collection, the researchers secured the necessary permissions from the concerned university administrators and participating institutions because Creswell and Creswell (2018) emphasized the importance of obtaining appropriate institutional access before conducting research involving human participants. The researchers explained the purpose of the study, confidentiality measures, voluntary participation, and informed consent to the respondents before administering the questionnaire, consistent with the ethical principles for research involving human participants discussed by Resnik (2020). The validated questionnaire was distributed through appropriate face-to-face or online methods to facilitate systematic data collection while accommodating the circumstances of the participating faculty members, consistent with the flexible data-collection approaches discussed by Creswell and Creswell (2018). Documentary information related to research publications, intellectual property, technology development, industry collaboration, and commercialization was also reviewed when permitted because Bowen (2009) identified document analysis as a useful complementary method for corroborating and contextualizing information obtained through other data sources. Completed questionnaires were checked, coded, tabulated, and prepared for statistical analysis to ensure that the quantitative data were systematically organized and ready for appropriate statistical treatment, consistent with the data-management procedures described by Creswell and Creswell (2018).

Data Analysis

Frequency and percentage were used to describe the demographic and professional profiles of the faculty respondents, consistent with the use of descriptive statistics to summarize the characteristics of a study population (Creswell & Creswell, 2018). Weighted mean and standard deviation were used to determine the levels of faculty productivity, research and innovation activities, academe–industry collaboration, technology enhancement, and commercialization because descriptive measures such as means and measures of dispersion are appropriate for summarizing quantitative responses (Pallant, 2020). Analysis of variance (ANOVA) was employed to determine whether statistically significant differences existed among selected groups of faculty respondents because ANOVA is appropriate for comparing mean scores across multiple groups (Pallant, 2020). Qualitative responses were organized and analyzed thematically to identify recurring challenges, needs, and recommendations because thematic analysis provides a systematic approach for identifying and interpreting patterns within qualitative data (Braun & Clarke, 2021). The integration of quantitative descriptive and inferential results with thematic findings provided a more comprehensive basis for interpreting the conditions affecting faculty productivity, research and innovation, academe–industry collaboration, and technology commercialization (Creswell & Creswell, 2018).

Ethical Considerations

The study observed appropriate research ethics throughout the research process because ethical research requires respect for participants, informed decision-making, privacy, confidentiality, and responsible management of research data (Resnik, 2020). Participation was voluntary, and respondents were informed of their right to decline participation or withdraw from the study because voluntary participation and respect for participant autonomy are fundamental principles in research involving human participants (Resnik, 2020). Personal information and responses were treated confidentially and used solely for research purposes because protecting participants' privacy and maintaining confidentiality are essential responsibilities of researchers (Resnik, 2020). Data were securely stored, and findings were reported in aggregate form to minimize the possibility of identifying individual respondents and to protect their privacy (Creswell & Creswell, 2018). The study also complied with applicable institutional research ethics policies and data privacy requirements because responsible research practice requires researchers to follow institutional and legal requirements governing the collection, storage, use, and reporting of participant information (Resnik, 2020).

Result and Discussions

The findings revealed that the study was predominantly represented by faculty members from Cebu Technological University (66.67%), while Sultan Kudarat State University and Jose Rizal Memorial State University each contributed 16.67% of the respondents, and descriptive statistics are appropriate for presenting the distribution and characteristics of participants in quantitative research (Pallant, 2020). The respondents were generally experienced, academically qualified, and permanently employed, with most respondents aged 35–54, holding associate professor positions, and possessing doctorate degrees, and participant characteristics provide important context for interpreting quantitative research findings (Creswell & Creswell, 2018). Despite these qualifications, the overall professional profile was low (M = 2.29, SD = 0.97), indicating the need for stronger professional development, mentoring, certification, and recognition opportunities, while continuous professional development is important for strengthening faculty competencies and career advancement in higher education (OECD, 2019).

Faculty productivity for reclassification was rated low overall (M = 2.53, SD = 1.00), suggesting that faculty accomplishments across the assessed productivity areas had not yet reached a consistently strong level, while systematic assessment of academic performance can help institutions identify professional-development needs and areas for improvement (OECD, 2019). Instruction obtained the highest productivity rating and was interpreted as moderate, whereas research, extension, professional development, and particularly innovation and technology development remained low, demonstrating an uneven distribution of faculty outputs across academic responsibilities (UNESCO, 2021). Research and innovation outputs were likewise rated low overall (M = 2.08, SD = 0.92), indicating that faculty members encountered difficulties in converting research activities into documented and potentially usable innovation outputs, while effective research systems require institutional support that facilitates the movement of knowledge toward application and societal impact (UNESCO, 2021). Faculty members demonstrated greater strength in research presentations but had limited accomplishments in intellectual property, patents, utility models, technology transfer, and commercialization, reflecting the broader challenge of translating academic research into innovation and market-oriented applications (OECD, 2019). Academe–industry collaboration was also rated low (M = 2.03, SD = 0.92), with engagement concentrated more on training and extension than on joint research, technology validation, technology transfer, and commercialization partnerships, while stronger university–industry relationships are important for connecting academic knowledge and research capabilities with innovation needs in industry (OECD, 2019).

The respondents experienced serious challenges in transforming research outputs into industry applications and commercialization (M = 4.16, SD = 0.82), indicating that institutional and resource-related barriers substantially affected the movement of research from academic production toward practical utilization, while innovation systems depend on adequate organizational, financial, and collaborative support (OECD, 2019). The major barriers included limited research and commercialization funding, inadequate prototype-development facilities and equipment, and insufficient industry partnerships, which are consistent with recognized barriers to innovation involving access to finance, infrastructure, knowledge, and external collaboration (OECD, 2019). In contrast, technology enhancement and commercialization were rated as very highly prioritized overall (M = 4.61, SD = 0.59), indicating strong faculty recognition of the need to strengthen institutional mechanisms that support the development and utilization of research-based technologies (UNESCO, 2021). Research and technology development funding, prototype development and technology upgrading, and industry market access and investment linkages received the highest priority, suggesting that faculty members considered financial resources, technical infrastructure, and external market and investment connections essential for transforming research outputs into sustainable innovations (OECD, 2019).

Thematic Statement

The findings revealed that faculty members need to move beyond a publication-oriented research culture toward an integrated research-to-industry innovation system supported by adequate funding, infrastructure, intellectual property assistance, technical expertise, industry partnerships, commercialization mechanisms, and institutional incentives, consistent with the emphasis of Perkmann et al. (2021) on strengthening university–industry engagement to improve the societal and economic utilization of academic research. The quantitative results supported this need, as research and innovation outputs (M = 2.08) and academe–industry collaboration (M = 2.03) were low, while commercialization challenges were rated serious (M = 4.16), reflecting the continuing barriers to translating academic research into practical and market-oriented innovations identified by Mascarenhas et al. (2018). In contrast, technology enhancement and commercialization were rated as very highly prioritized (M = 4.61), demonstrating the importance of institutional mechanisms that can facilitate the movement of research outputs toward innovation and industry application, as emphasized by Secundo et al. (2017).

The ANOVA results indicated that faculty profile characteristics significantly influenced selected areas of faculty productivity, research and innovation outputs, academe–industry collaboration, commercialization challenges, and technology enhancement priorities, supporting the view of Marini et al. (2020) that faculty characteristics and institutional environments can influence research productivity and engagement. Differences according to academic rank and length of service suggested the importance of professional experience and career position in reclassification-related accomplishments, consistent with the findings of McCarty et al. (2022) that academic career stage and professional circumstances may affect faculty research engagement and productivity. Significant differences in research and innovation outputs across age, academic rank, educational attainment, and length of service further indicated the need for faculty development and research support that consider varying professional backgrounds and career stages, as recommended by Bozeman and Youtie (2017) in their discussion of the factors influencing academic knowledge production and utilization.

Significant differences in academe–industry collaboration according to academic rank, educational attainment, and length of service also suggested that faculty qualifications and professional experience influence their capacity to establish and sustain industry partnerships, consistent with Perkmann et al. (2021), who emphasized the role of researchers' capabilities and institutional conditions in university–industry relationships. Differences in commercialization challenges according to academic rank, educational attainment, and length of service further indicated that faculty members experience barriers differently and therefore require targeted technical assistance, mentoring, funding, intellectual property support, and entrepreneurship training, as Secundo et al. (2017) emphasized the need for appropriate organizational capabilities and support mechanisms in university technology transfer and commercialization.

Finally, significant differences in technology enhancement and commercialization priorities according to academic rank indicated that faculty members at different academic levels may have varying institutional and professional needs, consistent with McCarty et al. (2022), who highlighted the importance of career-stage considerations in developing faculty support systems. However, the absence of significant differences according to age, educational attainment, and length of service suggested that several priorities were commonly recognized across faculty groups, supporting the argument of Perkmann et al. (2021) that institutional structures and shared objectives can facilitate broader university–industry engagement regardless of individual faculty characteristics. Overall, the findings supported the adoption of a differentiated yet integrated faculty development strategy that addresses differences in academic rank and professional experience while providing institution-wide support for research, innovation, intellectual property, industry collaboration, technology transfer, and commercialization, consistent with the integrated innovation ecosystem perspective proposed by Secundo et al. (2017). Such interventions could strengthen faculty readiness for JC 3 reclassification and enhance the institution's capacity to transform research outputs into industry-oriented and socially valuable innovations, as Mascarenhas et al. (2018) emphasized that effective university–industry knowledge transfer requires mechanisms that connect academic capabilities with practical applications and stakeholder needs.

Figures

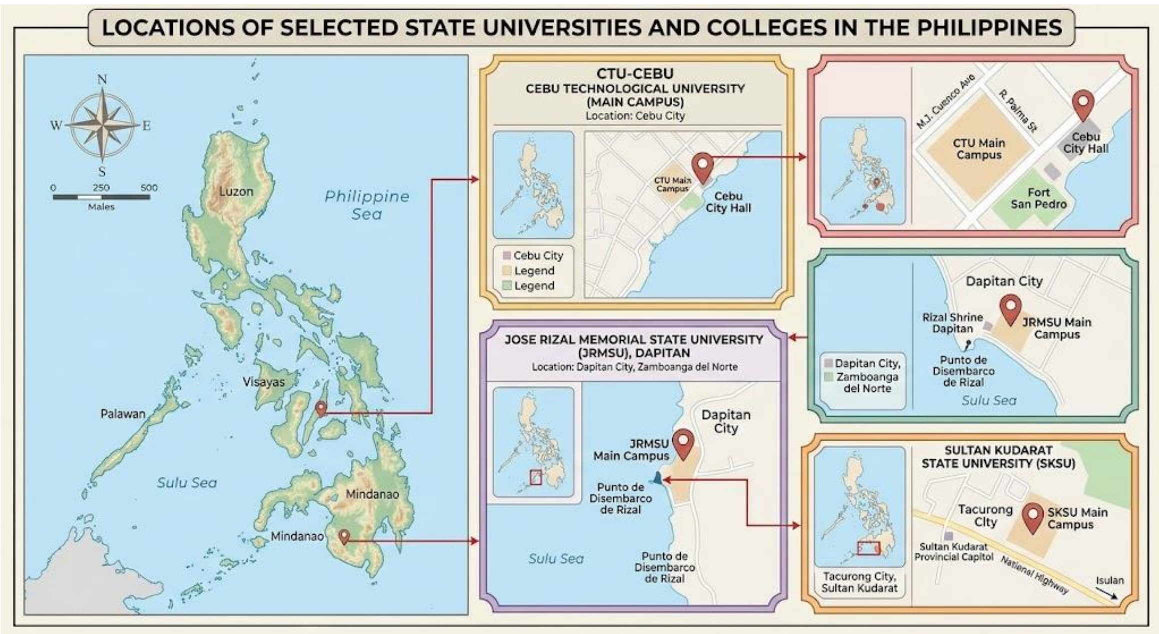

Figure 1. Location Map of the Research Environment

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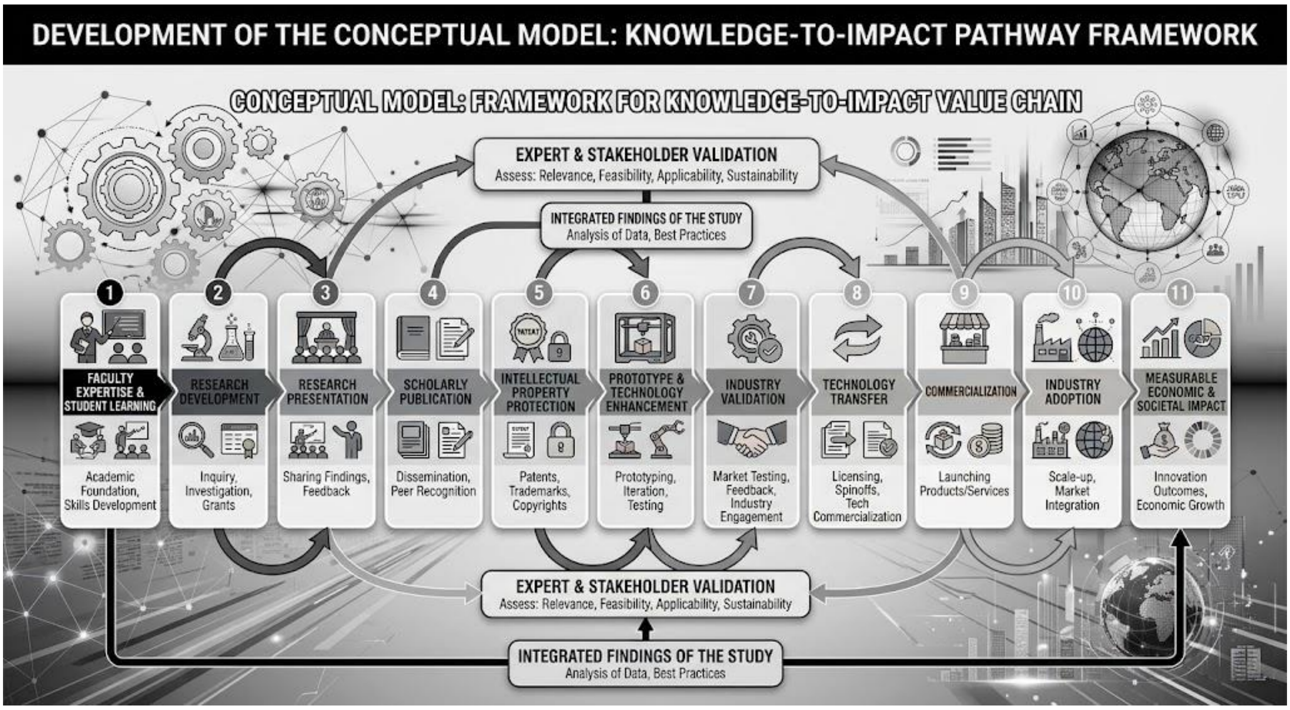

Figure 2. Conceptual Model

Table 1. Distribution of Respondents

N=60

Institution	Faculty Respondents	Percentage (%)
Cebu Technological University (CTU)	40	66.67
Sultan Kudarat State University (SKSU)	10	16.67
Jose Rizal Memorial State University (JRMSU)	10	16.67
Total	60	100

Table 2. Demographic Profile of the Faculty Respondents

N = 60

Demographic Variables	Categories	Frequency (f)	Percentage (%)
Age	25–34 years	8	13.33
	35–44 years	22	36.67

Demographic Variables	Categories	Frequency (f)	Percentage (%)
	45–54 years	20	33.33
	55 years and above	10	16.67
Gender	Male	32	53.33
	Female	28	46.67
Academic Rank	Instructor	4	6.67
	Assistant Professor	16	26.67
	Associate Professor	28	46.67
	Professor	12	20.00
Highest Educational Attainment	Bachelor's Degree	2	3.33
	Master's Degree	18	30.00
	Doctorate Degree	36	60.00
	Post-Doctorate/Other	4	6.67
Length of Service	1–5 years	6	10.00
	6–10 years	14	23.33
	11–15 years	16	26.67
	16–20 years	12	20.00
	21 years and above	12	20.00
Employment Status	Permanent	54	90.00
	Temporary	2	3.33
	Contractual	3	5.00
	Other	1	1.67
Total		60	100

Table 3. Professional Profile of the Faculty Respondents

N = 60

Professional Profile Indicators	5	4	3	2	1	Mean	SD	Interpretation
Teaching experience	2	8	18	22	10	2.50	1.03	Low Professional Profile
Professional licenses and certifications	1	7	16	24	12	2.35	0.99	Low Professional Profile
Trainings and seminars attended	1	6	15	25	13	2.28	0.98	Low Professional Profile
Memberships in professional organizations	1	5	14	27	13	2.23	0.95	Low Professional Profile
Awards and recognition	0	4	12	28	16	2.07	0.86	Low Professional Profile
Overall	5	30	75	126	64	2.29	0.97	Low Professional Profile

Table 4. Level of Faculty Productivity for Reclassification

N = 60

Faculty Productivity Indicators	5	4	3	2	1	Mean	SD	Interpretation
Instruction	4	12	24	16	4	2.93	0.96	Moderate Level of Faculty Productivity
Research	2	7	18	24	9	2.48	1.00	Low Level of Faculty Productivity
Extension and community involvement	2	8	17	23	10	2.48	1.02	Low Level of Faculty Productivity
Innovation and technology development	1	5	13	25	16	2.17	0.99	Low Level of Faculty Productivity
Professional development	2	9	19	21	9	2.57	1.01	Low Level of Faculty Productivity
Overall	**11**	**41**	**91**	**109**	**48**	**2.53**	**1.00**	**Low Level of Faculty Productivity**

Table 5. Faculty Research and Innovation Outputs

N = 60

Research and Innovation Output Indicators	**5**	**4**	**3**	**2**	**1**	**Mean**	**SD**	**Interpretation**
Research presentations	3	10	21	19	7	2.72	1.01	Moderately Research and Innovation Outputs
Scholarly publications	2	7	17	23	11	2.45	1.01	Low Research and Innovation Outputs

Research and Innovation Output Indicators	5	4	3	2	1	Mean	SD	Interpretation
Intellectual property registration	0	4	10	25	21	1.95	0.91	Low Research and Innovation Outputs
Patents and utility models	0	2	7	22	29	1.70	0.80	Very Low Research and Innovation Outputs
Prototypes and developed technologies	1	4	11	24	20	2.03	0.95	Low Research and Innovation Outputs
Technology transfer and commercialization	0	2	6	20	32	1.63	0.82	Very Low Research and Innovation Outputs
Overall	**6**	**29**	**72**	**133**	**120**	**2.08**	**0.92**	**Low Research and Innovation Outputs**

Table 6. Extent of Academe–Industry Collaboration

N = 60

Academe–Industry Collaboration Indicators	5	4	3	2	1	Mean	SD	Interpretation
Joint research and development	1	5	12	27	15	2.17	0.96	Low Collaboration
Industry-based projects	1	4	14	26	15	2.17	0.94	Low Collaboration
Technology validation	0	3	10	28	19	1.95	0.83	Low Collaboration
Industry training and extension	2	7	16	24	11	2.42	1.03	Low Collaboration
Technology transfer	0	2	9	25	24	1.82	0.81	Low Collaboration
Commercialization partnerships	0	1	7	22	30	1.65	0.76	Very Low Collaboration
Overall	**4**	**22**	**68**	**152**	**114**	**2.03**	**0.92**	**Low Collaboration**

Table 7. Challenges in Transforming Research Outputs into Industry Applications and Commercialization

N = 60

Challenges Encountered	5	4	3	2	1	Mean	SD	Interpretation
Limited research funding for technology development	30	20	7	3	0	4.28	0.78	Very Serious Transforming Research Outputs
Limited industry partnerships and linkages	27	22	8	3	0	4.22	0.79	Very Serious Transforming Research Outputs

Challenges Encountered	5	4	3	2	1	Mean	SD	Interpretation
Lack of facilities and equipment for prototype development	29	19	9	3	0	4.23	0.82	Very Serious Transforming Research Outputs
Limited knowledge of intellectual property protection	20	24	11	5	0	3.98	0.88	Serious Transforming Research Outputs
Limited technical support for technology enhancement	25	22	9	4	0	4.13	0.84	Serious Transforming Research Outputs
Limited knowledge and experience in commercialization	26	21	9	4	0	4.15	0.84	Serious Transforming Research Outputs
Difficulty in securing patents and intellectual property protection	24	23	9	4	0	4.12	0.83	Serious Transforming Research Outputs
Limited access to investors and commercialization funding	29	21	7	3	0	4.27	0.79	Very Serious Transforming Research Outputs
Limited institutional incentives for commercialization	25	23	8	4	0	4.15	0.83	Serious Transforming Research Outputs
Difficulty in meeting industry standards and market requirements	22	24	10	4	0	4.07	0.82	Serious Transforming Research Outputs
Overall	**257**	**219**	**87**	**37**	**0**	**4.16**	**0.82**	**Serious Transforming Research Outputs**

Table 8. Priority Areas for Technology Enhancement and Commercialization

N = 60

Priority Areas	5	4	3	2	1	Mean	SD	Interpretation
Research and technology development funding	43	14	3	0	0	4.67	0.56	Very High Priority
Research-to-industry partnership programs	41	16	3	0	0	4.63	0.58	Very High Priority
Prototype development and technology upgrading	42	15	3	0	0	4.65	0.57	Very High Priority
Intellectual property and patent support	39	17	4	0	0	4.58	0.61	Very High Priority
Technology transfer and licensing mechanisms	38	18	4	0	0	4.57	0.62	Very High Priority
Industry validation and product testing	40	17	3	0	0	4.62	0.58	Very High Priority
Technology incubation and startup development	36	19	5	0	0	4.52	0.65	Very High Priority
Faculty and student innovation training	39	18	3	0	0	4.60	0.59	Very High Priority

Priority Areas	5	4	3	2	1	Mean	SD	Interpretation
Commercialization and entrepreneurship support	40	16	4	0	0	4.60	0.61	Very High Priority
Industry market access and investment linkage	42	15	3	0	0	4.65	0.57	Very High Priority
Overall	**400**	**165**	**35**	**0**	**0**	**4.61**	**0.59**	**Very High Priority**

Table 9. One-Way ANOVA on Selected Faculty Outcomes When Grouped According to Selected Profile Variables

Faculty Outcomes	Grouping Variable	F-value	p-value	Decision	Interpretation
Faculty Productivity for Reclassification	Age	2.41	0.076	Accept H_0	Not Significant
Faculty Productivity for Reclassification	Academic Rank	3.18	0.031	Reject H_0	Significant
Faculty Productivity for Reclassification	Highest Educational Attainment	2.67	0.056	Accept H_0	Not Significant
Faculty Productivity for Reclassification	Length of Service	3.04	0.023	Reject H_0	Significant
Research and Innovation Outputs	Age	2.89	0.043	Reject H_0	Significant
Research and Innovation Outputs	Academic Rank	3.31	0.027	Reject H_0	Significant
Research and Innovation Outputs	Highest Educational Attainment	2.94	0.040	Reject H_0	Significant
Research and Innovation Outputs	Length of Service	3.22	0.18	Reject H_0	Significant
Academe–Industry Collaboration	Age	2.18	0.99	Accept H_0	Not Significant
Academe–Industry Collaboration	Academic Rank	3.46	0.21	Reject H_0	Significant
Academe–Industry Collaboration	Highest Educational Attainment	2.76	0.50	Reject H_0	Significant
Academe–Industry Collaboration	Length of Service	3.11	0.22	Reject H_0	Significant
Challenges in Research Commercialization	Age	2.35	0.81	Accept H_0	Not Significant
Challenges in Research Commercialization	Academic Rank	2.98	0.38	Reject H_0	Significant
Challenges in Research Commercialization	Highest Educational Attainment	2.94	0.40	Reject H_0	Significant
Challenges in Research Commercialization	Length of Service	2.71	0.035	Reject H_0	Significant

Faculty Outcomes	Grouping Variable	F-value	p-value	Decision	Interpretation
Priority Areas for Technology Enhancement and Commercialization	Age	1.96	0.129	Accept H_0	Not Significant
Priority Areas for Technology Enhancement and Commercialization	Academic Rank	2.87	0.043	Reject H_0	Significant
Priority Areas for Technology Enhancement and Commercialization	Highest Educational Attainment	2.52	0.067	Accept H_0	Not Significant
Priority Areas for Technology Enhancement and Commercialization	**Length of Service**	**2.61**	**0.058**	**Accept H_0**	**Not Significant**

CONCLUSION

The study concluded that the faculty respondents had a low professional profile and low productivity for JC 3 reclassification, with instruction stronger than research, innovation, intellectual property, and commercialization outputs. Academe–industry collaboration was also low, particularly in technology transfer and commercialization. Major challenges included limited funding, inadequate facilities, weak industry linkages, and insufficient commercialization support. Despite these challenges, technology enhancement and commercialization were rated as very highly prioritized. ANOVA results showed significant differences in selected outcomes across some faculty profile groups. Overall, stronger faculty development, research commercialization, industry collaboration, and institutional support are needed to improve JC 3 reclassification readiness.

Recommendations

1. Strengthen the JC 3 faculty development program through mentoring, training, and targeted professional development.
2. Increase research and innovation funding for publications, prototypes, intellectual property, and technology development.
3. Strengthen academe–industry partnerships through joint research, validation, technology transfer, and commercialization activities.
4. Enhance intellectual property and technology transfer support through patenting, licensing, and commercialization assistance.
5. Improve research and prototype facilities by providing appropriate laboratories, equipment, software, and technical support.
6. Establish a research-to-market pathway from research development and publication to IP protection, prototype development, industry validation, technology transfer, and commercialization.
7. Provide commercialization and entrepreneurship training to faculty researchers.
8. Strengthen incentives and recognition for publications, patents, prototypes, technology transfer, and commercially adopted innovations.
9. Provide differentiated mentoring based on faculty profile, academic rank, educational attainment, and length of service.
10. Conduct regular monitoring and evaluation of faculty productivity, research outputs, industry collaboration, and commercialization performance.

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