Technological Competency among Occupational Health Nurses in the Philippines: A Descriptive-Correlational Study of Technology Self-Efficacy and Perceived Barriers

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ABSTRACT

This study determined the technological competency, technology self-efficacy, and perceived barriers to technology utilization among 236 BOSH-trained occupational health nurses (OHNs) across all regions of Luzon, Philippines. Grounded solely in Locsin's Technological Competency as Caring in Nursing (TCCN) Theory, the study employed a quantitative descriptive-correlational, cross-sectional design. Respondents were recruited through referral sampling anchored in OHNAP's professional networks. Data were collected using researcher-constructed instruments informed by the Technological Competency as Caring in Healthcare Providers Instrument (TCCHI; Yamanaka et al., 2025, 2026) and the Digital and Technological Self-Efficacy Scale (Digitech-S; Conte et al., 2023).

Findings revealed that OHNs demonstrated a Very High overall level of technological competency (M = 3.30, SD = 0.32), with Technological Connectedness as the highest domain (M = 3.36) and Technological Knowing as the lowest (M = 3.25). Technology self-efficacy was High overall (M = 3.13, SD = 0.66), with Technology Problem-Solving Self-Efficacy as the lowest domain (M = 2.95). Perceived barriers were Moderate Barrier (M = 2.17, SD = 0.43), with Availability of Occupational Health Technology Training as the most prominent barrier domain (M = 2.07, Rank 1). Industry was the only demographic variable significantly associated with all three central variables and all measurable domains, establishing it as the master differentiating variable of the study. Spearman's rank-order correlation revealed significant weak positive relationships among all three variable pairs ($\rho = .342$ to $.385$, all $p < .001$).

The study concluded that OHN technological competency reflects regulatory-driven connectedness more than caring-oriented knowing, that structural training deficits, rather than individual deficiency, constitute the primary barrier, and that industry context is the most powerful shaper of OHN digital readiness. Based on these findings, the Occupational Health Nursing Digital Competency Framework (OHN-DCF) Version 1.0 was developed as the scholarly output, the first evidence-based digital competency framework specifically designed for occupational health nurses in the Philippines, organized around the TCCN Theory's three domains with three competency levels and four cross-cutting organizational enablers.

Keywords: technological competency, technology self-efficacy, perceived barriers, occupational health nursing, BOSH training, TCCN Theory, Philippines, Luzon, descriptive-correlational, OHN-DCF

INTRODUCTION

Background of the Study

Technology has become an inseparable part of how nurses observe, document, and respond to the people in their care. The World Health Organization formalized this shift through its Global Strategy on Digital Health 2020–2025, which calls on member states to build a digitally capable health workforce and to integrate digital competence into the education and ongoing training of health professionals (World Health Organization

[WHO], 2021). The strategy treats digital readiness not as a specialization reserved for informatics personnel, but as baseline competence expected across the health workforce, including nurses functioning outside the hospital setting (WHO, 2021).

Within this category of health workers are those who work in occupational health. Occupational health nurses do not work in hospitals; rather, they are often the only nurses on staff within the offices of organizations such as construction, manufacturing, or office environments. The growth of digital health technologies within the occupational health environment means that there are concerns about the occupational health nurses' adaptation to these technologies.

In the Philippines, occupational health nurses have a defined regulatory framework within which they work that predates the implementation of the digital health priorities of the country today. Republic Act No. 11058 and its implementing rules under Department Order No. 198-18 require covered workplaces to maintain qualified occupational health personnel, including nurses, but the qualifications specified center on licensure and a minimum number of hours of occupational health training rather than on any defined standard for technological or digital competence (Department of Labor and Employment [DOLE], 2018). The occupational health nurse's mandated functions, including conducting health examinations, maintaining medical records, and preparing annual medical reports to DOLE using prescribed forms, were written for a paper-based reporting environment and have not been substantially revised to reflect digital record-keeping, telehealth consultation, or electronic occupational health surveillance systems now used in many workplaces (DOLE, 2018).

The use of technology within the nursing profession throughout the Philippines shows a general deficit in the nurses' abilities to utilize digital technology within their field. A descriptive-correlational study of nurse educators across higher education institutions in CALABARZON found that limited internet access, insufficient training opportunities, and unclear expectations around how technology fits into professional practice constrained digital technology integration, even as the same nurse educators reported reasonably strong self-efficacy in narrower areas such as locating online resources (Abundabar, 2025). A separate study of nursing attendants in government hospitals in Sorsogon Province found that, among several competency domains assessed, digital and technological competence consistently scored lowest, trailing behind clinical knowledge, practical skills, and attitude. Among hospital-based nurses specifically, a study of telehealth readiness in Metro Manila hospitals reported moderate-to-high self-confidence overall but identified specific gaps in more complex telehealth competencies, with organizational support and resource availability emerging as factors shaping how ready nurses felt to adopt these tools (Telehealth Self-Confidence and Readiness for Practice, 2025).

The studies discussed above differ from the topic covered in this study. While they indicate the deficit in the nurses' use of technology and in their confidence in using technology, there is a distinction between the nurses' competencies in using the technology and their confidence in the use of that technology. Bandura's Self-Efficacy Theory frames this second construct as a belief in one's own capability to execute a given course of action, a belief that shapes effort, persistence, and willingness to engage with unfamiliar tasks independently of actual skill level (Bandura, 1997). Given that many occupational health nurses do not have access to support for their IT use, their confidence in the use of digital technology in their occupation may be a determining factor in their attempt to use and perform their work tasks with the use of digital technologies.

In addition, Locsin's theory of technological competency as caring in nursing (TCCN) states that rather than treating technology as a force in tension with nursing's caring mandate, TCCN positions technological knowing as a legitimate way of knowing persons, allowing nurses to attend to those in their care more fully when technology is used skillfully and ethically (Locsin, 2005; as cited in Pajnkihar et al., 2022). In the case of occupational health nurses who utilize an electronic health surveillance system within their occupational health profession, they are practicing a form of caring for the people in their field through the skillful use of that technology. Despite the various studies on technological competency within the nursing profession in the Philippines, there are no published studies that include occupational health nurses specifically. This study endeavored to determine the level of technological competency, self-efficacy in the use of digital technologies,

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and barriers to the use of those technologies among occupational health nurses in Luzon who have completed OHNAP-recognized Basic Occupational Safety and Health (BOSH) training. In addition, the studies performed in relation to this topic were utilized in the creation of a new digital competency framework for occupational health nurses.

Statement of the Problem

This study aimed to determine the technological competency, technology self-efficacy, and perceived barriers to technology utilization among occupational health nurses in Luzon who have completed OHNAP-recognized Basic Occupational Safety and Health (BOSH) training, and to develop a scholarly output responsive to the findings.

Specifically, this study sought to answer the following questions:

1. What is the demographic profile of occupational health nurses in terms of:

a. Age

b. Sex

c. Years of occupational health nursing experience

d. Industry

e. Number of technological competency-related trainings attended within the last three (3) years

2. What is the perceived level of technological competency of occupational health nurses in terms of:

a. Technological Knowing

b. Expression of Caring

c. Technological Connectedness

3. What is the perceived level of technology self-efficacy of occupational health nurses in terms of:

a. Technology Learning Self-Efficacy

b. Technology Use Self-Efficacy

c. Technology Problem-Solving Self-Efficacy

4. What are the perceived barriers to technology utilization among occupational health nurses in terms of:

a. Access to technology-related learning resources

b. Availability of occupational health technology training

c. Institutional and technical support for technology use

d. Integration of technology into occupational health nursing practice

5. Is there a significant difference in the perceived level of technological competency of occupational health nurses when their profile is considered?

6. Is there a significant difference in the perceived level of technology self-efficacy of occupational health nurses when their profile is considered?

7. Is there a significant difference in the perceived barriers to technology utilization of occupational health nurses when their profile is considered?

8. Is there a significant relationship among the occupational health nurses' perceived level of technological competency, technology self-efficacy, and perceived barriers to technology utilization?

9. Based on the findings of the study, which Occupational Health Nursing Digital Competency Framework or Technology Competency Enhancement Program was developed to address the identified levels of technological competency, technology self-efficacy, and perceived barriers among occupational health nurses?

Purpose of the Study

The purpose of this study is to determine the level of technological competency among occupational health nurses in Luzon who have undergone Basic Occupational Safety and Health (BOSH) training recognized by the Occupational Health Nurses Association of the Philippines (OHNAP). The research also sought to explore the relationship between technological competency and technology self-efficacy, as well as perceived barriers to the utilization of technology within their practice. The study further examined whether these variables differ significantly across respondents' demographic and professional profiles. In doing so, the researcher hopes to gain an understanding of how occupational health nurses in Luzon engaged with technology in their daily practice and the factors that influenced their utilization of such technologies within their roles.

Significance of the Study

The primary focus of this study is to explore the technological competencies, self-efficacy in using technology, and the barriers that occupational health nurses in the Philippines face when performing their jobs.

The outcomes of this study benefited several stakeholders.

To the occupational health nurses:

The results of this study allowed occupational health nurses to understand their levels of technological competency and self-efficacy in using technology. By examining the identified barriers to using technology, they were able to recognize where they may require additional professional development in the use of technology. They could also make informed decisions about pursuing additional training and articulate the support they required from their employers to perform their jobs more effectively in the current digitalized environment.

To the Occupational Health Nurses Association of the Philippines (OHNAP):

The findings of this study enabled OHNAP to identify the continuing professional development opportunities that would best meet the needs of its members. OHNAP was able to develop targeted training programs and competencies that helped their members to better perform their jobs in the use of technology in the workplace. An occupational health nursing digital competency framework or technology competency enhancement program was developed based on the findings.

To the employers and workplace Management:

According to Republic Act No. 11058, employers are required to hire qualified occupational health nurses. To make informed decisions regarding investments in occupational health nursing technology, training programs, and equipment, employers were able to use the findings of this study. They were also able to understand the organizational barriers to the use of technology by their occupational health nurses and how to mitigate them.

To the workers and the general working population:

With the increased competency of occupational health nurses in using technology, workers and the general

public can rely on an increase in the accuracy and efficiency of occupational health nurses when documenting workplace health issues and referring patients to healthcare providers. The quality of occupational health services provided was expected to improve in the Philippines.

To the schools of nursing and nursing education institutions:

The findings of this study guided nursing schools and educational institutions in developing relevant training programs for their students in the use of technology and digital health skills in occupational health nursing programs. The study helped identify gaps in existing curricula and develop strategies for improving the use of technology in preparing future occupational health nurses.

To nursing students who plan to enter the occupational health nursing field or transition to it:

The findings of this study informed nursing students regarding the expected technological competencies and self-efficacy levels within occupational health nursing. The identification of common barriers that occupational health nurses face enabled these students to make informed decisions regarding the technology skills that they should acquire during their education.

To future researchers in the field of occupational health nursing:

This study was the first to determine the level of technological competency, self-efficacy in using technology, and perceived barriers among occupational health nurses in the Philippines. It served as a foundation for future research within occupational health nursing in the Philippines and other countries, as well.

To policymakers and regulatory bodies such as the Department of Labor and Employment (DOLE), the Professional Regulation Commission (PRC), and the Department of Health (DOH):

Future revisions of regulations for the hiring of occupational health nurses may be influenced by the findings of this study. Specifically, occupational health nursing regulations do not require that nurses possess technological competencies; thus, the findings of this study may influence the development of such requirements.

Finally, the study led to the development of an occupational health nursing digital competency framework or technology competency enhancement program for OHNAP and other occupational health nursing institutions in the Philippines to use to improve their occupational health nurses' readiness to use technology in their jobs.

Scope and Delimitation

This study is delimited to occupational health nurses in Luzon who have completed OHNAP-recognized Basic Occupational Safety and Health (BOSH) training. In addition to BOSH training, the study collected information on the respondents' technological competency-related trainings attended within the last three (3) years as part of their demographic and professional profile. The study utilized a descriptive-correlational design to examine three key variables in occupational health nurses: technological competency, technology self-efficacy, and the barriers they perceive to the utilization of technology. The demographic profile of the respondents was also collected as part of the study. Data were gathered during August to September 2026 through the completion of self-administered survey questionnaires. These survey questionnaires were researcher-constructed. The occupational health nurses who participated in the study were identified and recruited through referral sampling from OHNAP's professional networks. The study did not focus on the direct observation of the participants' use of technology, their performance in a skills test, or the organizational technological infrastructure within their workplaces. The findings of the study were used to develop an Occupational Health Nursing Digital Competency Framework or a Technology Competency Enhancement Program for those nurses. The resulting framework or program was specifically designed for and tested within the context of the occupational health nursing practice in the Philippines, specifically the island of Luzon, and was only applicable to those occupational health nurses who completed the study and are part of the referral sampling process, rather than other types of nurses or healthcare settings.

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Definition of Terms

Basic Occupational Safety and Health (BOSH) Training: An accredited professional development program administered by the Occupational Health Nurses Association of the Philippines under Republic Act No. 11058 and Department Order No. 198-18, constituting the minimum qualification for occupational health nursing practice in covered workplaces. In this study, completion of BOSH training was a required inclusion criterion for all respondents.

Descriptive-Correlational Research Design: A quantitative research design that describes the characteristics of a population on one or more variables and examines the degree and direction of relationships among those variables without experimental manipulation. In this study, it was used to determine the levels of technological competency, technology self-efficacy, and perceived barriers among occupational health nurses, and to examine the associations among these variables.

Expression of Caring Through Technology: One of three domains of technological competency derived from Locsin's Technological Competency as Caring in Nursing Theory, referring to the deliberate and ethically grounded use of digital health tools as instruments through which the nurse expresses genuine caring for persons in their care. It reflects the TCCN philosophical position that technology is not a substitute for caring but a medium through which caring is expressed and deepened.

Occupational Health Nurse (OHN): A registered nurse who specializes in the prevention of work-related illness and injury and the promotion of worker health within workplace settings, operating under the regulatory mandate of Republic Act No. 11058 and Department Order No. 198-18 in the Philippines. In this study, the respondents were BOSH-trained registered nurses practicing as occupational health nurses in industries within Luzon, Philippines.

OHN Digital Competency Framework (OHN-DCF): An evidence-based competency standard developed from the empirical findings of this study, grounded in Locsin's Technological Competency as Caring in Nursing Theory, that defines and organizes digital competency among occupational health nurses across three domains and three developmental levels: Foundational, Proficient, and Advanced.

Perceived Barriers to Technology Utilization: The structural, organizational, and contextual conditions that occupational health nurses perceive as constraining their effective use of digital health technologies in practice. In this study, it was conceptualized as an environmental variable comprising four domains: Access to Technology-Related Learning Resources, Availability of OHN Technology Training, Institutional and Technical Support, and Integration of Technology into OHN Practice.

Referral Sampling: A non-probability sampling method in which an initial pool of qualified participants is recruited through accessible channels and subsequently asked to refer other eligible individuals from their professional networks, continuing until the required sample size is reached. It is appropriate when no comprehensive sampling frame exists for the target population, as was the case for BOSH-trained occupational health nurses in Luzon.

Self-Efficacy: A person's belief in their own capacity to execute a specific course of action successfully in a given situation, as theorized by Bandura (1997). It is domain-specific and influenced by mastery experience, vicarious learning, social persuasion, and physiological states. In this study, it was applied specifically as technology self-efficacy within the occupational health nursing context.

Technological Competency: The perceived ability of occupational health nurses to use digital health technologies in ways that reflect and advance their capacity to know and care for workers as whole persons, grounded in Locsin's Technological Competency as Caring in Nursing Theory. In this study, it was operationalized across three domains: Technological Knowing, Expression of Caring Through Technology, and Technological Connectedness.

Technological Competency as Caring in Nursing (TCCN) Theory: A mid-range nursing theory developed by Rozzano C. Locsin (2005), proposing that technological competency is a legitimate and essential expression of caring in nursing practice, enabling nurses to know persons more fully as complete and dynamic human beings. This theory served as the sole theoretical framework of this study and informed the conceptualization, operationalization, and interpretation of all three central variables.

Technological Connectedness. One of three domains of technological competency derived from TCCN Theory, referring to the use of digital technologies to establish and maintain professional connections with workers, employers, healthcare professionals, and regulatory bodies, including electronic DOLE reporting, teleconsultation, and inter-professional digital coordination. In this study, it was the highest-scoring competency domain.

Technological Knowing: One of three domains of technological competency derived from TCCN Theory, referring to the use of digital health tools to gather, integrate, and interpret data about workers in ways that deepen the nurse's knowledge of each worker as a whole and unique person. In this study, it was the lowest-scoring competency domain, indicating that the caring-oriented application of technology remained the least fully realized dimension of competency.

Technology Self-Efficacy: The occupational health nurse's perceived confidence in their ability to perform technology-related tasks relevant to occupational health nursing practice, comprising three dimensions: learning new digital tools, using digital systems in routine practice, and resolving technology problems independently. It was grounded in Bandura's Self-Efficacy Theory (1997) and served as the second central variable of this study.

REVIEW OF RELATED LITERATURE AND STUDIES

Technological Competency in Nursing Practice

Locsin’s Technological Competency as Caring in Nursing (TCCN) Theory emphasizes that the use of technology should not be opposed to the care of nurses for their patients. Instead, the technology should be used to understand the patient and provide care to meet their individual needs. This theory also emphasizes the universal technological domain, which incorporates three essential components to the relationship between humans and technology: technological knowing, designing, and engaging in the use of technology. According to Locsin (2016, 2017), nurses continue to play a critical role in ensuring that technology is used ethically and in a manner that promotes patient wellbeing.

Within the nursing profession, technology is used in a variety of ways. A study by Nakano et al. (2021) on nurses in Japanese hospitals discovered that nurses with between 20 and less than 30 years of experience had the highest level of technological competency. Furthermore, nurses who had completed nursing training in the use of technology to care for patients also scored higher in their level of technological competency than other nurses. Krel et al. (2022) also found that TCCN is still relevant and applicable to the nursing profession.

Studies continue to emphasize the importance of technological competencies among nurses. Cachata et al. (2025) discovered that there are five different instruments used in various healthcare settings to measure the technological competencies of nurses. Conte et al. (2023) developed the Digital and Technological Framework (Digitech-F), which includes various elements that can be used to assess the competence of nurses in the use of technology. In spite of these studies, the findings suggest that many nurses struggle to incorporate technology into their practice, and the levels of technological competence vary between healthcare settings.

The research suggests that the development of the technological competency of nurses is a continuous process rather than a skill that could be taught to individuals and would then result in them mastering the use of the technology. These findings and competencies have led to the development of the Technological Competency as Caring in Healthcare Instrument (TCCHI), developed by Yamanaka et al. (2025, 2026). The studies that have been completed on the technological competencies of nurses in various settings provide a foundation for examining the competencies of occupational health nurses in the Philippines.

Technology Self-Efficacy among Nurses

Another factor that influences the use of technology by nurses is the technology self-efficacy of those individuals. Bandura's Self-Efficacy Theory (1997) provides the foundational explanation for this construct, positing that beliefs about personal capability significantly influence behavior, motivation, effort, and persistence. This theory has been applied to the area of technology use, where it is known as the technology self-efficacy of an individual, and it has been found to influence the adoption and use of technology by individuals (Compeau & Higgins, 1995).

Studies have found that nurses with high levels of technology self-efficacy exhibit higher levels of technological competency. Alshammari and Alenezi (2023) found that self-efficacy partially mediated the relationship between technology integration and nursing workforce competency, confirming that confidence in technology use functions as an enabling mechanism through which training and exposure translate into actual competence. Güllü and Kanadlı (2025) found that the attitudes that nurses held toward health technology influenced the technology self-efficacy of nurses working in critical care units. Furthermore, a study of 1,081 Italian nurses found that only 47.1% of the study participants had adequate levels of technology self-efficacy (Conte et al., 2025). Ibrahim et al. (2026) found that the technology self-efficacy of nurses was a partial mediator of the relationship between their digital competence and their adaptability to the changing nature of healthcare technology.

The technology self-efficacy of nurses can be measured, and it is a factor that influences nurses' ability to use technology to care for their patients. This is particularly important in the field of occupational health nursing, where nurses often practice without any technological support or guidance from nurses who have more experience in using the technology to care for their patients.

Perceived Barriers to Technology Utilization

Even with nurses with adequate technology competency and confidence in using that technology to care for their patients, there are other factors that may influence their ability to use that technology in practice. These barriers exist independently of the individual nurse’s capabilities in using technology, and understanding them is crucial to understanding the influence that technology has upon occupational health nurses in the Philippines.

Fahs et al. (2026) found that nearly half of mobile health application users reported barriers, including poor internet access, information overload, and privacy concerns, highlighting that geographical location, access, and connectivity significantly influence digital health engagement. Sanjeevi et al. (2026) found that perceived barriers to telehealth use influenced patterns of healthcare service delivery, suggesting that provider-level perceptions of technology limitations translate directly into reduced utilization. Yang et al. (2026) confirmed that perceived barriers significantly predicted technology adoption readiness among newly qualified nurses, supporting the present study's decision to treat perceived barriers as a distinct variable rather than subsuming them under self-efficacy or competency.

The factors that hinder the use of technology by nurses are a distinct category from the technological competencies of those individuals and their technology self-efficacy. Therefore, to understand the influence of technology upon nurses in their practice, it is necessary to identify these barriers and develop interventions that enable nurses to overcome them. These barriers may be especially problematic for occupational health nurses, who may not have the technological resources available to them to use to care for their patients or to develop their competencies with the technology.

Technological Competency in Occupational Health Nursing

Occupational health nurses provide care for the workers within a company or organization. They are responsible for the health and wellness of these workers, for managing their health records, for monitoring for occupational health and safety hazards in the workplace, and for ensuring that regulations are followed to protect the health and wellbeing of these employees. The practice of occupational health nurses in the

Philippines is governed by Republic Act No. 11058 and its Implementing Rules and Regulations under Department Order No. 198-18. This legislation outlines the responsibilities of occupational health nurses, but does not define the standards that they should have in terms of technological competency. However, the WHO Global Strategy on Digital Health 2020-2025 (WHO, 2021) recognizes digital readiness as a critical requirement for all health professionals, including those in non-hospital settings, and calls on member states to build digitally capable workforces through education, training, and supportive policy environments. Furthermore, digital health technologies are used in the practice of occupational health nurses in the Philippines, including health information systems, electronic medical records, and digital health consultation platforms.

A three-round e-Delphi study involving 45 occupational health nurses determined that these individuals are not required to have any particular level of technological competency or digital literacy (Gok Metin & Yildiz, 2023). Additionally, an exploration of the vulnerabilities of occupational health nursing as a profession found that factors such as the limited recognition of those individuals in their profession, their limited autonomy in making decisions for the health of their patients, and the inability of occupational health nurses to incorporate findings into their practice are contributing to the profession's technological readiness (Gonzalez-Caballero, 2024). Despite the growing importance of digital technologies in the occupational health field, the research on the technological competencies, technology self-efficacy, and barriers to the use of technology by occupational health nurses in the Philippines is scarce. This is particularly concerning in a country where technology is rapidly becoming a part of the occupational health field, but where the regulations for the practice of occupational health nurses have not evolved with the growth of technology in that field, and where nurses in the field often work independently with limited access to the resources of the organization for which they work.

Thematic Synthesis of Related Literature

The use of digital technology has transformed the practice of nursing and has led to an increase in the use of various technologies. Some of the technologies used include electronic health records (EHR), telehealth, mobile health technologies, wearable health technologies, and health information systems. As the healthcare system continues to use technology, the nurses in the healthcare profession are expected to use these technologies in their practice. According to the World Health Organization (WHO) (2021), building a digitally competent healthcare workforce is essential for addressing the changing needs of modern healthcare systems. This expectation applies not only to hospital-based nurses but also to those working in specialized areas, including occupational health nursing.

In order to provide a complete understanding of the technology used in occupational health nursing, this literature review covered the following themes: the technological competencies of nurses in their practice, the technology self-efficacy of nurses, the barriers to the use of technology by nurses, and the technological competencies of occupational health nurses.

THEORETICAL FRAMEWORK

The theoretical framework of this study is anchored on Rozzano C. Locsin's Technological Competency as Caring in Nursing (TCCN) Theory. This theory was selected as the sole theoretical foundation because it comprehensively accounts for all three central variables of the study within a single, nursing-specific explanatory model. Locsin's TCCN Theory was specifically developed to explain how nurses develop and express competency in using technology as an act of caring, making it the most directly applicable framework for a study examining technological competency among occupational health nurses in the Philippines.

Locsin (2005) proposed that technological competency in nursing is not merely a technical skill but a mode of caring through which nurses come to know persons more fully. The theory holds that technology and caring are not opposing forces but complementary expressions of nursing practice. A nurse who uses technology competently is exercising a form of caring that allows for more complete, continuous, and individualized knowing of the person in their care. Within this framework, technological competency encompasses not only

the technical ability to operate digital tools but also the nurse's confidence, ethical orientation, and willingness to engage with technology in the service of knowing and caring for persons.

This distinction is critical to the theoretical foundation of this study. Technology self-efficacy, or the nurse's confidence in using technology, is not a separate external variable but an inherent dimension of technological competency as Locsin defines it. A nurse who lacks confidence cannot fully express technological competency as caring, because genuine competency requires both the ability and the willingness to engage. Technology self-efficacy is therefore subsumed within the broader construct of technological competency that TCCN Theory describes, rather than being an independent variable that explains competency from outside the framework. Technological competency contains self-efficacy as a component, but self-efficacy does not contain technological competency. Hence, the more encompassing construct must anchor the framework.

TCCN Theory also provides the conceptual basis for understanding perceived barriers to technology utilization as a distinct and meaningful variable. The full expression of technological competency as caring requires not only individual ability and confidence but also environmental conditions that support competent technology use. When occupational health nurses practice in environments with limited access to training, inadequate institutional support, or poor technological infrastructure, they are prevented from fully developing and expressing technological competency as caring, regardless of their individual capability. Perceived barriers, therefore, represent the environmental constraints that inhibit the realization of technological competency as an expression of caring in occupational health nursing practice.

The theory was further developed by Locsin and Purnell (2015), who introduced the universal technological domain and proposed three key process elements through which competency is expressed: technological knowing, designing, and participative engaging. These elements are directly reflected in the three domains through which technological competency was measured in this study, namely Technological Knowing, Expression of Caring, and Technological Connectedness. Locsin (2016, 2017) continued to refine the theory in response to advancing healthcare technologies, affirming that the ethical and humanistic use of technology remains the nurse's enduring professional responsibility regardless of how sophisticated the technological environment becomes. The theory has been validated as meeting the criteria of clarity, adequacy, significance, and testability required of a nursing middle-range theory (Krel et al., 2022), and has been operationalized through a lineage of validated instruments, including the TCCNI, TCCNI-R, and, most recently, the Technological Competency as Caring in Healthcare Providers Instrument (TCCHI, Yamanaka et al., 2025, 2026), which was specifically designed for multidisciplinary healthcare providers beyond hospital-based nursing populations.

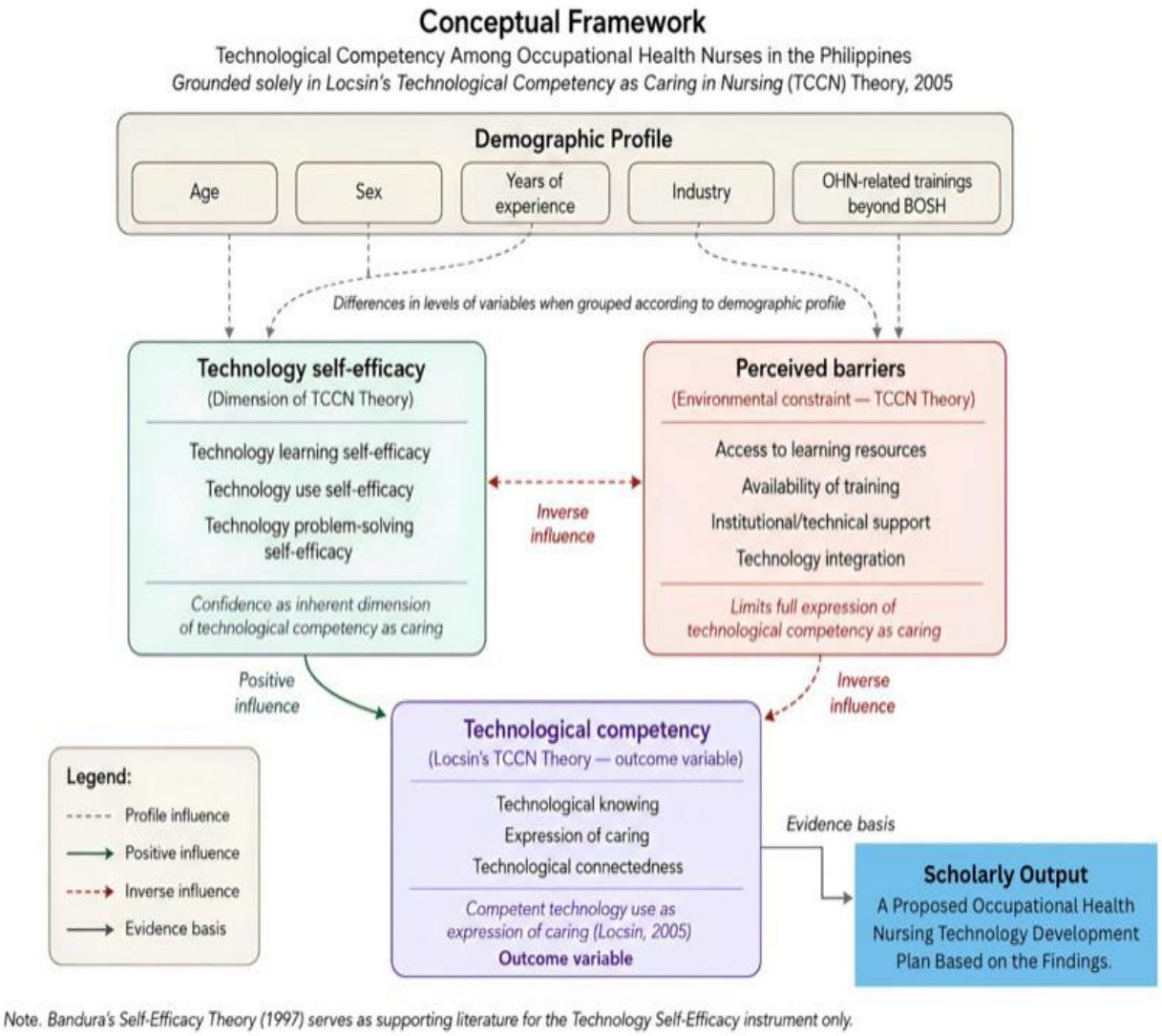
The demographic profile variables, namely age, sex, years of occupational health nursing experience, industry, and number of technological competency-related trainings attended within the last three (3) years, are theoretically grounded in TCCN Theory's recognition that the development of technological competency as caring is shaped by accumulated professional experience, educational background, and the environmental conditions of practice. Nurses with more years of experience had more opportunities to develop competency through direct engagement with technology in caring practice. Nurses who participate in technological competency-related training may provide additional opportunities to acquire knowledge and skills relevant to technology use. The industry in which a nurse practiced shaped the technological environment and the opportunities available for competency development. Differences in these characteristics produced differences in technological competency, the self-efficacy dimension within it, and the perceived barriers that constrain its full expression across respondents.

Based on this theoretical foundation, the following proposition guided the present study: occupational health nurses who demonstrate higher levels of technology self-efficacy as a dimension of their overall technological competency, and who perceive fewer barriers to technology utilization, also demonstrated higher levels of technological competency as caring in their practice. These patterns varied across nurses' demographic and professional profiles in ways consistent with TCCN Theory's account of how competency develops through accumulated experience, environmental support, and the nurse's orientation toward technology as an expression of caring.

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It is important to note that while Bandura's Self-Efficacy Theory is not adopted as a theoretical framework in this study, it served as a supporting theoretical reference for the operationalization of the Technology Self-Efficacy variable and for the selection and adaptation of the instrument used to measure it. Bandura's conceptualization of self-efficacy as a task-specific belief shaped by mastery experiences, vicarious learning, social persuasion, and physiological states informs how the confidence dimension of technological competency is defined and measured in this study, without positioning self-efficacy as a theoretical construct independent of Locsin's TCCN framework.

CONCEPTUAL FRAMEWORK



Note. Bandura's Self-Efficacy Theory (1997) serves as supporting literature for the Technology Self-Efficacy instrument only.

The conceptual framework of this study is structured as a theory-driven directed model that illustrates the nature, direction, and theoretical basis of the relationships among the variables examined. At the top are the five demographic profile variables, positioned as antecedent characteristics that may differentially influence all three central variables, consistent with TCCN Theory's recognition that the development of technological competency as caring is shaped by accumulated professional experience, educational background, and the environmental conditions of practice. These connect to the three central variables through downward arrows corresponding to research questions 5,6, and 7.

In the middle row are technology self-efficacy and perceived barriers in a lateral relationship. The dashed inverse-influence arrow from perceived barriers to technology self-efficacy reflects TCCN Theory's recognition that environmental obstacles prevent nurses from engaging with technology in caring practice, thereby constraining the development of the confidence dimension embedded within technological

competency. At the bottom is technological competency as the primary outcome variable, with a positive directional arrow from self-efficacy and an inverse arrow from perceived barriers, making the framework's central theoretical proposition visually explicit. Outside the theoretical model is the proposed scholarly output, an Occupational Health Nursing Digital Competency Framework or Technology Competency Enhancement Program, connected by an arrow labeled evidence-based, signifying that the output was derived directly from the study's empirical findings.

Review of Previous Quantitative Studies

Studies on Technological Competency

In the study by Nakano et al. (2021), a cross-sectional survey was conducted among a total of 421 nurses, both staff nurses and nurse managers of general hospitals in Japan. A technology caring competence in nurses scale (TCCNI-R) was utilized in their findings, and results indicated that nurses with 20 to fewer than 30 years of experience showed the highest scores, as did those with a history of receiving education on caring in nursing. These findings established a basis for the present study's methodology and the use of years of experience and education as demographic variables in their nursing population.

Yamanaka et al. (2025) developed the technology caring in healthcare providers instrument (TCCHI) using a modified Delphi method of a group of ten healthcare experts. They produced a 38-item instrument with average I-CVI scores ranging from 0.80 to 0.90. Following up on these results, Yamanaka et al. (2026) refined the TCCHI into a concise 12-item, three-factor model. Factor 1 included items related to the mastery of technology and the maintenance of a trusting relationship between patients and providers; Factor 2 related to maintaining the autonomy of the patient within the technologically advanced health care environment; and Factor 3 related to maintaining the comfort of patients and providing a voice to their health and health care experiences. This TCCHI was designed for multidisciplinary healthcare professionals, as opposed to just nurses who work in hospitals; this makes it the most appropriate instrument to use for the present study. Both of these studies are published as open access within Creative Commons license CC BY 4.0.

A study of technological caring competence for nursing education was completed by Narvaez et al. (2024). This study focused on nursing educators in the Philippines and established one of the few quantitative investigations into TCCN in that country. Furthermore, Pineda et al. (2025) demonstrated that technology competency was the least scoring among the different domains of skill in nursing attendants working in nine government hospitals in the Province of Sorsogon.

Studies on Technology Self-Efficacy

In Italy, Conte et al. (2025) investigated the self-efficacy of nurses and nursing students with the use of a digital and technological self-efficacy scale. Of the 1,081 participants, 47.1% demonstrated insufficient self-efficacy with regard to technology use within the hospital environment; nurses who were female showed a 2.038 odds of demonstrating insufficient self-efficacy when compared to their male counterparts ($p < 0.001$). Additionally, each year of nursing experience reduced the odds of demonstrating insufficient self-efficacy among nurses by 0.955 ($p < 0.001$). In another study from Saudi Arabia, Alshammari and Alenezi (2023) showed that the self-efficacy of nurses was associated with technology integration within the hospital, as was the competency of the nursing workforce. Güllü and Kanadlı (2025) in Turkey showed that the attitudes of their nursing professionals toward the implementation of technology in their health care environments were associated with their professional self-efficacy ($p < 0.001$). Additionally, the technology attitudes explained 24.9% of the total variance in nurses' professional self-efficacy. Lastly, Ibrahim et al. (2026) identified technological self-efficacy and learning agility as parallel mediators.

Studies on Perceived Barriers to Technology Utilization

In China, Yang et al. (2026) survey of 329 nurses who had recently graduated from the nursing schools there identified the perceived barriers of nurses to the use of AI technology in their healthcare professions. Additionally, the barriers of those nurses were significantly associated with the readiness of those nurses to

adopt the technology into their practices, as demonstrated by the linear regression performed by the study. Lastly, Fahs et al. (2026) gathered information from 514 adults in Lebanon concerning the barriers to the use of mobile health applications. The barriers to these individuals included a lack of internet access, the over-information provided through these applications, and issues related to their health information privacy. Additionally, the barriers to mobile health applications were significantly associated with the geographic location and the professional roles of those individuals.

Synthesis and Relationship to the Present Study

The quantitative studies that were reviewed demonstrate the association between nurses' years of experience and their technology competence, that the technology self-efficacy of nurses within their health care professions is often insufficient, and that the barriers to the implementation of technologies into health care settings are associated with nurses' self-efficacy. However, there have been no quantitative studies that have examined the association between nurses technological competency, their technology self-efficacy, and their perceived barriers to the implementation of the technologies into their health care environments that focused upon the role of occupational health nurses in any country, and no such studies have been performed in the Philippines or of those nurses who are trained in occupational health through their program of study and training in the Philippines. Therefore, there was a clear gap in the literature that was addressed by the present study.

Research Gap and Justification

Numerous studies have investigated the various technological competencies of nurses. Such research shows that nurses' technological skills vary by their professional backgrounds and personal demographics (Nakano et al., 2021). Likewise, studies have examined nurses' self-efficacy towards using technology. Research indicates that many nurses lack self-confidence in their technological skills and that their self-efficacy influences the use of technology (Conte et al., 2025; Alshammari & Alenezi, 2023). Finally, numerous studies have investigated the barriers that nurses face in using technology. Some of the more frequently reported barriers include a lack of training, a lack of support from the institution where they work, and a lack of integration of technology into their work environment (Yang et al., 2026; Fahs et al., 2026).

Despite the breadth of research on nurses' technological skills, there are numerous gaps in the literature. The vast majority of studies investigating these technological skills have focused on nurses working in hospitals. However, nurses working in occupational health settings differ significantly from their hospital-based counterparts and have not been studied in this regard. Another gap in the literature is the lack of Philippine studies that have analyzed the technological competencies of occupational health nurses. While studies have analyzed occupational health nursing attendants (Pineda et al., 2025) and nurse educators in the Philippines (Narvaez et al., 2024; Abundabar, 2025), it has yet to be determined if similar gaps exist in the country's occupational health nursing profession. Finally, there is a lack of quantitative studies in the existing literature that have examined nurses' technological competencies, self-efficacy, and barriers to using technology as an interconnected group of variables. Furthermore, the regulatory framework of occupational health nursing in the Philippines, R.A. 11058 and D.O. 198-18, lacks standards for technological competency for occupational health nurses.

The present study examined the technological competencies of the country's BOSH-trained occupational health nurses, assessed their self-efficacy towards using technology, and determined the barriers they face in using the technologies within their work environment. The findings will be translated into a tool to help increase the technological readiness of occupational health nurses within the Philippines.

Relevance to the Current Study

The studies and literature reviewed in this study are directly relevant to the present research.

The studies conducted by Locsin (2005, 2015, 2016, 2017) are directly relevant to the research conducted in this study due to the fact that the theory developed by Locsin provides the foundation for the theory that was

examined in the present study. In addition, the theory that technological competency is an expression of caring for others is directly relevant to the idea of occupational health nurses using technology to care for the employees of the businesses that they serve. The studies by Krel et al. (2022) show that the theory of technological competency is suitable for the quantitative research conducted in this study to test the theory. The studies by Nakano et al. (2021) confirmed that there is a relationship between the levels of technological competency in nursing and the demographic characteristics of those individuals who were studied, which is why the demographic characteristics were collected in the study that was conducted in the future. The studies by Yamanaka et al. (2025) and Yamanaka et al. (2026) developed an instrument to measure the technological competency of health care providers who are not in a hospital setting, which was used as the basis for the instrumentation developed by the researcher.

The studies by Cachata et al. (2025) and Conte et al. (2023) validated that an instrument can be developed to measure the digital competency of nursing professionals, which is what this study aimed to accomplish. The studies by Bandura (1997) and Compeau and Higgins (1995) provided a theoretical foundation for the development of the instrument that measured the technological self-efficacy of the participants in this study. The studies by Conte et al. (2025) validated an instrument to measure the technological self-efficacy of nursing professionals, which was adapted for use in this study. The studies by Alshammari and Alenezi (2023), Güllü and Kanadlı (2025), Ibrahim et al. (2026), Cui and Nasir (2026), and Zhang et al. (2026) validated that the technological self-efficacy of the participants is related to the levels of technological competency of nursing professionals, which supports the theory that guided this study. The studies by Yang et al. (2026) and Fahs et al. (2026) found that there are a number of variables in the study that may influence the ability of the nursing professionals to develop technology instrumentation for future use, which validated the development of such instruments in this study.

The studies by Gonzalez-Caballero (2024) and Metin and Yildiz (2022) highlighted the need for investigations into the competencies of nursing professionals who work in the occupational health field. The studies by Narvaez et al. (2024), Pineda et al. (2025), and Abundabar (2025) confirmed that the competencies of nursing professionals in the Philippines have gaps in their skills and knowledge of technology, which provided additional justification for the present study.

Overall, the studies reviewed within the research paper provide a theoretical foundation and framework upon which this research was based.

RESEARCH METHODOLOGY

Research Design

This study employed a quantitative descriptive-correlational research design. The study's design had a descriptive component to establish the levels of the study's key variables and a correlational component to identify the significant relationships between the variables. The data were collected at one point in time (cross-sectional). Three main rationales underpinned the decision to utilize a descriptive-correlational design for the study. First, the design is appropriate given the theoretical frameworks upon which the study was built. Both Locsin's Technological Competency as Caring in Nursing (TCCN) Theory and Bandura's Self-Efficacy Theory suggest that there is a relationship between technological competency, technology self-efficacy, and perceived barriers among nurses in the field. Neither theory suggests that any of the variables are causally related to one another, but rather that they influence each other. A correlational study is appropriate for understanding the relationship between these naturally occurring variables without the need for experimental manipulation. Second, the descriptive-correlational design was the only viable option for satisfying the statement of the problem within a single study. A descriptive design would only allow for the investigation of items 1-4 of the statement of the problem, while leaving items 5-8 of the problem without a statistically justified study. A correlational study would permit the study of items 5-8, but would not provide the descriptive baseline of the remaining items in the study. Thus, a descriptive-correlational study was the only option that could address the study's objectives within the research study. Additionally, a cross-sectional study was appropriate for the study in that it permitted the establishment of a baseline profile of the occupational health nurses with regard to the

study's variables. This information could be used to guide the nurses' professional development as well as the development of the health policies for the occupational health nurses. Third, descriptive-correlational studies are the dominant approach that has been utilized in prior studies on occupational health nurses and technology in the nursing field. For example, studies by Nakano et al. (2021), Conte et al. (2025), Alshammari and Alenezi (2023), Güllü and Kanadlı (2025), and Pineda et al. (2025) all employed cross-sectional surveys with descriptive and correlational statistics to investigate the study's variables. This study's design aligns with the established methodological approaches to studying this topic, which provides further defensibility for the study's methodology.

While descriptive-correlational studies can establish the presence of a relationship between study variables, they are not capable of establishing the causality of the relationship between these variables. Thus, although there may be a statistically significant relationship between technological competency, technology self-efficacy, and perceived barriers among occupational health nurses, no statement was made that any of the variables cause the other to occur. This limitation was acknowledged and discussed further in the scope and delimitations, as well as the discussion of the findings of the study in Chapter 5.

Variables and Operational Definitions

This section outlines the variables that were examined within this study. The operational definition for each variable identifies the variable, how it was classified, and how it was measured within the context of the present study.

Demographic Profile Variables. The demographic profile variables were those variables used as the grouping variables within the inferential analyses of research questions 5, 6, and 7. According to both TCCN theory and Bandura's Self-Efficacy Theory, these types of variables are of importance to occupational health nursing.

Age: The age of the respondent in years. This variable was grouped as: 20-29, 30-39, 40-49, and 50+.

Sex: The biological sex of the respondent (male or female).

Years of Occupational Health Nursing Experience: The number of years that the respondent has been practicing as an occupational health nurse. This variable was grouped as: less than 2 years, 2-5 years, 6-10 years, 11-15 years, 16-20 years, and more than 20 years.

Industry: The industry that the respondent works within. This was grouped as: Construction and Infrastructure, Business Process Outsourcing (BPO) and Corporate Services, Manufacturing and Industrial, Government and Public Services, Healthcare and Hospitals, Education and Schools/Universities, and Transportation and Logistics.

Number of Technological Competency-Related Trainings Attended Within The Last Three (3) Years: The number of trainings, seminars, workshops, continuing professional development activities, or other structured learning activities related specifically to the development of technological competencies relevant to occupational health nursing practice that the respondent attended within the last three (3) years. BOSH training was treated separately as an inclusion criterion and was not counted as a technological competency-related training for this variable. This was grouped as: none, 1-2 trainings, and 3+ trainings.

Technological Competency. The primary outcome variable of the present study was Technological Competency, which was based upon Locsin's TCCN Theory. This variable measured the level of competency that occupational health nurses feel that they have when using technology as an element of caring in occupational health nursing. It specifically examined their competency in using technology to get to know the patient, provide care, and communicate with patients and their employers. This variable was measured using a research-constructed instrument that was informed by the Technological Competency as Caring in Healthcare Providers Instrument (TCCHI; Yamanaka et al., 2025; 2026) and was rated on a four-point Likert-type scale from 1 (Strongly Disagree) to 4 (Strongly Agree). The mean score for this variable was interpreted according to the scale below.

Mean Score	Interpretation
3.26 - 4.00	Very High
2.51 - 3.25	High
1.76 - 2.50	Low
1.00 - 1.75	Very Low

The Technology Self-Efficacy variable is based upon Bandura's Self-Efficacy Theory. Self-Efficacy Theory was used to investigate the occupational health nurses' confidence in using technology in their profession. This variable was measured according to three domains that measured self-efficacy in technology: Technology Learning, Technology Use, and Technology Problem-Solving. The research-constructed instrument that was informed for this study was from Conte et al. (2023) and included items that will be rated on a four-point Likert-type scale from 1 (Not at All Confident) to 4 (Completely Confident). The mean score was interpreted according to the same scale as Technological Competency.

Perceived Barriers to Technology Utilization

The Perceived Barriers to Technology Utilization variable was based upon Bandura's concept of reciprocal determinism. It examined the occupational health nurses' perceptions of those barriers to their utilization of technology in their profession. It is distinct from the other two outcome variables, as it examined the environment and resources of the nurses rather than their self-efficacy or competency in technology. This variable was measured according to four domains of barriers: Access to Technology-Related Resources, Occupational Health Technology Training, Technology Support, and Technology Integration into OHN Practice. A research-constructed instrument that was used for this study measured this variable according to a four-point Likert-type scale from 1 (Strongly Disagree) to 4 (Strongly Agree) with reverse scoring for negatively worded items. The mean score was interpreted according to the same scale as Technological Competency.

Population and Sampling Techniques

The target population of this study consisted of occupational health nurses in Luzon, Philippines, who had completed the Basic Occupational Safety and Health (BOSH) training accredited by the Occupational Health Nurses Association of the Philippines (OHNAP). The study aimed to include all registered nurses within Luzon who have completed the OHNAP-accredited BOSH training program, regardless of their current membership with OHNAP or other specific requirements. Information regarding technological competency-related trainings attended within the last three (3) years was also collected as part of the respondent's demographic and professional profile. This approach ensured that the population of the study represented all individuals qualified within Luzon to practice as occupational health nurses.

Referral sampling was employed in this study. The initial pool of participants was gathered from OHNAP's official communication channels with the endorsement of the OHNAP national board and the Luzon chapter officers. The nurses within the initial pool of participants were requested to refer other qualified occupational health nurses within their professional networks who would be interested in taking the survey for the study. These referrals were continued until the minimum number of participants required for the study was achieved. Referral sampling was employed in this study because there was no readily available list of all the occupational health nurses in Luzon who have completed the OHNAP-accredited BOSH training program. Furthermore, using the official communication channels of OHNAP provided a structured and controlled method for initiating the study.

Since the total population of BOSH-trained occupational health nurses in Luzon could not be enumerated. The minimum sample size was therefore determined using G*Power version 3.1.9.7, a statistical power analysis software widely used in nursing and health sciences research when the total population size is unknown (Faul et al., 2007).

200 respondents were adopted as the minimum required sample size for this study, ensuring adequate statistical power across all inferential analyses planned for research questions 5 through 8. To account for

potential non-responses and incomplete survey submissions during the referral sampling process, a 20% response rate buffer was applied, yielding a target recruitment figure of 240 respondents. Data collection continued until a minimum of 200 complete and usable responses were obtained.

The inclusion criteria for this study are as follows: (1) The participant must be 18 years of age or older; (2) the participant can be of any sex; (3) the participant must be a licensed registered nurse in the Republic of the Philippines with a currently active professional license from the Professional Regulation Commission (PRC); (4) the participant must have completed the Basic Occupational Safety and Health (BOSH) training accredited by the Occupational Health Nurses Association of the Philippines (OHNAP); (5) the participant must either be currently practicing as a registered nurse in an occupational health capacity in any industry within the Luzon region, or have previously practiced as a registered nurse in an occupational health capacity in any industry within the Luzon region; (6) the participant may have any amount of occupational health experience in the field; (7) the participant may or may not have undergone technological competency-related trainings within the last three (3) years; and (8) the participant must be willing to participate in the study and be able to provide informed consent to do so.

The exclusion criteria for this study are as follows: (1) Registered nurses in the Republic of the Philippines who have never completed the Basic Occupational Safety and Health (BOSH) training accredited by the Occupational Health Nurses Association of the Philippines (OHNAP); (2) registered nurses who are not currently practicing or have never practiced as an occupational health registered nurse; (3) occupational health nurses who are currently practicing outside of the Luzon region; and (4) any nurses who decline to provide informed consent to participate in the study.

Research Locale

The study was conducted among occupational health nurses practicing within Luzon, Philippines. As data were collected through an online survey, no single physical location defined the research locale. Respondents practiced in various workplace settings throughout Luzon, from manufacturing and BPOs to healthcare and government institutions, spanning all eight regions, including the National Capital Region (NCR), Cordillera Administrative Region (CAR), Ilocos Region, Cagayan Valley, Central Luzon, CALABARZON, MIMAROPA, and Bicol Region, in areas covered by Republic Act No. 11058 and Department Order No. 198-18. By encompassing all regions of Luzon, the study ensured that all occupational health nurses from this region are represented in the survey data.

Instrumentation

Description of Instruments

Data were collected using a researcher-constructed survey questionnaire organized into four parts, each addressing one component of the study's Statement of the Problem.

Part I: Demographic Profile collected information on respondents' age, sex, years of occupational health nursing experience, industry, and number of technological competency-related trainings attended within the last three (3) years. Items used categorical response options and numerical entries appropriate to each variable. BOSH training was treated as an inclusion criterion and was not counted as a technological competency-related training for this variable.

Part II: Technological Competency measured respondents' perceived level of technological competency using a researcher-constructed instrument grounded in Locsin's Technological Competency as Caring in Nursing (TCCN) Theory. Item content was contextualized to reflect the specific technological tasks and responsibilities of occupational health nurses in the Philippine workplace settings. The researcher-constructed instrument assessed three domains consistent with the study's Statement of the Problem: (a) Technological Knowing, which refers to the use of technology to know workers more fully through data-driven health assessment and surveillance; (b) Expression of Caring, which refers to the use of technology as a deliberate expression of person-centered caring in occupational health nursing practice; and (c) Technological Connectedness, which

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refers to the use of technology to maintain communication, coordination, and continuity of care between the nurse, workers, and other health professionals. The instrument consisted of 21 items (7 per domain), each rated on a four-point Likert-type scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree.

Part III: Technology Self-Efficacy measured respondents' perceived level of technology self-efficacy using a researcher-constructed instrument informed by the Digital and Technological Self-Efficacy Scale (Digitech-S) developed and validated by Conte et al. (2023). Items reflected the specific technological tasks and responsibilities of occupational health nurses. The instrument assessed three domains: (a) Technology Learning Self-Efficacy, (b) Technology Use Self-Efficacy, and (c) Technology Problem-Solving Self-Efficacy. Items were rated on a four-point Likert-type scale: 1 = Not at All Confident, 2 = Slightly Confident, 3 = Very Confident, 4 = Completely Confident.

Part IV: Perceived Barriers to Technology Utilization measured respondents' perceived barriers using a researcher-constructed instrument grounded in Bandura's framework of triadic reciprocal causation and informed by the relevant literature. Because no single validated instrument was identified that adequately addressed perceived technology barriers specific to occupational health nursing practice, a researcher-constructed instrument was developed following established procedures for scale development, including item generation from the literature, expert panel content validation, and pilot reliability testing. The instrument assessed four domains: (a) Access to Technology-Related Learning Resources, (b) Availability of Occupational Health Technology Training, (c) Institutional and Technical Support for Technology Use, and (d) Integration of Technology into Occupational Health Nursing Practice. Items were rated on a four-point Likert-type scale: 1 = Strongly Disagree to 4 = Strongly Agree, with negatively worded items reverse-scored before analysis.

Scoring and Interpretation. For all three variable instruments, domain scores and overall variable scores were computed as the mean of all items within each domain and across the full scale, respectively. Mean scores were interpreted using a four-level scale: 3.26–4.00 (Very High), 2.51–3.25 (High), 1.76–2.50 (Low), and 1.00–1.75 (Very Low).

Validity and Reliability Measures

The content validity of the researcher-constructed instruments in Parts II, III, and IV was established through a panel of three expert validators who independently evaluated all items prior to the main data collection. The panel consisted of: (1) Raymond D. Papa, MOH, RN, President of the Occupational Health Nurses Association of the Philippines, representing expertise in OHN professional leadership and practice standards; (2) Ryan Salamera Mora, RN, an active occupational health nurse practitioner affiliated with American Crescent Healthcare Centre, representing practitioner-level expertise in OHN technology use; and (3) Drexel Heinz Magpantay Cruz, PhD, RN, RM, CHA, CIN, CLSSYB, CHRA, FISQua, Nursing Director at Biñan Doctors' Hospital, Adjunct Professor at Crestmont Metropolitan University and Far Eastern University, Fellow of the International Society for Quality in Health Care, and thesis adviser of the researcher, representing expertise in nursing research methodology and TCCN Theory. Each validator independently rated all items using a four-point relevance scale, where ratings of 3 or 4 were classified as relevant. The Item-level Content Validity Index (I-CVI) was computed as the proportion of validators rating each item as relevant, with a minimum threshold of 0.80 per item. The Scale-level Content Validity Index (S-CVI/Ave) was computed for each instrument as a whole, with a minimum threshold of 0.90. All 64 items across Parts II, III, and IV achieved an I-CVI of 1.00, and all three instruments achieved an S-CVI/Ave of 1.00, exceeding the required thresholds. Based on the concurrent feedback of Validators 1 and 2, the wording of Demographic Item 5 in Part I was revised to specify technological competency-related trainings completed within the last three (3) years. No items across Parts II, III, or IV were added, deleted, or restructured. All 64 items were retained in their finalized form.

The reliability of the three variable instruments was established through a pilot study conducted with 15 BOSH-trained occupational health nurses who met all inclusion criteria but were recruited independently of the OHNAP referral channels used for the main study, to prevent sample contamination. All 15 pilot

participants completed the full questionnaire, yielding a 100 percent completion rate. Cronbach's coefficient alpha was computed for each domain subscale and the overall instrument using IBM SPSS Statistics 32, with the following classification thresholds following Polit and Beck (2021): below 0.70 as inadequate, 0.70 to 0.79 as acceptable, 0.80 to 0.89 as good, and 0.90 and above as excellent. Part II, the Technological Competency instrument, achieved an overall Cronbach's alpha of 0.913, classified as Excellent, with domain-level alpha values of 0.867 for Technological Knowing, 0.882 for Expression of Caring, and 0.875 for Technological Connectedness, all classified as Good. Part III, the Technology Self-Efficacy instrument, achieved an overall alpha of 0.924, classified as Excellent, with domain-level values of 0.878 for Technology Learning Self-Efficacy, 0.891 for Technology Use Self-Efficacy, and 0.852 for Technology Problem-Solving Self-Efficacy, all classified as Good. Part IV, the Perceived Barriers instrument, achieved an overall alpha of 0.891, classified as Good, with domain-level values of 0.812 for Access to Technology-Related Learning Resources, 0.834 for Availability of OHN Technology Training, 0.803 for Institutional and Technical Support, and 0.821 for Integration of Technology into OHN Practice, all classified as Good. No item across any of the three instruments produced a higher alpha-if-item-deleted value than the obtained scale alpha, confirming that all 64 items contributed positively to internal consistency. All items were retained without revision for the main data collection phase. The complete pilot reliability results are presented in Appendix D.

Data Gathering Procedure

After getting approval from the Institutional Research Ethics Committee of the University of Perpetual Help System DALTA and endorsement from the OHNAP Board, the data collection for this study occurred in three phases.

Phase 1: Pre-Data Collection

Step 1 - Ethics Clearance. The researcher submitted the complete study protocol, including research instruments and data privacy documents, to the Institutional Research Ethics Committee (IREC) of the University of Perpetual Help System DALTA for approval. Data collection commenced only after the approval was received.

Step 2 - Institutional Endorsement. The researcher requested endorsement of the study from the OHNAP national board and Luzon chapter officers to distribute the survey through their official communication channels.

Step 3 - Instrument Finalization and Content Validation. The researcher-constructed instruments for Parts II, III, and IV of the questionnaire were submitted to a panel of three expert validators to evaluate their content. The researcher then calculated the Item-level Content Validity Index (I-CVI) and Scale-level Content Validity Index (S-CVI/Ave). Items that did not meet the required threshold (I-CVI $\geq$ 0.80; S-CVI $\geq$ 0.90) were revised or deleted based on the validators' feedback.

Step 4 - Pilot Testing. The finalized instruments were distributed to 15 BOSH-trained occupational health nurses who fit the inclusion criteria but did not participate in the main study. The researcher calculated the Cronbach's alpha coefficients for each subscale and the overall instrument to test its reliability. Items that significantly decreased the overall alpha upon deletion were reviewed and revised before the main data collection began.

Step 5 - Survey Platform Preparation. The finalized questionnaire, along with the electronic informed consent form and two eligibility screening questions, was encoded in Google Forms. The survey link was tested for functionality and data collection before distribution.

Phase 2: Data Collection

Step 6 - Initial Distribution. The cover letter was distributed through OHNAP's official communication channels (e.g., email, social media, professional networks) along with the Google Forms survey link. The cover letter included information about the study's purpose, voluntary participation, rights of the respondents,

and the confidentiality of their data. Each respondent was requested to refer other eligible BOSH-trained occupational health nurses within their network.

Step 7 - Eligibility Screening. Those who accessed the survey link encountered two eligibility screening questions that confirmed if they have active PRC licensure and if they practice occupational health nursing within Luzon. The screening also identified whether respondents had attended any technological competency-related training within the last three (3) years; however, attendance at such training was not an eligibility requirement. Only those who met these criteria and provided informed consent were able to proceed and complete the full questionnaire.

Step 8 - Follow-Up Distribution. Two weeks after the initial distribution, a follow-up reminder was distributed through OHNAP's communication channels to encourage those who had yet to respond to complete the survey. The referral process continued until at least 200 completed responses were received. Data collection was completed by September 2026.

Phase 3: Post-Collection

Step 9 - Data Screening. After receiving responses in Google Forms, they were exported into Microsoft Excel. Responses that did not have at least 90% of the items answered were excluded from the study. Responses from participants who did not meet the eligibility criteria were also removed.

Step 10 - Data Coding and Encoding. The retained responses were coded and assigned numerical values. The negatively worded items in Part IV were reverse-scored. The cleaned and coded data were then transferred into SPSS for statistical analysis.

Step 11 - Statistical Analysis. The statistical analysis was conducted using descriptive and inferential statistics, as outlined in the Statistical Treatment of Data section of this chapter and as it corresponds to the study's Statement of the Problem.

Step 12 - Data Storage. All raw data from this study, along with the statistical analysis outputs, were stored in a password-protected folder that was accessible only to the researcher. This data storage was in compliance with Republic Act No. 10173 and the study's data Management plan.

Statistical Treatment of Data

Data was analyzed using IBM SPSS Statistics 32. The following statistical tools were employed in the study, as determined by the Statement of the Problem:

Descriptive Statistics

Descriptive statistics were used to describe the demographic profile of the study respondents according to SOP Item 1. The mean and standard deviation were used to describe the levels of technological competency (SOP Item 2), technology self-efficacy (SOP Item 3), and perceived barriers to technology utilization (SOP Item 4).

Inferential Statistics

A Mann-Whitney U Test was used to determine significant differences in the three central variables according to the respondents' sex (SOP Items 5, 6, and 7). Sex is a dichotomous variable with two independent groups, and the Mann-Whitney U Test was selected as the appropriate non-parametric alternative to the Independent Samples t-test, given that normality testing confirmed that all three central variables violated the assumption of normal distribution.

A Kruskal-Wallis H Test was conducted to determine if there are significant differences in the three central variables according to the respondents' age, years of occupational health nursing experience, industry of employment, and number of technological competency-related trainings attended within the last three years

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(SOP Items 5, 6, and 7). Each of these variables has more than two independent groups. The Kruskal-Wallis H Test was selected as the appropriate non-parametric alternative to the One-Way Analysis of Variance (ANOVA), consistent with the normality violations confirmed by the Kolmogorov-Smirnov test (D = 0.103 to 0.184, critical value = 0.0577, N = 236). When the Kruskal-Wallis H Test produced significant results, pairwise Mann-Whitney U comparisons were conducted to identify which specific groups differed.

A Spearman's Rank-Order Correlation Coefficient was conducted between the three central variables (SOP Item 8). Although a Pearson Product-Moment Correlation Coefficient was initially considered, the same normality violations confirmed above rendered the Pearson coefficient inappropriate, and Spearman's rho was employed as the non-parametric alternative. All statistical tests were conducted with an alpha level of 0.05.

r Value	Interpretation
0.00 - 0.19	Negligible
0.20 - 0.39	Weak
0.40 - 0.59	Moderate
0.60 - 0.79	Strong
0.80 - 1.00	Very Strong

The findings of these tests served as the basis for the scholarly output described in SOP Item 9.

Ethical Considerations

This study was conducted in full compliance with the ethical standards prescribed by the Philippine Health Research Ethics Board (PHREB), the institutional research ethics framework of the University of Perpetual Help System DALTA, and the provisions of Republic Act No. 10173 (Data Privacy Act of 2012).

Informed Consent

Participation in the study was entirely voluntary. Prior to accessing the survey questionnaire, all respondents were presented with an electronic informed consent form that clearly describes the study's purpose, procedures, potential benefits and risks, the voluntary nature of participation, the right to withdraw at any time without penalty, and the intended use of the data. Only respondents who acknowledge having read and understood the consent form and indicate willingness to participate will be allowed to proceed.

Confidentiality and Anonymity

No personally identifying information, including name, employer, or specific workplace location, was collected. Respondents were assigned numerical codes for data management purposes. All survey responses were stored on a password-protected Google Drive account accessible only to the researcher and were reported exclusively at the aggregate, group level. Individual responses were not shared with OHNAP, employers, or any third party.

Data Privacy Compliance

In accordance with RA 10173 and its Implementing Rules and Regulations, respondents were informed of the specific personal data being collected, the purpose for which it was used, and their rights to access, correct, or request deletion of their data. All data were securely stored for a period not exceeding five years from the completion of the study, after which they were permanently deleted.

Freedom from Harm

The study involved no experimental procedures, no clinical interventions, and no collection of sensitive personal health information. The risk of harm to participants is assessed as minimal. Participation required approximately 15 to 20 minutes to complete.

AI Disclosure

In compliance with Sections 4.3.2 and 4.3.4 of the UPHSD Graduate School Research Manual (2025–2030), the researcher discloses that artificial intelligence tools were used in the preparation of this manuscript. All AI tools were used for literature organization, drafting support, conceptual feedback, and manuscript refinement. All research decisions, variable definitions, interpretations, analyses, and conclusions are solely the researcher's own. A complete AI Disclosure Statement and report are provided in Appendix E.

Social Value

This study is needed because there is a lack of research in occupational health nursing in the Philippines. The findings from this study informed the development of occupational health nurses, the continuing education that nurses receive from OHNAP, and the policies that regulate occupational health personnel according to Republic Act No. 11058. Therefore, this study had a significant social value as it is designed to produce findings that will lead to improvements in the health services provided to Filipino workers.

Risks and Benefits

The risks to participants in this study are minimal. There are no experimental procedures or clinical interventions performed in the study, nor is there a collection of sensitive health information from participants. The only risk that participants face is the expenditure of a small amount of time to complete the study's questionnaire, which is estimated to take between 15 to 20 minutes of their time. There is no physical, psychological, social, or legal risk associated with participating in this study. The benefits to participants include contributing to the advancement of occupational health nursing practice in the Philippines, from which both the participants and their professional community stand to benefit.

Transparency

All participants in this study were informed about all aspects of the study. Participants received an informed consent form that included the study's objectives, the data that were collected, the use and dissemination of study findings, and the identities of both the researcher and the thesis advisor. Participants will also be informed that study findings were published or presented in professional forums, with all data provided in aggregate form.

Justice

This study upheld the principle of justice through equitable selection of participants. The selection criteria for this study are solely based on professionally relevant qualifications for occupational health nurses, and no other selection criteria were utilized. Therefore, no group of occupational health nurses was favored or disadvantaged in their selection to participate in this study.

Data Management Plan

All data collected throughout this study were managed in accordance with Republic Act No. 10173 (Data Privacy Act of 2012) and its Implementing Rules and Regulations. Data was collected through Google Forms with an encrypted data transmission feature. No paper-based data was collected from participants. The researcher had exclusive access to the raw data collected through Google Forms by logging into their secured Google account with two-factor authentication. Data were stored in a password-protected folder on the researcher's personal device and a secure cloud storage platform with restricted access to the researcher only. Data were not shared with OHNAP, the participants' employers, or any third party. Data were retained for a maximum of five (5) years from the date that the thesis was completed and submitted. After this five-year period has expired, all research data will be permanently deleted from all data storage platforms.

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Presentation, Analysis, and Interpretation of Data

This chapter presents the results of the statistical analyses conducted to address the nine research questions of this study. The data were collected from 236 BOSH-trained occupational health nurses across all regions of Luzon, Philippines, from August to September 2026. Descriptive statistics are presented first for the demographic profile and for the three central variables. Hypothesis testing results follow for each inferential research question, using non-parametric tests confirmed appropriate by the Kolmogorov-Smirnov normality test. Interpretations of all statistical findings are provided after each set of results. Graphs and figures are embedded alongside the relevant tables to support visual interpretation of key patterns.

Prior to inferential analyses, all domain scores were tested for normality using the Kolmogorov-Smirnov (Lilliefors) test (N = 236, critical value = 0.0577). All nine domain variables across the three central constructs violated the normality assumption (D statistics ranging from 0.103 to 0.184, all exceeding the critical value at $\alpha = .05$). Non-parametric alternatives were therefore used throughout: the Mann-Whitney U test for two-group comparisons (sex), the Kruskal-Wallis H test for three or more group comparisons (age, experience, industry, trainings), and Spearman's rank-order correlation for examining relationships (RQ8). All inferential tests used an alpha level of $\alpha = .05$.

Research Question 1: Demographic Profile

Tables 1 through 5 present the frequency distributions of the five demographic profile variables.

Table 1. Frequency Distribution of Respondents by Age (n = 236)

Age Group	Frequency (f)	Percentage (%)
20–29 years	17	7.20%
30–39 years	127	53.81%
40–49 years	55	23.31%
50 years and above	37	15.68%
Total	236	100.00%

Note. The age group with the highest frequency is 30–39 years (53.81%), representing the majority of respondents.

The age distribution of the 236 respondents shows that the majority were in the 30–39 years age group (f = 127, 53.81%), followed by the 40–49 years group (f = 55, 23.31%), the 50 years and above group (f = 37, 15.68%), and the 20–29 years group with the least representation (f = 17, 7.20%). This suggests that the OHN workforce in Luzon is predominantly composed of mid-career nurses.

Table 2. Frequency Distribution of Respondents by Sex (n = 236)

Sex	Frequency (f)	Percentage (%)
Male	102	43.22%
Female	134	56.78%
Total	236	100.00%

Note. Female OHNs comprise the majority of respondents (56.78%).

Female respondents outnumbered male respondents (f = 134, 56.78% vs. f = 102, 43.22%), consistent with the general gender composition of the Philippine nursing profession.

Table 3. Frequency Distribution of Respondents by Years of OHN Experience (n = 236)

Years of OHN Experience	Frequency (f)	Percentage (%)
Less than 2 years	52	22.03%

2 to 5 years	73	30.93%
6 to 10 years	59	25.00%
11 to 15 years	39	16.53%
16 to 20 years	0	0.00%
More than 20 years	13	5.51%
Total	236	100.00%

Note. No respondents fell in the 16–20 years of experience category. The 2–5 years group is the most represented (30.93%).

The most common experience level was 2 to 5 years (f = 73, 30.93%), followed by 6 to 10 years (f = 59, 25.00%). The 16 to 20 years category had no respondents. Those with more than 20 years represented the smallest group (f = 13, 5.51%).

Table 4. Frequency Distribution of Respondents by Industry (n = 236)

Industry	Frequency (f)	Percentage (%)
Construction and Infrastructure	85	36.02%
Manufacturing and Industrial	53	22.46%
Business Process Outsourcing (BPO) and Corporate Services	42	17.80%
Government and Public Services	15	6.36%
Healthcare and Hospitals	7	2.97%
Transportation and Logistics	6	2.54%
Manpower Services	4	1.69%
Education and Schools/Universities	4	1.69%
Aviation MRO	4	1.69%
NGO	3	1.27%
Assaying Laboratory	3	1.27%
Hospitality	3	1.27%
Power Plant Industry	3	1.27%
Golf and Hotel Accommodation	3	1.27%
Consultancy	1	0.42%
Total	236	100.00%

Note: Construction and Infrastructure is the most represented industry (36.02%). The sample spans 15 distinct industry categories across Luzon.

The sample represented a diverse range of industries across Luzon. Construction and Infrastructure was the most represented sector (f = 85, 36.02%), followed by Manufacturing and Industrial (f = 53, 22.46%), and BPO and Corporate Services (f = 42, 17.80%). These three sectors accounted for 76.27% of respondents. The remaining 23.73% was distributed across 12 additional industry categories.

Table 5. Frequency Distribution of Respondents by Number of Technological Competency-Related Trainings in the Last Three Years (n = 236)

Training Category	Frequency (f)	Percentage (%)
None	128	54.24%
1 to 2 competency-related trainings	65	27.54%
3 or more competency-related trainings	43	18.22%
Total	236	100.00%

Note: Over half of respondents (54.24%) attended no technology-related trainings in the last three years, excluding BOSH.

The majority of respondents (f = 128, 54.24%) had attended no technological competency-related trainings in

the past three years. Only 27.54% attended one to two trainings, and 18.22% attended three or more. This finding indicates a significant professional development gap in technology-related learning among the sampled OHN population.

Research Question 2: Perceived Level of Technological Competency

Tables 6 through 9 present the mean scores, standard deviations, and verbal interpretations for each item within the three domains of technological competency, followed by the overall domain summary. The scale used is: 3.26–4.00 = **Strongly Agree/Very High**; 2.51–3.25 = **Agree/High**; 1.76–2.50 = **Disagree/Low**; 1.00–1.75 = **Strongly Disagree/Very Low**.

Table 6. Perceived Level of Technological Competency: Domain A - Technological Knowing (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
1	I use digital health records and information systems to gather comprehensive data about the health status of the workers I serve.	3.40	0.61	**Strongly Agree**	**Very High**
2	I use technology to monitor changes in workers' health conditions over time, allowing me to recognize emerging health concerns early.	3.33	0.61	**Strongly Agree**	**Very High**
3	I use health surveillance technologies to identify occupational health risks and hazards that may affect the overall well-being of workers.	3.16	0.71	**Agree**	**High**
4	I use digital tools and systems to assess workers' physical, mental, and occupational health needs in a thorough and systematic manner.	3.09	0.70	**Agree**	**High**
5	I use technology to analyze occupational health data and translate findings into meaningful information that guides my nursing decisions.	3.33	0.63	**Strongly Agree**	**Very High**
6	I am able to use digital health records to develop a comprehensive understanding of each worker as a whole person, beyond their immediate health complaint.	3.22	0.61	**Agree**	**High**
7	I use technology-based assessment tools to identify workers who may be at risk for occupational illness or injury before symptoms become apparent.	3.23	0.58	**Agree**	**High**
—	**Overall Domain Mean**	3.25	0.45	**Agree**	**High**

Note: M = Mean; SD = Standard Deviation. Items are rated on a 4-point Likert scale (1 = Strongly Disagree to 4 = Strongly Agree).

The perceived level of technological competency in the domain of Technological Knowing yielded an overall mean of 3.25 (SD = 0.45), verbally interpreted as **Agree/High**. The highest-rated item was the use of digital health records to gather comprehensive data (M = 3.40, SD = 0.61). The lowest-rated item was the use of digital tools for thorough and systematic worker assessment (M = 3.09, SD = 0.70). Three of seven items were rated Very High, and four were rated High, indicating a generally strong but not uniformly advanced level of technological knowing among respondents.

Table 7. Perceived Level of Technological Competency: Domain B - Expression of Caring (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
8	I use technology as a tool for caring — not merely for efficiency, but to provide more individualized and responsive health services to the workers I serve.	3.08	0.49	**Agree**	**High**

9	I use digital health records and documentation systems to ensure that the care I provide to workers is continuous, accurate, and respectful of their individual health needs.	3.33	0.52	**Strongly Agree**	**Very High**
10	I use technology to deliver health education and wellness information to workers in a way that is personalized to their specific occupational health concerns.	3.42	0.62	**Strongly Agree**	**Very High**
11	When I use technology in occupational health nursing practice, I remain focused on the worker as a whole person rather than on the technology itself.	3.39	0.55	**Strongly Agree**	**Very High**
12	I use digital tools to plan and implement workplace health programs that address the specific health needs of the workers in my care.	3.42	0.57	**Strongly Agree**	**Very High**
13	I am able to balance the demands of using technology competently with maintaining a caring and person-centered approach to occupational health nursing.	3.27	0.61	**Strongly Agree**	**Very High**
14	I use technology-supported clinical decision-making tools to ensure that the health interventions I recommend are appropriate, safe, and responsive to workers' individual conditions.	3.04	0.63	**Agree**	**High**
—	**Overall Domain Mean**	3.28	0.37	**Strongly Agree**	**Very High**

Note: M = Mean; SD = Standard Deviation. The overall domain mean of 3.28 falls within the Very High range (3.26–4.00).

Expression of Caring yielded an overall mean of 3.28 (SD = 0.37), verbally interpreted as **Strongly Agree/Very High**. The highest-rated items were personalized health education delivery (M = 3.42) and digital tools for workplace health programs (M = 3.42). The lowest-rated item was technology-supported clinical decision-making (M = 3.04). Five of seven items were rated Very High, indicating that respondents generally perceived a strong caring orientation in their technology use.

Table 8. Perceived Level of Technological Competency: Domain C - Technological Connectedness (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
15	I use digital communication platforms to maintain regular and accessible communication with the workers I serve regarding their occupational health concerns.	3.32	0.62	**Strongly Agree**	**Very High**
16	I use technology to coordinate with occupational physicians, safety officers, and other health professionals regarding the management of workers' health conditions.	3.41	0.56	**Strongly Agree**	**Very High**
17	I use teleconsultation or digital referral systems to connect workers with appropriate healthcare services when their needs exceed the scope of my occupational health nursing	3.27	0.73	**Strongly Agree**	**Very High**

	practice.				
18	I use digital reporting and documentation systems to maintain accurate, timely, and legally compliant occupational health records for the workers in my care.	3.41	0.57	**Strongly Agree**	**Very High**
19	I use technology to submit required occupational health reports to the Department of Labor and Employment (DOLE) and other regulatory bodies efficiently and accurately.	3.36	0.59	**Strongly Agree**	**Very High**
20	I use digital platforms to communicate workplace health findings, surveillance results, and health promotion materials to workers and management in a clear and accessible manner.	3.42	0.60	**Strongly Agree**	**Very High**
21	I am able to use technology to maintain the continuity of occupational health nursing care for workers even when face-to-face interaction is limited or not immediately possible.	3.33	0.58	**Strongly Agree**	**Very High**
—	**Overall Domain Mean**	3.36	0.44	**Strongly Agree**	**Very High**

Note: M = Mean; SD = Standard Deviation. All seven items in this domain were rated Very High, indicating the strongest domain among the three competency domains.

Technological Connectedness yielded the highest overall mean among the three competency domains at 3.36 (SD = 0.44), verbally interpreted as **Strongly Agree/Very High**. All seven items within this domain were rated Very High. The highest-rated item was digital platform use for communicating health findings (M = 3.42). The lowest-rated item was the use of teleconsultation or digital referral systems (M = 3.27).

Table 9. Summary of the Perceived Level of Technological Competency Across Three Domains (n = 236)

Domain	M	SD	Verbal Interpretation	Descriptive Interpretation
a. Technological Knowing	3.25	0.45	**Agree**	**High**
b. Expression of Caring	3.28	0.37	**Strongly Agree**	**Very High**
c. Technological Connectedness	3.36	0.44	**Strongly Agree**	**Very High**
Overall Technological Competency	3.30	0.32	**Strongly Agree**	**Very High**

Note: Scale: 3.26–4.00 = Strongly Agree/Very High; 2.51–3.25 = Agree/High; 1.76–2.50 = Disagree/Low; 1.00–1.75 = Strongly Disagree/Very Low.

The overall perceived level of technological competency across all three domains was 3.30 (SD = 0.32), verbally interpreted as **Strongly Agree/Very High**. Technological Connectedness was the highest-rated domain (M = 3.36), followed by Expression of Caring (M = 3.28) and Technological Knowing (M = 3.25). Technological Knowing was the only domain rated High rather than Very High, indicating that while OHNs generally perceive strong technological competency, the domain most directly associated with person-centered knowing of workers through technology represents the area for greatest improvement.

Research Question 3: Perceived Level of Technology Self-Efficacy

Tables 10 through 13 present the descriptive statistics for Technology Self-Efficacy across three domains. The scale is: 3.26–4.00 = **Completely Confident/Very High**; 2.51–3.25 = **Very Confident/High**; 1.76–2.50 = **Slightly Confident/Low**; 1.00–1.75 = **Not at All Confident/Very Low**.

Table 10. Perceived Level of Technology Self-Efficacy: Domain A — Technology Learning Self-Efficacy (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
1	I am confident that I can learn to use a new digital health record system for occupational health nursing documentation even if I have had no prior training on it.	3.15	0.83	**Very Confident**	**High**
2	I am confident that I can independently learn to operate a new digital workplace health surveillance platform when it is introduced in my workplace.	3.13	0.87	**Very Confident**	**High**
3	I am confident that I can acquire the technological skills needed to use new digital tools for occupational health assessments through self-study or online resources.	3.15	0.83	**Very Confident**	**High**
4	I am confident that I can update my technology-related knowledge and skills to keep pace with the digital tools being used in occupational health nursing practice.	3.14	0.81	**Very Confident**	**High**
5	I am confident that I can learn to use digital communication platforms for occupational health service delivery even without formal instruction.	3.03	0.86	**Very Confident**	**High**
6	I am confident that I can complete online training programs or tutorials to develop my digital competencies in occupational health nursing when opportunities are available.	3.17	0.80	**Very Confident**	**High**
—	**Overall Domain Mean**	3.13	0.75	**Very Confident**	**High**

Note: M = Mean; SD = Standard Deviation. All six items were rated Very Confident/High. The highest-rated item was Item 6 (M = 3.17), and the lowest was Item 5 (M = 3.03).

Technology Learning Self-Efficacy yielded an overall mean of 3.13 (SD = 0.75), verbally interpreted as **Very Confident/High**. All six items were rated within the High range. Respondents expressed the highest confidence in completing online training programs (M = 3.17) and the lowest confidence in learning digital communication platforms without formal instruction (M = 3.03).

Table 11. Perceived Level of Technology Self-Efficacy: Domain B — Technology Use Self-Efficacy (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
7	I am confident that I can accurately encode, update, and retrieve worker health records using electronic health record systems used in my workplace.	3.31	0.64	**Completely Confident**	**Very High**
8	I am confident that I can use digital tools to conduct and document occupational health assessments accurately and efficiently.	3.36	0.66	**Completely Confident**	**Very High**
9	I am confident that I can prepare and submit occupational health reports using digital or	3.35	0.72	**Completely Confident**	**Very High**

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	electronic reporting systems.				
10	I am confident that I can use digital health surveillance systems to monitor and track the health status and occupational health risks of the workers in my care.	3.37	0.70	**Completely Confident**	**Very High**
11	I am confident that I can effectively use digital communication technologies to deliver occupational health services and referrals.	3.24	0.71	**Very Confident**	**High**
12	I am confident that I can use technology to access and apply evidence-based occupational health guidelines and reference materials in my daily practice.	3.25	0.74	**Very Confident**	**High**
13	I am confident that I can navigate and operate the digital systems required in my workplace to fulfill my occupational health nursing responsibilities without requiring frequent assistance.	3.22	0.71	**Very Confident**	**High**
—	**Overall Domain Mean**	3.30	0.62	**Completely Confident**	**Very High**

Note: M = Mean; SD = Standard Deviation. The overall domain mean of 3.30 is interpreted as Completely Confident/Very High (3.26–4.00). This is the highest-scoring self-efficacy domain.

Technology Use Self-Efficacy obtained the highest overall mean among the three self-efficacy domains at 3.30 (SD = 0.62), verbally interpreted as **Completely Confident/Very High**. Four items were rated Very High, and three items were rated High. Respondents expressed the highest confidence in using digital surveillance systems (M = 3.37) and the lowest confidence in navigating digital systems independently (M = 3.22).

Table 12. Perceived Level of Technology Self-Efficacy: Domain C — Technology Problem-Solving Self-Efficacy (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
14	I am confident that I can identify the cause of a technical problem affecting the digital tools I use in my occupational health nursing practice.	2.85	0.92	**Very Confident**	**High**
15	I am confident that I can resolve minor technical difficulties with digital health systems independently, without always needing to contact technical support.	2.89	0.88	**Very Confident**	**High**
16	I am confident that I can find alternative ways to complete my occupational health nursing tasks when a digital system I normally use becomes unavailable or malfunctions.	3.15	0.84	**Very Confident**	**High**
17	I am confident that I can troubleshoot problems with digital occupational health records, surveillance tools, or reporting systems when I encounter errors or unexpected issues.	2.76	1.00	**Very Confident**	**High**
18	I am confident that I can adapt quickly when a digital tool I use in my occupational health nursing practice is updated, changed, or replaced by a different system.	3.07	0.91	**Very Confident**	**High**
19	I am confident that I can seek out and apply appropriate technical support resources to resolve technology problems that I cannot address on my own.	3.00	0.90	**Very Confident**	**High**
—	**Overall Domain Mean**	2.95	0.81	**Very Confident**	**High**

Note: M = Mean; SD = Standard Deviation. This is the lowest-scoring domain of the three. Item 17 (troubleshooting errors) received the lowest mean score across all self-efficacy items (M = 2.76, SD = 1.00).

Technology Problem-Solving Self-Efficacy was the lowest-scoring self-efficacy domain with an overall mean of 2.95 (SD = 0.81), verbally interpreted as **Very Confident/High**. The lowest-rated item was troubleshooting system errors (M = 2.76, SD = 1.00), followed by identifying the cause of technical problems (M = 2.85). The highest-rated item was finding alternative ways to complete tasks during system unavailability (M = 3.15), suggesting that OHNs are more confident in workaround strategies than in active technical troubleshooting.

Table 13. Summary of the Perceived Level of Technology Self-Efficacy Across Three Domains (n = 236)

Domain	M	SD	Verbal Interpretation	Descriptive Interpretation
a. Technology Learning Self-Efficacy	3.13	0.75	**Very Confident**	**High**
b. Technology Use Self-Efficacy	3.30	0.62	**Completely Confident**	**Very High**
c. Technology Problem-Solving Self-Efficacy	2.95	0.81	**Very Confident**	**High**
Overall Technology Self-Efficacy	3.13	0.66	**Very Confident**	**High**

Note: Scale: 3.26–4.00 = Completely Confident/Very High; 2.51–3.25 = Very Confident/High; 1.76–2.50 = Slightly Confident/Low; 1.00–1.75 = Not at All Confident/Very Low.

The overall perceived level of technology self-efficacy was 3.13 (SD = 0.66), verbally interpreted as **Very Confident/High**. Technology Use Self-Efficacy was the highest-scoring domain (M = 3.30, Very High), followed by Technology Learning Self-Efficacy (M = 3.13, High) and Technology Problem-Solving Self-Efficacy (M = 2.95, High). The gap between Technology Use and Technology Problem-Solving (0.35 points) represents the most notable discrepancy within the self-efficacy variable.

Research Question 4: Perceived Barriers to Technology Utilization

Tables 14 through 18 present the descriptive statistics for the four domains of Perceived Barriers. After reverse-scoring of negatively worded items (marked *), higher scores indicate fewer perceived barriers. Verbal interpretations: 3.26–4.00 = **Strongly Agree/Minor Barrier**; 2.51–3.25 = **Agree/Slight Barrier**; 1.76–2.50 = **Disagree/Moderate Barrier**; 1.00–1.75 = **Strongly Disagree/Major Barrier**.

Table 14. Perceived Barriers: Domain A — Access to Technology-Related Learning Resources (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
1	I have sufficient access to online learning materials that can help me develop my digital skills for occupational health nursing practice.	2.50	0.94	**Disagree**	**Moderate Barrier**
2	I have access to updated references, guidelines, and informational resources about the digital tools used in occupational health nursing.	2.39	0.92	**Disagree**	**Moderate Barrier**
3	The equipment and devices I need to practice and develop my digital skills in occupational health nursing are available to me.	2.31	0.97	**Disagree**	**Moderate Barrier**
4	Reliable internet connectivity is consistently available in my workplace, allowing me to access online resources for professional development.	2.53	1.00	**Agree**	**Slight Barrier**
5	I am aware of professional development opportunities focused on technology use in occupational health nursing that I can access.	2.50	0.98	**Disagree**	**Moderate Barrier**

6*	The cost of technology-related learning resources and professional development programs is a barrier to my digital skills development as an occupational health nurse. [Reverse-scored]	1.48	0.73	**Strongly Disagree**	**Major Barrier**
—	**Overall Domain Mean**	2.29	0.56	**Disagree**	**Moderate Barrier**

Note: M = Mean; SD = Standard Deviation. Items marked * are negatively worded and were reverse-scored before analysis (SA=1, A=2, D=3, SD=4). Lower scores indicate higher perceived barriers.

Access to Technology-Related Learning Resources yielded an overall mean of 2.29 (SD = 0.56), interpreted as **Disagree/Moderate Barrier** (Rank 4 — least prominent among the four domains). The most accessible element was internet connectivity (M = 2.53, Slight Barrier). The most significant barrier within this domain was the cost of technology-related learning resources and professional development (M = 1.48, Major Barrier, reverse-scored).

Table 15. Perceived Barriers: Domain B — Availability of Occupational Health Technology Training (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
7	My employer or organization provides formal training on the digital systems and technologies I am expected to use in my occupational health nursing practice.	2.29	1.00	**Disagree**	**Moderate Barrier**
8	The technology-related training I have received has been sufficient to allow me to use digital tools effectively in my occupational health nursing work.	2.23	0.99	**Disagree**	**Moderate Barrier**
9	OHNAP or other professional nursing organizations offer continuing education programs specifically focused on technology and digital competency for occupational health nurses.	2.35	1.00	**Disagree**	**Moderate Barrier**
10*	New digital systems or tools are introduced in my workplace without adequate orientation or training for occupational health nursing staff. [Reverse-scored]	1.70	0.84	**Strongly Disagree**	**Major Barrier**
11*	Training on technology use in occupational health nursing is difficult to access because it is rarely offered, too expensive, or geographically inaccessible. [Reverse-scored]	1.53	0.75	**Strongly Disagree**	**Major Barrier**
12	I have had opportunities to practice using digital health tools in a supervised or supported environment before being required to use them independently in practice.	2.30	1.03	**Disagree**	**Moderate Barrier**
—	**Overall Domain Mean**	2.07	0.51	**Disagree**	**Moderate Barrier**

Note: M = Mean; SD = Standard Deviation. This domain was ranked Rank 1 — the most prominent perceived barrier. Items 10 and 11 were the two lowest-scoring items across the entire study (M = 1.70 and M = 1.53, respectively).

Availability of Occupational Health Technology Training yielded the lowest overall domain mean at 2.07 (SD = 0.51), interpreted as **Disagree/Moderate Barrier** and ranked as the most prominent barrier domain. The lowest-rated item was the difficulty of accessing technology training due to scarcity, cost, or geographic inaccessibility (M = 1.53, Major Barrier), followed by the introduction of new systems without adequate

training (M = 1.70, Major Barrier). These findings indicate that structured, accessible, and contextualized OHN technology training is a critical unmet need.

Table 16. Perceived Barriers: Domain C — Institutional and Technical Support for Technology Use (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
13	My employer actively supports and encourages the use of digital tools and technology in my occupational health nursing practice.	2.58	0.99	**Agree**	**Slight Barrier**
14	Technical assistance is available to me when I encounter problems with the digital systems I use in my work.	2.26	0.94	**Disagree**	**Moderate Barrier**
15	The digital systems and technologies available in my workplace are reliable and function consistently enough to support my occupational health nursing practice.	2.55	0.91	**Agree**	**Slight Barrier**
16*	Insufficient budget allocation for technology infrastructure in my workplace limits my ability to use digital tools effectively in occupational health nursing. [Reverse-scored]	1.57	0.79	**Strongly Disagree**	**Major Barrier**
17*	I am required to use outdated or poorly maintained digital systems that make technology use in my occupational health nursing practice difficult or inefficient. [Reverse-scored]	1.94	0.94	**Disagree**	**Moderate Barrier**
18	My immediate supervisor or management team demonstrates an understanding of and support for the role of technology in occupational health nursing practice.	2.47	0.97	**Disagree**	**Moderate Barrier**
—	**Overall Domain Mean**	2.23	0.53	**Disagree**	**Moderate Barrier**

Note: M = Mean; SD = Standard Deviation. This domain was ranked 3. Insufficient budget (M = 1.57) was the most prominent individual institutional barrier.

Institutional and Technical Support yielded an overall mean of 2.23 (SD = 0.53), interpreted as **Disagree/Moderate Barrier** (Rank 3). Employer support (M = 2.58) and system reliability (M = 2.55) were rated as Slight Barriers, suggesting some positive institutional engagement. However, insufficient budget allocation for technology infrastructure (M = 1.57) was identified as a Major Barrier, indicating that financial constraints significantly limit OHN technology utilization.

Table 17. Perceived Barriers: Domain D — Integration of Technology into Occupational Health Nursing Practice (n = 236)

No.	Statement	M	SD	Verbal Interpretation	Descriptive Interpretation
19	The digital systems I use in my occupational health nursing practice are compatible with the established workflows and procedures of my workplace clinic or health unit.	2.32	0.94	**Disagree**	**Moderate Barrier**
20*	Using digital tools in my occupational health nursing practice requires more time than traditional paper-based methods, making it difficult to integrate technology into my daily work. [Reverse-scored]	1.68	0.79	**Strongly Disagree**	**Major Barrier**
21*	The digital systems available in my workplace are too complicated or difficult to navigate to be used effectively in my daily occupational health nursing responsibilities. [Reverse-	1.95	0.91	**Disagree**	**Moderate Barrier**

	scored]				
22	Technology has improved the efficiency and quality of the occupational health nursing services I provide to workers in my care.	2.36	0.93	**Disagree**	**Moderate Barrier**
23	I am able to integrate the use of digital tools into my occupational health nursing practice without significantly disrupting my existing clinical routines.	2.45	0.96	**Disagree**	**Moderate Barrier**
24*	Concerns about worker privacy and data confidentiality make me hesitant to use digital systems for managing occupational health records and surveillance data. [Reverse-scored]	1.74	0.85	**Strongly Disagree**	**Major Barrier**
—	**Overall Domain Mean**	2.08	0.51	**Disagree**	**Moderate Barrier**

Note: M = Mean; SD = Standard Deviation. This domain was ranked 2nd. Time burden (M = 1.68) and privacy concerns (M = 1.74) were the two most prominent individual integration barriers.

Technology Integration yielded an overall mean of 2.08 (SD = 0.51), interpreted as **Disagree/Moderate Barrier** (Rank 2). Time burden from digital tools compared to paper-based methods (M = 1.68) and worker privacy and data confidentiality concerns (M = 1.74) were the two most prominent individual barrier items across the entire study. These findings highlight unique OHN-specific barriers not commonly addressed in existing nursing technology barrier literature.

Table 18. Summary of Perceived Barriers to Technology Utilization Across Four Domains (n = 236)

Domain	M	SD	Verbal Interpretation	Descriptive Interpretation	Rank
a. Access to Technology-Related Learning Resources	2.29	0.56	**Disagree**	**Moderate Barrier**	4
b. Availability of Occupational Health Technology Training	2.07	0.51	**Disagree**	**Moderate Barrier**	1
c. Institutional and Technical Support	2.23	0.53	**Disagree**	**Moderate Barrier**	3
d. Integration of Technology into OHN Practice	2.08	0.51	**Disagree**	**Moderate Barrier**	2
Overall Perceived Barriers	2.17	0.43	**Disagree**	**Moderate Barrier**	—

Note: Rank 1 = most prominent barrier; Rank 4 = least prominent. All four domains were rated within the Moderate Barrier range. Lower means indicate higher perceived barriers after reverse-scoring.

The overall perceived barriers score was 2.17 (SD = 0.43), indicating **Moderate Barriers** across all four domains. Availability of Occupational Health Technology Training ranked first (most prominent barrier, M = 2.07), followed by Integration of Technology (M = 2.08), Institutional and Technical Support (M = 2.23), and Access to Learning Resources (M = 2.29). All four domains fell within the Moderate Barrier range, indicating consistent and persistent — though not overwhelming — obstacles to technology utilization across the entire sample.

Research Questions 5–7: Significant Differences by Demographic Profile

The following section presents the results of non-parametric hypothesis tests conducted to determine whether significant differences in the three central variables exist when respondents are grouped according to their five

demographic profile variables. The Mann-Whitney U test was used for sex (two groups), and the Kruskal-Wallis H test was used for age, years of experience, industry, and number of trainings (three or more groups). The significance threshold was set at $\alpha = .05$.

Research Question 5: Significant Differences in Technological Competency

Table 19. Kruskal-Wallis H and Mann-Whitney U Test Results: Significant Differences in Technological Competency by Demographic Profile (n = 236)

Profile Variable	**Test Used**	**Technological Knowing**			**Expression of Caring**		
		Statistic	**p-value**	**Result**	**Statistic**	**p-value**	**Result**
Age	Kruskal-Wallis H	H = 25.55	p < .001	**Significant**	H = 11.54	p = .009	**Significant**
Sex	Mann-Whitney U	U = 4,305, z = −4.87	p < .001	**Significant**	U = 6,565, z = −0.52	p = .605	Not Significant
Years of Experience	Kruskal-Wallis H	H = 35.43	p < .001	**Significant**	H = 9.51	p = .050*	**Significant**
Industry	Kruskal-Wallis H	H = 53.57	p < .001	**Significant**	H = 83.07	p < .001	**Significant**
Trainings Attended	Kruskal-Wallis H	H = 2.12	p = .347	Not Significant	H = 2.11	p = .348	Not Significant

Profile Variable	**Test Used**	**Technological Connectedness (Statistic)**	**p-value**	**Result**	**Overall Interpretation**
Age	Kruskal-Wallis H	H = 2.77	p = .428	Not Significant	Significant in 2 of 3 domains
Sex	Mann-Whitney U	U = 6,826.5, z = −0.01	p = .989	Not Significant	Significant in Technological Knowing only
Years of Experience	Kruskal-Wallis H	H = 22.73	p < .001	Significant	Significant in ALL 3 domains
Industry	Kruskal-Wallis H	H = 55.05	p < .001	Significant	Significant in ALL 3 domains
Trainings Attended	Kruskal-Wallis H	H = 2.10	p = .350	Not Significant	Not significant in any domain

Note: * p = .0496, reported as .050 when rounded; however, the precise value falls below the $\alpha = .05$ criterion and is therefore considered statistically significant. df = 3 for age; df = 4 for years of experience and industry (14 groups); df = 2 for trainings.

Significant differences in technological competency were found for **age** in Technological Knowing (H = 25.55, p < .001) and Expression of Caring (H = 11.54, p = .009), but not in Technological Connectedness (H = 2.77, p = .428). For **sex**, a significant difference was found only in Technological Knowing (U = 4,305, z = −4.87, p < .001), but not in the other two domains. **Years of experience** were significantly associated with all three domains (p values: < .001, .050, < .001). **Industry** showed the strongest pattern, with significant differences across all three domains (H values ranging from 53.57 to 83.07, all p < .001). **Number of additional trainings** was not significantly associated with any competency domain, suggesting that current training formats do not produce measurable competency differences.

Research Question 6: Significant Differences in Technology Self-Efficacy

Table 20. Kruskal-Wallis H and Mann-Whitney U Test Results: Significant Differences in Technology Self-Efficacy by Demographic Profile (n = 236)

Profile Variable	Test	Learning SE			Use SE			Problem-Solving SE
		Stat	p	Result	Stat	p	Result	(Stat / p / Result)
Age	KW	H=10.87	p=.013	**Significant**	H=3.22	p=.359	Not Significant	**H=16.52, p<.001, Significant**
Sex	MWU	U=6726, z=−0.21	p=.835	Not Sig.	U=5987.5, z=−1.63	p=.103	Not Significant	U=6647.5, z=−0.36, p=.720, Not Significant
Yrs. Exp.	KW	H=23.39	p<.001	**Significant**	H=8.89	p=.064	Not Significant	**H=25.56, p<.001, Significant**
Industry	KW	H=65.08	p<.001	**Significant**	H=51.06	p<.001	**Significant**	**H=58.61, p<.001, Significant**
Trainings	KW	H=6.78	p=.034	**Significant**	H=11.95	p=.003	**Significant**	H=4.33, p=.115, Not Significant

Note: KW = Kruskal-Wallis H; MWU = Mann-Whitney U; SE = Self-Efficacy. Alpha level = .05. Industry tested with df = 14 (15 distinct industry categories represented in the data).

Age was significantly associated with Technology Learning (H = 10.87, p = .013) and Problem-Solving Self-Efficacy (H = 16.52, p < .001) but not Technology Use Self-Efficacy. **Sex** showed no significant differences in any self-efficacy domain, departing from international literature patterns. **Years of experience** were significant for the Learning and Problem-Solving domains but not for Use Self-Efficacy.

Industry was the only variable with significant differences across all three self-efficacy domains (H values from 51.06 to 65.08, all p < .001). Notably, **training frequency** showed significant differences in Learning and Use Self-Efficacy but not Problem-Solving Self-Efficacy, suggesting that training builds confidence in learning and use applications but does not substantially improve troubleshooting confidence.

Research Question 7: Significant Differences in Perceived Barriers

Table 21. Kruskal-Wallis H and Mann-Whitney U Test Results: Significant Differences in Perceived Barriers by Demographic Profile (n = 236)

Profile Variable	Test	Access (Domain A)		Training Avail. (Domain B)		Inst. Support (Domain C)	
		Stat / p	Result	Stat / p	Result	Stat / p	Result
Age	KW	H=1.02, p=.796	Not Sig.	H=2.60, p=.457	Not Sig.	H=6.05, p=.109	Not Sig.
Sex	MWU	U=5849.5, p=.058	Not Sig.	U=6748.5, p=.869	Not Sig.	U=6090.5, p=.152	Not Sig.
Yrs. Exp.	KW	H=8.87, p=.064	Not Sig.	H=16.76, p=.002	**SIGNIFICANT**	H=5.02, p=.285	Not Sig.
Industry	KW	H=42.05, p<.001	**SIGNIFICANT**	H=35.56, p=.001	**SIGNIFICANT**	H=43.90, p<.001	**SIGNIFICANT**
Trainings	KW	H=7.17, p=.028	**SIGNIFICANT**	H=2.74, p=.255	Not Sig.	H=2.27, p=.322	Not Sig.

Profile Variable	Test	Integration (Domain D): Stat / p	Result	Overall Interpretation
Age	KW	H = 3.51, p = .319	Not Significant	No significant differences in any domain
Sex	MWU	U = 6554, p = .590	Not Significant	No significant differences in any domain
Years of Exp.	KW	H = 2.67, p = .614	Not Significant	Significant in Training Availability only
Industry	KW	H = 34.49, p = .002	SIGNIFICANT	Significant in ALL 4 barrier domains
Trainings	KW	H = 0.36, p = .836	Not Significant	Significant in Access only

Note. KW = Kruskal-Wallis H; MWU = Mann-Whitney U. Industry tested with df = 14. All tests at α = .05.

Age and **sex** showed no significant differences in perceived barriers across any of the four domains, suggesting that barriers are experienced consistently regardless of age or sex. **Years of experience** produced a significant difference only in Availability of Technology Training (H = 16.76, p = .002), indicating that experience level shapes perceptions of training availability specifically. **Industry** was again the only variable significantly associated with all four barrier domains (H values from 34.49 to 43.90, all p < .001), confirming that the industrial environment is the primary contextual determinant of perceived technology barriers. **Training frequency** was significant only for Access to Learning Resources (H = 7.17, p = .028).

Research Question 8: Significant Relationships Among the Three Central Variables

To address RQ8, Spearman's Rank-Order Correlation (ρ) was applied to examine the relationships among Technological Competency, Technology Self-Efficacy, and Perceived Barriers. Spearman correlation was used because all three variables violated the normality assumption (KS Lilliefors test). The correlation strength is interpreted as: 0.80–1.00 = Very Strong; 0.60–0.79 = Strong; 0.40–0.59 = Moderate; 0.20–0.39 = Weak; 0.00–0.19 = Negligible.

Table 22. Spearman's Rank-Order Correlation Among Technological Competency, Technology Self-Efficacy, and Perceived Barriers (n = 236)

Variable Pair	Spearman's ρ	t-value	df	p-value	Strength & Direction	Interpretation
Technological Competency & Technology Self-Efficacy	0.385	6.389	234	**p < .001**	Weak Positive	**SIGNIFICANT**
Technological Competency & Perceived Barriers	0.342	5.559	234	**p < .001**	Weak Positive	**SIGNIFICANT**
Technology Self-Efficacy & Perceived Barriers	0.344	5.605	234	**p < .001**	Weak Positive	**SIGNIFICANT**

Note: computed via Spearman rank-order correlation on rank-transformed domain scores. Positive correlations with Perceived Barriers indicate that higher scores (fewer perceived barriers, after reverse-scoring) are associated with higher competency and self-efficacy. All tests are two-tailed at α = .05. Spearman's correlation revealed statistically significant relationships among all three variable pairs. Technological Competency and Technology Self-Efficacy were positively correlated (ρ = .385, t(234) = 6.39, p < .001), indicating that OHNs with higher perceived competency tended to report higher technology self-efficacy. Technological Competency and Perceived Barriers were also positively correlated (ρ = .342, t(234) = 5.56, p < .001). Technology Self-Efficacy and Perceived Barriers showed a similar positive relationship (ρ = .344, t(234) = 5.61, p < .001).

An important interpretive note is warranted. Because the Perceived Barriers instrument was reverse-scored for

negatively worded items, higher barrier scores indicate fewer perceived barriers. The positive correlations between Perceived Barriers and both Competency and Self-Efficacy therefore indicate that OHNs with higher competency and higher self-efficacy perceived *fewer* barriers to technology utilization, a directionality consistent with Locsin's TCCN Theory's proposition that competency development and barrier reduction are mutually reinforcing. All three relationships were characterized as weak (ρ values of .342 to .385), indicating that the variables are meaningfully but modestly related, suggesting the presence of additional mediating or moderating factors not examined in this study.

Advanced Analyses

Advanced statistical analyses, including Structural Equation Modeling (SEM), predictive modeling, and multilevel analysis, were evaluated for applicability to this study. Given the study's descriptive-correlational design and the weak to moderate strength of the bivariate correlations identified in RQ8 (Spearman ρ values ranging from .342 to .385), SEM was considered but determined to be premature for this first empirical investigation of these variables in the OHN population. SEM requires established theoretical measurement models validated in the target population, which do not yet exist for Filipino OHNs. The researcher recommends SEM as a priority for future research following the development and validation of more refined instruments in subsequent studies.Multilevel analysis was also considered, given the nested structure of the data (OHNs nested within industries across eight regions). However, the unequal and, in many cases, small cell sizes within industry categories (with 10 of 15 industry groups having $n < 10$) did not support stable multilevel estimation at this sample size. A larger, nationally representative sample would be required for meaningful multilevel modeling of industry-level and regional-level effects. These advanced analyses are recommended as priorities for the longitudinal and national replication studies proposed in Chapter 6 of this thesis.

Summary of Statistical Findings

Table 23 provides a consolidated summary of all statistically significant findings across research questions 5 through 8.

Table 23. Summary of Significant Findings Across Research Questions 5–8

RQ	Variable	Profile Variable	Key Finding
RQ5	Technological Competency	Age	Significant in Knowing (H=25.55) and Caring (H=11.54); Not in Connectedness
RQ5	Technological Competency	Sex	**Significant in Knowing only (U=4,305, z=−4.87)**
RQ5	Technological Competency	Years of Experience	**Significant in ALL three domains**
RQ5	Technological Competency	Industry	**Significant in ALL three domains (highest H=83.07 for Caring)**
RQ5	Technological Competency	Trainings Attended	NOT significant in any domain
RQ6	Technology Self-Efficacy	Age	Significant in Learning and Problem-Solving; Not Use
RQ6	Technology Self-Efficacy	Sex	NOT significant in any domain
RQ6	Technology Self-Efficacy	Years of Experience	Significant in Learning and Problem-Solving; Not Use
RQ6	Technology Self-Efficacy	Industry	**Significant in ALL three domains**
RQ6	Technology Self-Efficacy	Trainings Attended	Significant in Learning and Use; Not Problem-Solving
RQ7	Perceived Barriers	Age	NOT significant in any domain
RQ7	Perceived Barriers	Sex	NOT significant in any domain
RQ7	Perceived Barriers	Years of Experience	**Significant in Training Availability only (H=16.76)**
RQ7	Perceived Barriers	Industry	**Significant in ALL four domains**
RQ7	Perceived Barriers	Trainings Attended	**Significant in Access only (H=7.17)**
RQ8	All Three Variables	—	**All three variable pairs: significant weak positive correlations (ρ=.342–.385, all p<.001)**

Note: Only statistically significant or non-significant outcomes are reported here. Full test statistics are

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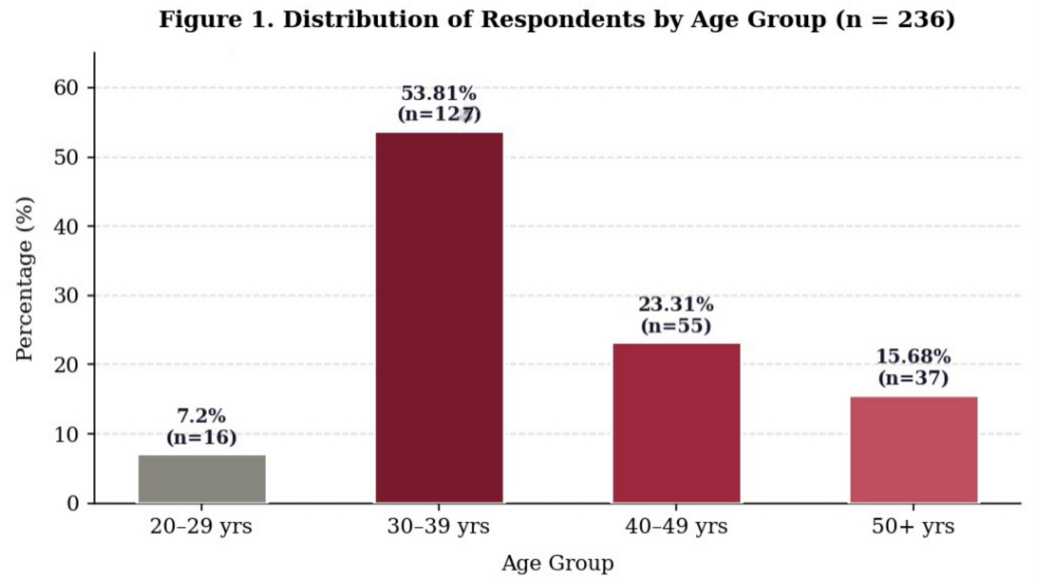
reported in Tables 19–22. Industry was significant across all constructs and all domains, establishing it as the master differentiating variable of this study.

Graphs and Figures

The following figures provide visual representations of the key findings of this study. Figures 1 through 5 present the demographic profile distributions. Figures 6 through 8 illustrate the descriptive patterns of the three central variables. Figure 9 presents a summary heatmap of statistically significant differences across demographic profile variables. Figure 10 shows the correlation diagram for Research Question 8.

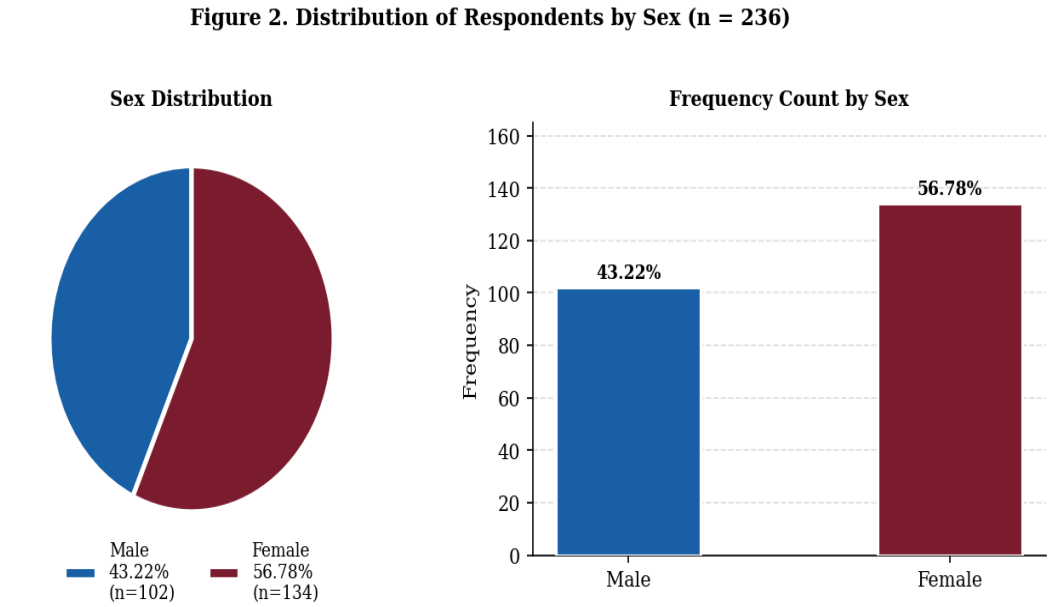
Research Question 1: Demographic Profile — Figures 1–5

Figure 1. Distribution of Respondents by Age Group (n = 236)



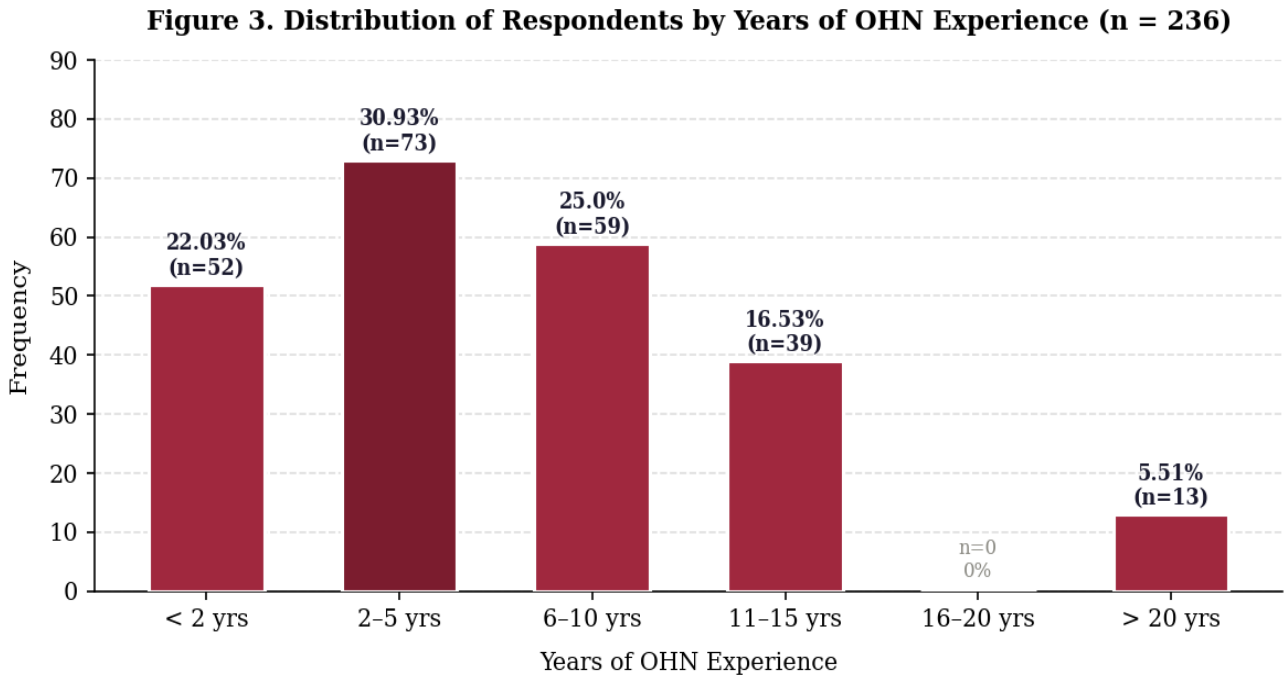
Note. The 30–39 years age group comprised the majority of respondents (53.81%, n = 127).

Figure 2. Distribution of Respondents by Sex (n = 236)



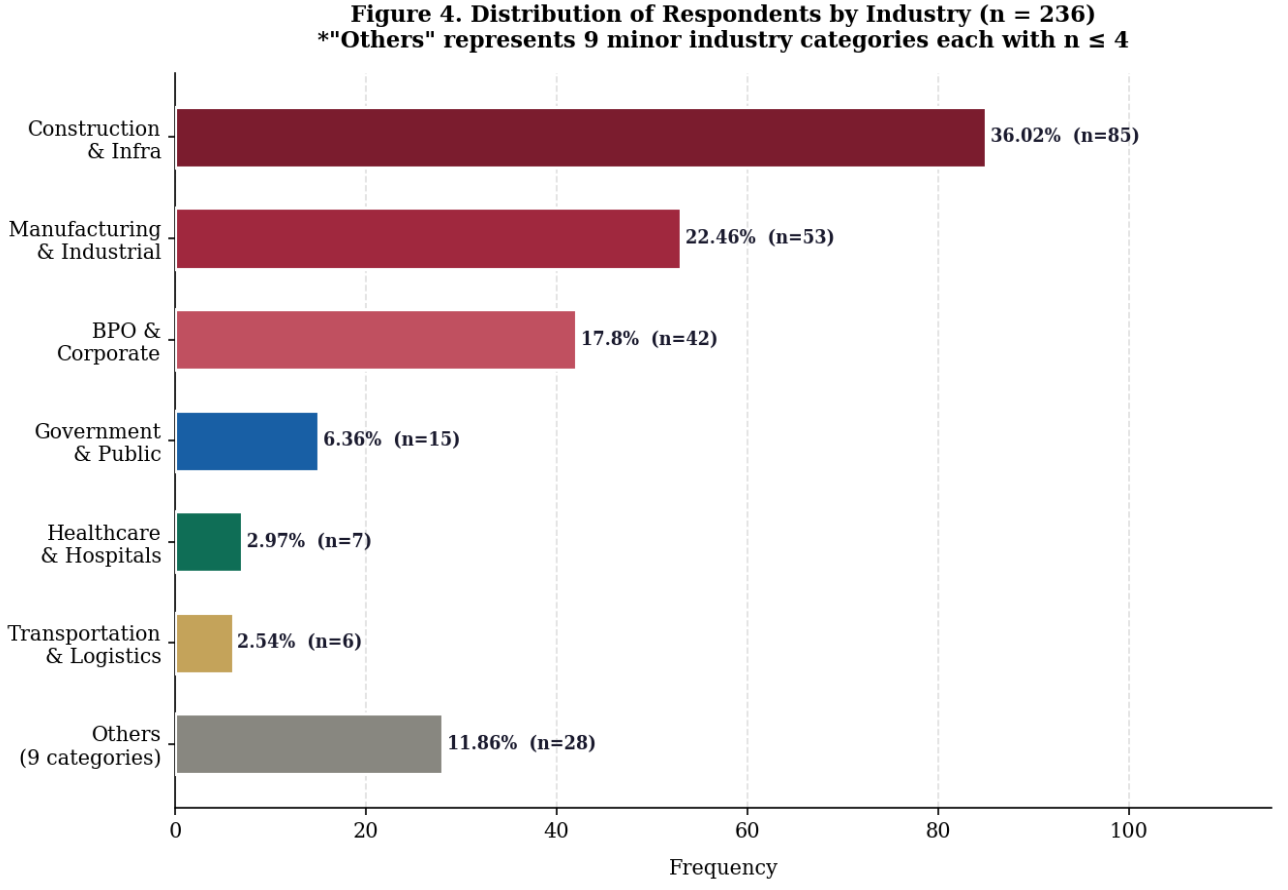
Note: Female respondents (56.78%, n = 134) outnumbered male respondents (43.22%, n = 102).

Figure 3. Distribution of Respondents by Years of OHN Experience (n = 236)



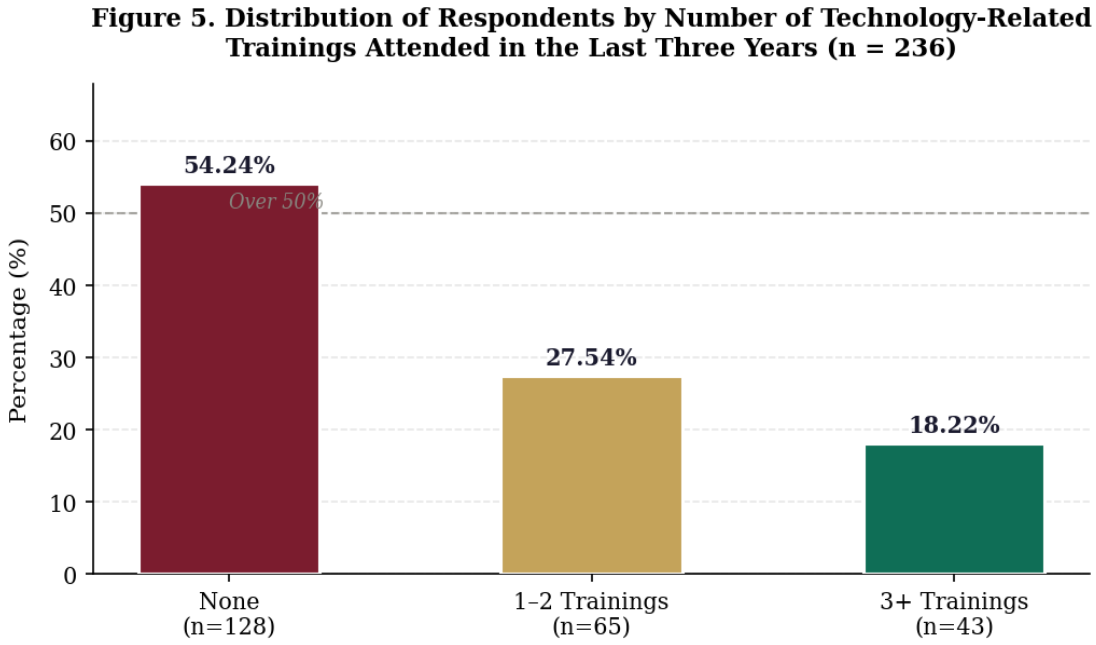
Note: No respondents reported 16–20 years of OHN experience (n = 0, 0.00%). The 2–5 years group was the most represented (30.93%).

Figure 4. Distribution of Respondents by Industry (n = 236)



Note: "Others" consolidates 9 minor industry categories, each with n ≤ 4 respondents (total = 28, 11.86%). Construction and infrastructure were the largest single sector (36.02%).

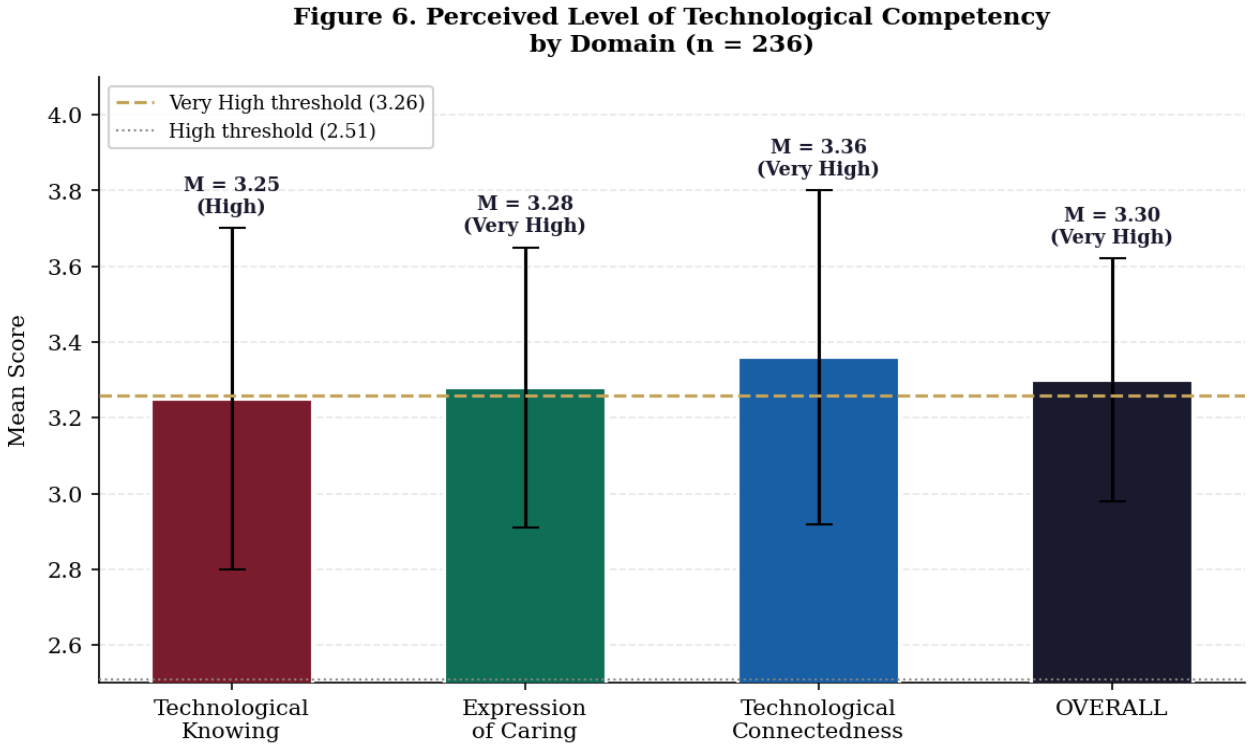
Figure 5. Distribution of Respondents by Number of Technology-Related Trainings Attended in the Last Three Years (n = 236)



Note: The dashed line at 50% highlights that over half of respondents (54.24%) had attended no technology-related trainings beyond BOSH in the last three years.

Research Question 2: Technological Competency - Figure 6

Figure 6. Perceived Level of Technological Competency by Domain (n = 236)

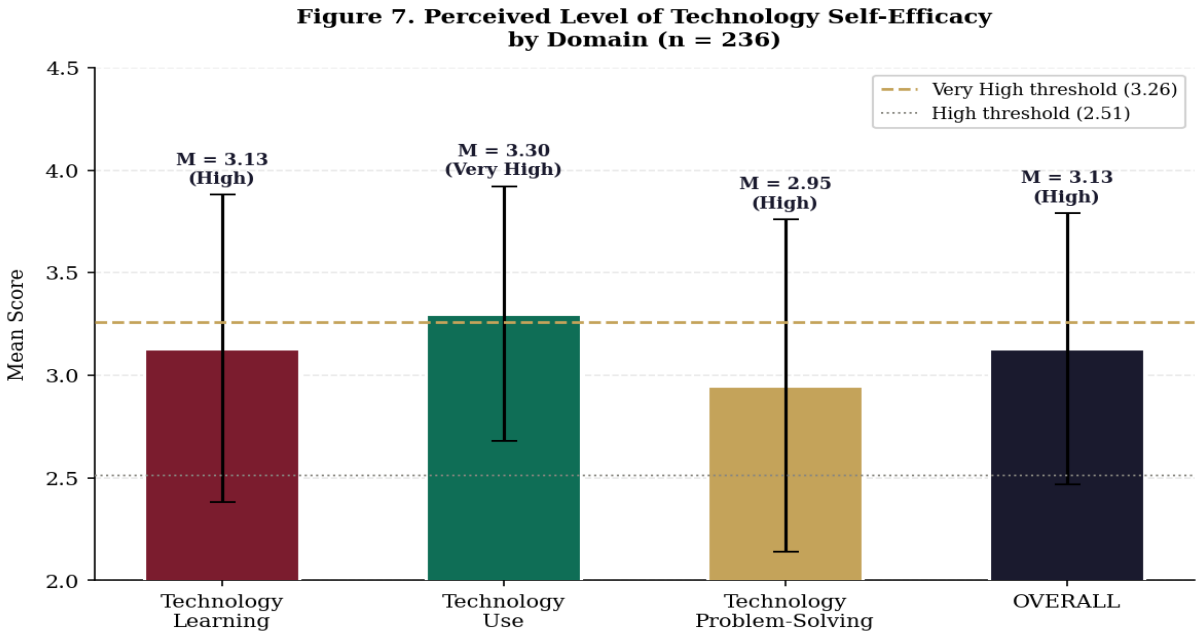


Note. Error bars represent ± 1 SD. The dashed gold line indicates the Very High threshold (3.26). Technological Knowing is the only domain below the Very High threshold (M = 3.25). Technological Connectedness is the highest-scoring domain (M = 3.36).

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Research Question 3: Technology Self-Efficacy — Figure 7

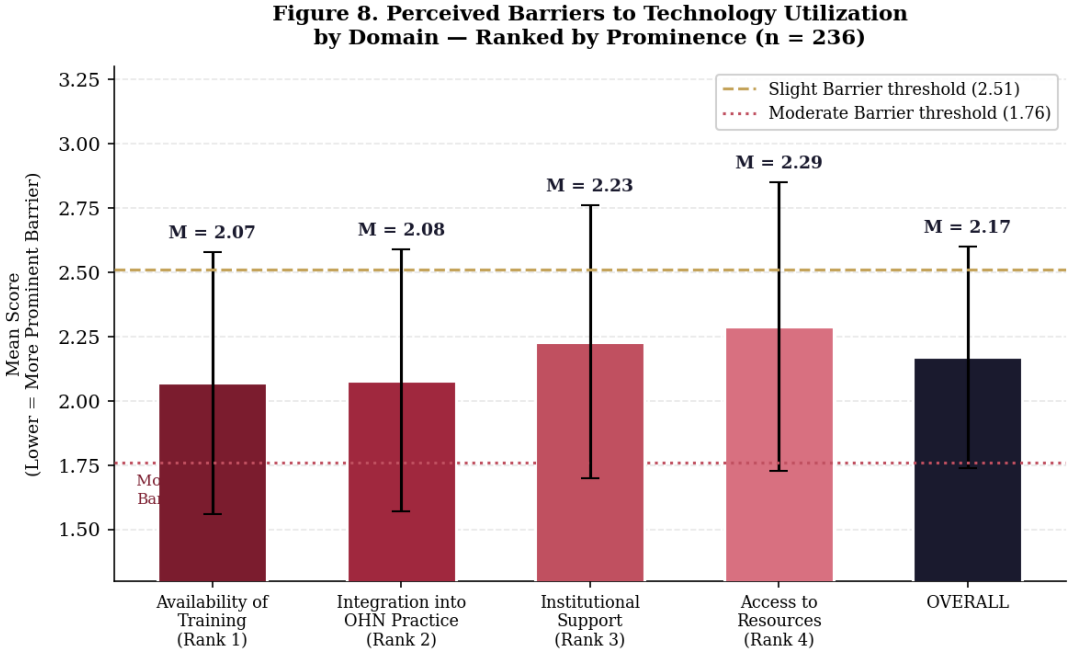
Figure 7. Perceived Level of Technology Self-Efficacy by Domain (n = 236)



Note. Error bars represent ± 1 SD. Technology Problem-Solving Self-Efficacy is the lowest-scoring domain (M = 2.95) and shows the widest SD (0.81), indicating the greatest variability among respondents in troubleshooting confidence. Technology Use Self-Efficacy is the only domain rated Very High (M = 3.30).

Research Question 4: Perceived Barriers — Figure 8

Figure 8. Perceived Barriers to Technology Utilization by Domain — Ranked by Prominence (n = 236)

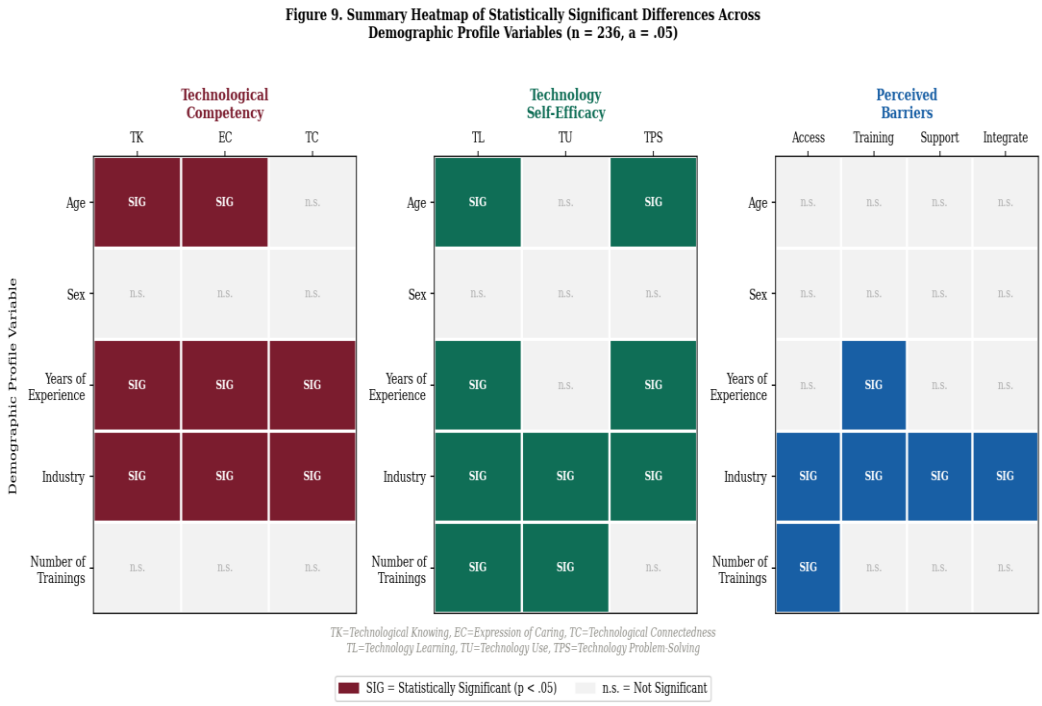


Note. After reverse-scoring, lower mean scores indicate more prominent (greater) barriers. Availability of Training is ranked the most prominent barrier domain (M = 2.07, Rank 1). The gold dashed line marks the Slight Barrier threshold (2.51); the red dotted line marks the Moderate Barrier threshold (1.76). All four domains fall in the Moderate Barrier range.

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Research Questions 5–7: Significant Differences — Figure 9

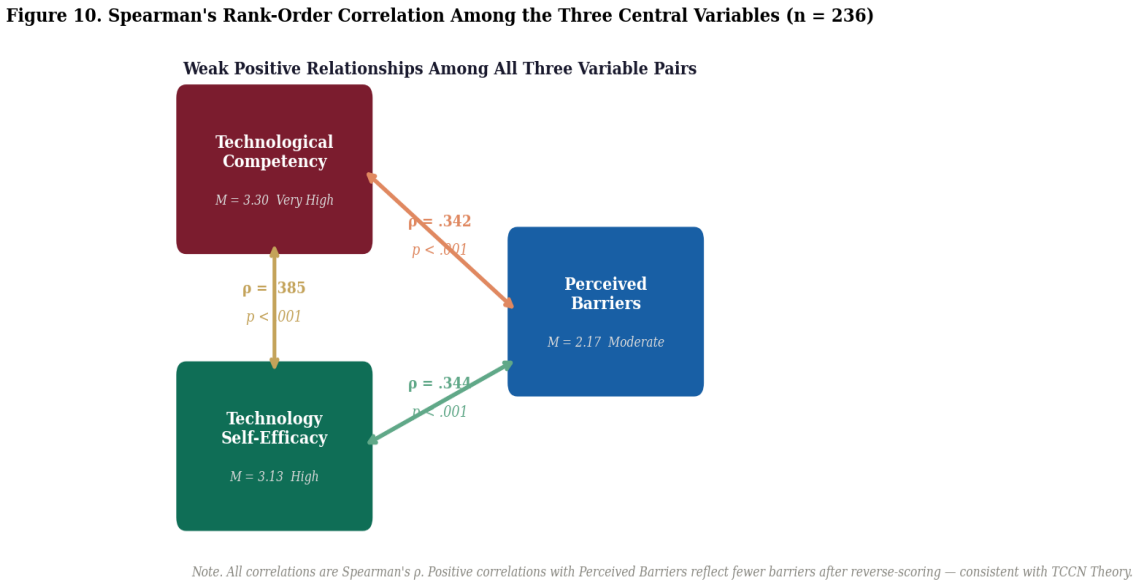
Figure 9. Summary Heatmap of Statistically Significant Differences Across Demographic Profile Variables (n = 236, α = .05)



Note. SIG = statistically significant ($p < .05$); n.s. = not statistically significant. TK = Technological Knowing, EC = Expression of Caring, TC = Technological Connectedness. TL = Technology Learning, TU = Technology Use, TPS = Technology Problem-Solving. Industry is the only variable with SIG across all domains of all three central variables. Sex showed no significant differences in any self-efficacy domain or barrier domain. Number of Trainings showed no significant differences in any competency domain.

Research Question 8: Relationships Among Variables — Figure 10

Figure 10. Spearman's Rank-Order Correlation Diagram Among the Three Central Variables (n = 236)



Note. All three bivariate correlations are statistically significant ($p < .001$) and characterized as Weak Positive

(ρ = .342–.385). Positive correlations with Perceived Barriers are directionally consistent with TCCN Theory because higher Barriers scores — after reverse-scoring — indicate fewer perceived barriers. The diagram does not imply directionality of influence; the study design is correlational, not experimental.

DISCUSSION OF FINDINGS

This chapter presents an integrated discussion of the study findings in relation to Locsin's Technological Competency as Caring in Nursing Theory, the body of related literature reviewed in Chapter 2, and the broader theoretical, practical, and policy contexts that surround occupational health nursing in the Philippines. The discussion moves from the descriptive findings through the inferential analyses, then examines implications for nursing practice, professional organizations, and policy development. The chapter concludes with critical reflections from the researcher as a practitioner who has worked within the very occupational health nursing environment this study examined.

Section 1: Interpretation of Results In Light Of Frameworks And Literature

1.1 The Demographic Landscape: Who Filipino OHNs Are

The study enrolled 236 BOSH-trained occupational health nurses from across all regions of Luzon. The age distribution revealed that more than half of the respondents, specifically 127 or 53.81 percent, belonged to the 30 to 39 age bracket. This finding is not incidental. Occupational health nursing in the Philippines is rarely a point of entry for new graduates. Nurses typically move into it after establishing clinical foundations elsewhere, which explains why so few respondents were under 30. What is worth reflecting on is that the dominant cohort entered the profession roughly around 2010 to 2015, during a period when digital health systems were beginning to appear in Philippine workplaces but before any institutional training for these systems became standard. These nurses occupy a peculiar professional space. They are neither digital natives who grew up immersed in technology nor veterans whose entire formation predated digital tools. They are caught somewhere between, learning technology largely on their own, often under conditions of professional isolation.

The finding that female respondents outnumbered males, at 56.78 percent versus 43.22 percent, is consistent with the broader gender composition of the registered nursing workforce in the Philippines. The more meaningful question is whether sex interacts with technology engagement in ways that have practical consequences. The study found a statistically significant difference in Technological Knowing between male and female nurses, with male nurses scoring higher on this domain specifically. This mirrors the pattern reported by Conte and colleagues in 2025, who found that female nurses in Italy were more than twice as likely to demonstrate inadequate technology self-efficacy compared to their male counterparts. The Filipino OHN context may produce a similar dynamic, though for reasons that deserve deeper qualitative exploration. Whether this reflects differences in early technology exposure, workplace expectations, or the nature of the industries where female OHNs are concentrated, the data alone cannot resolve this.

Among the most practically significant descriptive findings was the training frequency data. Over half of all respondents, 128 out of 236 or 54.24 percent, had attended no technological competency-related training in the three years preceding this study. Only 43 nurses, or 18.22 percent, had attended three or more such trainings. This distribution has implications that reach beyond simple gaps in professional development. It speaks to a structural condition in which the professional infrastructure supporting OHNs has not kept pace with the technological demands of the role as defined by Republic Act 11058 and Department Order 198-18. The regulatory framework tells OHNs what to do digitally. The professional development ecosystem largely leaves them to figure it out on their own.

1.2 Technological Competency: High on the Surface, Uneven Beneath

The overall perceived level of technological competency among respondents was Very High, with a mean of 3.30 and a standard deviation of 0.32 on a four-point scale. On its face, this is an encouraging finding. Closer

inspection of the domain-level data, however, reveals a more complicated picture that has direct implications for how this finding should be read and acted upon.

Technological Connectedness emerged as the strongest domain at a mean of 3.36. This domain captures the use of technology to maintain regulatory reporting, coordinate with other health professionals, and communicate findings to management and workers. The high scores here likely reflect compliance-driven behavior rather than freely chosen technology engagement. OHNs who fail to submit DOLE reports electronically, maintain digital health records, or process occupational health documentation through required digital systems face real regulatory consequences. Their competency in these areas was not cultivated in a context of institutional support and structured learning. It was forged under the pressure of legal obligation and professional survival. This distinction matters enormously for how OHNAP and policymakers interpret the high Connectedness scores. It does not mean these nurses are digitally confident or well-supported. It means they have learned to comply because they had no other option.

Technological Knowing, at a mean of 3.25, was the only domain that fell below the Very High threshold. This domain sits at the philosophical center of what Locsin meant by technological competency as caring. It refers to the use of technology not merely to document or report, but to know the worker more fully as a whole, dynamic person whose health risks, occupational exposures, and care needs are revealed through technological engagement. The lowest-scoring individual item in the entire study appeared here, specifically the use of digital tools to assess workers systematically across physical, mental, and occupational health dimensions, which received a mean of only 3.09. What this suggests is that while Filipino OHNs can comply with digital requirements, fewer of them have reached the point where technology genuinely deepens their clinical knowing of the workers they serve. The gap between compliance-driven connectedness and caring-oriented knowing is arguably the most important finding of this study from a TCCN Theory standpoint.

1.3 Technology Self-Efficacy: Confidence to Use, Doubt to Fix

The overall perceived level of technology self-efficacy was High, with a mean of 3.13 and a standard deviation of 0.66. The pattern across the three self-efficacy domains was instructive. Technology Use Self-Efficacy, which captures confidence in performing daily digital tasks, scored highest at 3.30, entering the Very High range. Technology Learning Self-Efficacy, reflecting confidence in acquiring new digital skills, scored 3.13, firmly in the High range. Technology Problem-Solving Self-Efficacy, the domain measuring confidence in independently diagnosing and resolving technology failures, scored lowest at 2.95.

The two items within the Problem-Solving domain that received the lowest ratings in the entire self-efficacy variable were troubleshooting digital system errors, which scored 2.76, and identifying the cause of technical problems, which scored 2.85. These are not peripheral competencies for an occupational health nurse working alone in a company clinic. They are essential. When an EHR system crashes mid-shift, when a DOLE reporting platform refuses to upload, when surveillance software produces error messages that no IT support is available to decode, the OHN must either solve the problem or stop functioning digitally until someone else does. The low problem-solving confidence scores indicate that for a significant portion of the respondents, technology disruptions represent a genuine vulnerability in their professional functioning, one that no one has specifically prepared them to navigate.

Bandura's Self-Efficacy Theory, which informs how the self-efficacy instrument was operationalized, holds that confidence is built through mastery experience, vicarious learning, social persuasion, and physiological states. For nurses who have never received structured training in OHN technology use, the primary source of mastery experience has been unsupervised trial and error. Vicarious learning opportunities are limited by the professional isolation that defines much of OHN practice. Social persuasion from peers or mentors is rare in workplaces where the OHN unit is a staff of one. Under these conditions, the relative confidence in routine use and the pronounced doubt in troubleshooting are precisely what one would predict. Confidence builds through repeated success. Troubleshooting is where failure concentrates.

1.4 Perceived Barriers: A Structural Problem, Not a Personal One

The overall perceived barriers score was 2.17 with a standard deviation of 0.43, falling in the Moderate Barrier range across all four domains. All four domains were interpreted as Moderate Barriers, meaning that none of the barrier categories was perceived as either negligible or overwhelming. The consistency of this pattern across domains and across respondents, many of them in different industries and regions, suggests that the barriers faced by Filipino OHNs are not idiosyncratic features of particular workplaces. They reflect systemic conditions that cut across the full breadth of occupational health nursing practice in Luzon.

Availability of Occupational Health Technology Training ranked as the most prominent barrier, with a domain mean of 2.07. Within this domain, the two most prominent individual items were the inaccessibility of technology training due to scarcity, cost, or geographic distance, which received a mean of only 1.53, and the introduction of new digital systems without adequate orientation or training, which scored 1.70. These items received the lowest means of any item across the entire study. They are not describing dissatisfaction with the quality of training that is available. They are describing the near-complete absence of training that is specifically designed for the technology demands of occupational health nursing practice.

Integration of Technology into Occupational Health Nursing Practice ranked second as a barrier domain, with a mean of 2.08. Two items stood out within this domain. The first was the perception that using digital tools required more time than paper-based methods, which scored 1.68. The second was concern about worker privacy and data confidentiality when using digital systems for occupational health records, which scored 1.74. The time burden finding is widely documented in nursing technology literature. The privacy concern, however, is more specific to the OHN context and deserves the attention it rarely receives. An occupational health nurse works within an organizational context where the worker is simultaneously a patient with legally protected health information and an employee whose employer has a legitimate interest in aggregate occupational health data. Navigating that dual accountability through digital systems, without clear institutional guidance on what can and cannot be shared, and with whom, creates a form of ethical and regulatory anxiety that has no direct parallel in hospital nursing. This study appears to be the first to document it quantitatively.

1.5 Significant Differences: Industry Emerges as the Master Variable

Among all five demographic profile variables tested across Research Questions 5, 6, and 7, industry was the only variable associated with statistically significant differences in all three central variables and across every measurable domain. The Kruskal-Wallis H values for industry ranged from 34.49 in barrier domains to 83.07 for Expression of Caring in the competency variable. All industry comparisons produced p-values below .001. No other demographic variable came close to this pervasiveness.

Age was significant in some competency and self-efficacy domains but not across barriers. Sex was significant only in Technological Knowing. Years of experience were significant across all competency domains and two self-efficacy domains, but only for one of four barrier domains. The number of additional trainings, notably, was not significant in any competency domain, though it was significant in two self-efficacy domains and one barrier domain.

The industry finding carries substantial theoretical and practical weight. Within the conceptual framework grounded in Locsin's TCCN Theory, the industry in which a nurse practices constitutes the environmental context that shapes both the opportunities available for technological competency development and the barriers that constrain it. A BPO company where workers spend their entire shifts interacting with digital platforms provides a fundamentally different technological environment from a construction site, where connectivity may be intermittent, and management culture is oriented toward physical output rather than digital documentation. An OHN in a healthcare institution has colleagues who share digital health vocabulary. An OHN in an aviation maintenance facility may be the only person in the building who thinks about electronic health records at all.

Where an OHN works appears to determine her digital readiness more powerfully than who she is as an individual. This is a significant finding with direct implications for how interventions are designed. Generic,

one-size-fits-all technology training programs will not adequately address the diversity of technological contexts represented across the 15 industry categories identified in this study. The scholarly output developed from these findings accounts for this by embedding industry-sensitive indicators throughout its competency levels.

The non-significance of training frequency on technological competency deserves particular attention because it challenges an assumption that might otherwise drive intervention design. More trainings did not translate into significantly higher competency scores. This counterintuitive finding does not mean training is without value. It likely means that the technology trainings currently available to Filipino OHNs are not specifically designed to produce measurable improvements in the TCCN-grounded competency domains this study measured. A seminar on general computer skills or a workshop on a specific software product that is not widely used in OHN settings would register as a training attended without necessarily improving a nurse's ability to use technology as an expression of caring for workers. This finding is a call for quality and contextual relevance in training design, not merely more training volume.

1.6 Relationships Among Variables: Weak, Significant, and Theoretically Consistent

Spearman's rank-order correlation revealed statistically significant positive associations among all three variable pairs. The correlation between Technological Competency and Technology Self-Efficacy was .385. The correlation between Technological Competency and Perceived Barriers was .342. The correlation between Technology Self-Efficacy and Perceived Barriers was .344. All three correlations reached significance at the p less than .001 level.

An essential interpretive point must be stated clearly. The Perceived Barriers instrument used reverse scoring for negatively worded items throughout its administration and analysis. After this reverse scoring, higher scores on the barriers instrument indicate fewer perceived barriers, not more. The positive correlations between Perceived Barriers and both Competency and Self-Efficacy, therefore, indicate that nurses with higher competency and higher self-efficacy tended to perceive fewer barriers. This directional finding is consistent with TCCN Theory's proposition that competency development and environmental support are mutually reinforcing. It is also consistent with Bandura's concept of mastery experience. Nurses who have successfully used technology in their practice build confidence and develop the skills to navigate around or through barriers. Those who have not had those opportunities experience barriers as more limiting.

The characterization of all three correlations as weak, with rho values between .342 and .385, warrants reflection rather than dismissal. A weak correlation does not indicate a meaningless relationship. It indicates a relationship that exists but whose full explanation requires additional variables not examined in this cross-sectional study. Organizational culture, the quality of available technology, the nurse-to-worker ratio, the caring orientation of individual nurses, and the specific nature of occupational hazards in the workplace all plausibly mediate or moderate these relationships. The weak correlations are not a failure of TCCN Theory. They are a finding of complexity that future research must address with more sophisticated designs and broader variable sets.

Section 2: Theoretical, Practical, and Policy Implications

2.1 Contributions to TCCN Theory

This study offered three contributions to the theoretical literature on Locsin's TCCN Theory that extend beyond its original hospital-nursing context.

The first contribution is empirical operationalization in a non-hospital nursing population. The TCCHI-grounded competency instrument performed coherently across 236 OHNs from 15 industries and 8 Luzon regions, demonstrating that TCCN Theory's constructs are measurable outside the clinical hospital settings in which most prior instrument development occurred. The three-factor structure of Technological Knowing, Expression of Caring, and Technological Connectedness held meaningfully for OHNs whose technology environments are vastly different from hospital wards.

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The second contribution concerns the relationship between self-efficacy and competency within the TCCN framework. The weak but significant positive correlation between the two provides empirical grounding for Locsin's positioning of confidence as a dimension embedded within competency rather than as an external predictor of it. Self-efficacy and competency share conceptual space in TCCN Theory. The correlation confirms they share empirical space as well, while the weak strength of the association confirms that they are not redundant constructs but overlapping ones.

The third contribution is evidence for the environmental dimension of TCCN Theory. The consistent significance of industry across all three central variables provides empirical support for the theory's implicit but undertheorized claim that environmental conditions at the organizational level shape the development and expression of technological competency as caring. This study provides the first quantitative evidence of that environmental effect in a Philippine occupational health nursing context.

2.2 Practical Implications for Occupational Health Nursing Practice

At the level of individual practice, the gap between Technology Use Self-Efficacy and Technology Problem-Solving Self-Efficacy points to a specific skill set that professional development should address. OHNs need not just exposure to digital health tools but preparation for what to do when those tools fail. Practical training in creating digital workarounds during system unavailability, identifying common error patterns in OHN-specific software, and maintaining care continuity during technology disruptions would directly address the lowest-scoring self-efficacy domain.

The prominence of worker privacy concerns as a barrier to technology integration points to another practice-level need. OHNs require clear, actionable guidance on applying RA 10173, the Data Privacy Act of 2012, specifically within occupational health nursing records. The distinction between individual worker health information, which is protected, and aggregate workforce health surveillance data, which serves employer-mandated functions, is not always obvious in practice. OHNAP should develop data privacy guidance specifically for OHN digital documentation, including templates, decision trees, and illustrative cases drawn from actual OHN practice contexts.

2.3 Practical Implications for OHNAP

For the Occupational Health Nurses Association of the Philippines, the findings provide a data-driven basis for restructuring continuing professional development programming around three priorities.

The first priority is developing a structured OHN Technology Competency Certification Pathway aligned with the OHN Digital Competency Framework proposed in Chapter 6. This pathway should offer three levels corresponding to the foundational, proficient, and advanced competency levels of the framework, with defined learning outcomes, observable behavioral indicators, assessment criteria, and CPD credit equivalences for each level. Regional delivery mechanisms must be established, given that geographic accessibility was among the most prominent barriers.

The second priority is redesigning technology training content to target competency outcomes rather than awareness or confidence building. The non-significance of training frequency on competency scores suggests that current training formats improve awareness without substantially improving the caring-oriented competency dimensions this study measured. Training must be hands-on, scenario-based, and OHN-specific, using actual DOLE reporting platforms, occupational health surveillance systems, and teleconsultation tools that OHNs use in practice.

The third priority is establishing an OHN digital peer support network accessible through OHNAP's official communication channels. Because professional isolation is a defining feature of OHN practice and because social persuasion is one of the key sources of self-efficacy identified by Bandura, connecting OHNs across industries to share troubleshooting approaches, technology solutions, and digital best practices would directly address the problem-solving confidence gap identified in this study.

2.4 Implications for Employers

Employers covered under RA 11058 should understand that the technological competency of their OHNs is substantially shaped by the organizational environment they provide, not merely by the individual nurse's training history or personal aptitude. An OHN in a workplace with reliable digital infrastructure, functional IT support, and management that understands the role of technology in occupational health services will develop and sustain higher competency than one who operates in isolation with outdated systems and no technical assistance.

The Organizational Enablers table in the OHN-DCF, presented in Chapter 6, assigns specific responsibilities to employers across four enabling conditions. Employers should treat these not as aspirational suggestions but as compliance obligations consistent with RA 11058's requirement that qualified health personnel are provided with the facilities necessary to perform their mandated functions.

2.5 Policy Implications

The most significant policy finding of this study is structural. Republic Act 11058 and Department Order 198-18 mandate digital functions for occupational health nurses without specifying digital competency standards as a qualification requirement. OHNs are legally expected to perform electronic health surveillance, digital DOLE reporting, and teleconsultation-supported referrals, but the qualification framework that governs who may practice as an OHN contains no provision defining what digital readiness those functions require.

The Department of Labor and Employment should initiate a review of Department Order 198-18 to incorporate minimum digital competency standards, anchored in the OHN-DCF proposed in this study. The Professional Regulation Commission should designate OHN digital competency training as a required category within the CPD units necessary for nursing license renewal. Neither of these policy changes requires new legislation. Both can be accomplished through administrative rulemaking using the empirical evidence this study provides as justification.

Section 3: Alignment With National And Global Research Priorities

3.1 AmBisyon Natin 2040

AmBisyon Natin 2040 is the Philippine government's long-term national vision describing the aspirations of Filipinos for a strongly rooted, comfortable, and secure life, referred to in Filipino as matatag, maginhawa, at panatag na buhay. The vision identifies a healthy, resilient, and productive population as among the foundational pillars of national development, one that requires a health workforce capable of delivering quality services across all sectors of society, including the working population. Occupational health nurses serve the working population directly. They are the frontline health workforce in the company clinic settings where 11058-covered workers spend their productive lives. When OHNs are technologically competent, they can deliver health surveillance, early risk identification, and coordinated referral services with greater accuracy and continuity, contributing to the maintenance of a productive and protected workforce. The findings of this study, by documenting the current state of OHN technological readiness and the barriers that constrain it, provide the evidence base needed to strengthen this health workforce category in a way directly aligned with AmBisyon 2040's vision of a nationally healthy population.

3.2 Philippine Development Plan 2023 to 2028

The Philippine Development Plan 2023 to 2028 identifies human capital development and inclusive labor markets as central to the country's medium-term development trajectory. The plan emphasizes the need to build a workforce that is digitally capable and responsive to the demands of an increasingly technology-mediated economy. It also calls for strengthening occupational safety and health systems across industries, consistent with the regulatory mandate of RA 11058. This study directly supports two PDP pillars. First, in building digitally capable human capital, the OHN-DCF proposed in this study provides a competency standard that can guide the professional development of a specialized and currently unaddressed segment of

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the health workforce. Second, in strengthening occupational health systems, the findings provide evidence that a key gap exists between the digital expectations embedded in existing OSH regulations and the digital readiness of the nurses responsible for fulfilling those expectations. Addressing this gap is not merely a professional development concern. It is a workforce development and occupational safety concern with direct consequences for worker protection.

3.3 Second Congressional Commission on Education Final Report 2026

The Second Congressional Commission on Education, or EDCOM II, released its Final Report in 2026 with a comprehensive assessment of educational quality and workforce readiness across the Philippine education system. Among its key findings, the report identified persistent gaps between the competencies produced by professional nursing education programs and the competencies demanded by actual nursing practice environments, including specialized practice areas such as occupational health nursing. EDCOM II specifically called for curriculum reform in nursing education to address digital health competencies, noting that most nursing programs have not systematically integrated digital health skills into their core curriculum. The finding in this study that 54.24 percent of practicing OHNs had received no technology-related training in the previous three years provides quantitative evidence for the scope of this curriculum gap at the post-licensure continuing education level. The OHN-DCF proposed in Chapter 6 includes curriculum integration recommendations that respond directly to the EDCOM II call for competency-aligned nursing education, providing a framework that schools offering OHN specialization courses can use to structure relevant coursework and clinical simulation experiences.

3.4 Harmonized National Research and Development Agenda 2022 to 2028

The Harmonized National Research and Development Agenda 2022 to 2028 identifies health systems research and workforce development as priority research areas for the Philippines. Within the health systems cluster, the HNRDA specifically calls for research that examines the readiness and capacity of health workers to deliver quality services in evolving healthcare environments, including environments where digital health tools are becoming standard components of care delivery. This study responds to that mandate. It is the first quantitative investigation of technological competency, technology self-efficacy, and perceived barriers among occupational health nurses in the Philippines, generating the baseline data that the HNRDA envisions as the foundation for evidence-based health workforce development policy. The study also identifies research gaps, including the need for longitudinal studies tracking competency development over time and mixed-methods investigations into the industry-specific mechanisms driving the differences documented here. These future research directions are consistent with the HNRDA's call for sustained, programmatic health workforce research in the Philippines.

3.5 National Integrated Basic Research Agenda 2022 to 2028

The National Integrated Basic Research Agenda 2022 to 2028, or NIBRA, establishes priority areas for basic research across disciplines, with nursing and health sciences identified as a key field where foundational evidence must be built before applied interventions can be meaningfully designed. NIBRA specifically calls for studies that examine the knowledge, skills, and attitudes of health workers in specialty practice areas, with particular attention to populations and practice contexts that have received limited empirical attention.

Occupational health nursing meets the NIBRA criterion for an underexamined specialty practice context. No prior Philippine study had examined the TCCN Theory constructs in this population before the present investigation. The baseline profile this study generates, covering technological competency across three TCCN-derived domains, self-efficacy across three task-specific dimensions, and barriers across four environmental categories in a sample of 236 BOSH-trained OHNs from 15 industries, represents exactly the type of foundational evidence NIBRA was designed to fund and promote. The study also produces a validated set of researcher-adapted instruments that future investigators can use to replicate and extend these findings across the remaining nursing regions of the Philippines.

3.6 United Nations Sustainable Development Goals 2015 to 2030

Three Sustainable Development Goals are directly implicated by the findings of this study. SDG 3, Good Health and wellbeing, includes the target of achieving universal health coverage and access to quality essential health services for all. Occupational health nursing is the primary mechanism through which employed workers in hazardous industries access structured health surveillance, early intervention, and referral services under RA 11058. When OHNs are technologically competent, they provide these services with greater accuracy, consistency, and continuity. The findings of this study, documenting gaps in the caring-oriented knowing dimension of that competency, point directly to where improvements are needed to close the quality gap in occupational health service delivery.

SDG 4, Quality Education, includes the target of ensuring that all people have access to quality technical and vocational education. The finding that 54.24 percent of respondents had no technology-related training in the previous three years, combined with the finding that training accessibility was the most prominent perceived barrier to technology utilization, indicates a quality gap in the professional education infrastructure for occupational health nursing. The OHN-DCF proposed in Chapter 6, by providing a competency standard for curriculum integration in schools of nursing and for OHNAP's CPD programming, contributes directly to closing this gap.

SDG 8, Decent Work and Economic Growth, includes the target of promoting safe and secure working environments for all workers. Occupational health nurses are the frontline implementers of workplace health protection under RA 11058. Their technological competency directly affects the quality of occupational health risk identification, health surveillance, and regulatory compliance. The industry-level differences documented in this study show that OHNs in construction, the largest single industry group at 36.02 percent of respondents and one of the most hazardous, showed significant variation in competency compared to nurses in other sectors, which have direct implications for worker protection in settings where health surveillance errors carry the most serious consequences.

Section 4: Researcher's Critical Reflections

4.1 On What It Means to Work Alone With Technology

I entered this field not as an outside observer curious about occupational health nursing, but as someone who has lived the experience this study examined. My first job after graduating in 2023 was as a project nurse and occupational health nurse in a construction company in Zambales with more than 500 workers and no company physician. I was, by every organizational definition, the highest health officer in the facility. I was required from my first week to build a digital worker health database from scratch, file electronic DOLE reports, create health education presentations, manage a digital surveillance system, and coordinate teleconsultations without any formal preparation for any of these tasks. I was fortunate to be technologically confident. I figured things out through persistence and a certain comfort with trial and error that not every nurse shares. But the question that stayed with me then, and that ultimately became this study, was simpler: what about the ones who are not like me? What happens to the workers in companies where the OHN arrived in the same condition I did, but without the same temperament for self-directed technology learning, The answer is not reassuring. Workers in those settings receive less systematic health surveillance, less accurate digital documentation, and less confident digital referral coordination. The quality of their occupational health protection is diminished, not because their nurse lacks clinical skill, but because no one prepared that nurse for the digital dimension of the role.

4.2 On What the Numbers Did Not Say

The correlation findings of this study are statistically significant but weak. I want to be honest about what this means and what it does not mean. A correlation of .385 between competency and self-efficacy does not indicate a strong or deterministic relationship. It indicates that these variables tend to move together across respondents, but that the relationship accounts for a relatively small portion of the variation in either. There are nurses in this sample who scored high on competency and low on self-efficacy, and nurses who showed the

reverse pattern. The bivariate relationships this study examined do not capture the full complexity of what shapes an individual nurse's technological engagement in practice.

The non-significance of training frequency on competency is the finding I expected least and found most interesting. My assumption going into this study, informed by my own experience and by the professional development literature, was that nurses who attended more technology trainings would demonstrate higher competency. The data did not support this. What I believe this finding reveals is that the trainings currently available to Filipino OHNs is largely misaligned with what their competency actually requires. Attending a general digital literacy seminar or a vendor-specific software demonstration does not build the kind of technology engagement with workers as whole persons that TCCN Theory describes and this study measured. Quality and contextual fit matter more than quantity. That is a harder message to institutionalize than simply requiring more CPD hours, but it is the honest message the data delivered.

4.3 On the Limits of Self-Report

Every finding in this study rests on what respondents reported about themselves. There was no observation of actual technology use, no performance testing, and no audit of digital documentation quality. This limitation is not unique to this study. It is inherent to the research approach. But I want to name it clearly because it shapes how the findings should be used. The Very High overall competency score may partly reflect social desirability, the tendency of professionals to present themselves as capable to an evaluator, even an anonymous online one. The fact that competency in Technological Knowing was the lowest-scoring domain, and that items involving systematic and holistic worker assessment scored lowest within it, may reflect genuine gaps or may reflect that nurses undervalue those activities relative to the compliance tasks that receive more external scrutiny.

What I am confident the data captures accurately is the barrier experience. Nurses who reported that technology training was inaccessible, that new systems were introduced without orientation, and that privacy concerns made digital documentation uncomfortable, were describing concrete, lived conditions in their workplaces. These were not self-assessments of skill but descriptions of environmental reality. And it is on these environmental realities, more than on the competency self-ratings, where intervention should begin. Build the conditions. The competency will follow.

4.4 On Why This Study Should Not Sit on a Shelf

Research on occupational health nurses in the Philippines has been almost entirely absent from the nursing literature. This study produced findings for a professional group that has been invisible in the competency literature despite constituting a significant and legally mandated segment of the Philippine health workforce. The 236 nurses who completed this survey did so because they trusted that someone was paying attention to their experience. The framework that emerges from their responses in Chapter 6 is the most direct form of repayment I can offer. OHNAP, the Department of Labor and Employment, the Professional Regulation Commission, and the schools of nursing that train the next generation of OHNs each have a role to play in ensuring that this study leads to something tangible. The findings are clear enough, and the implications specific enough, that none of these institutions needs to commission further foundational research before acting. The data already tells them what is broken and where to begin fixing it. What is needed now is the institutional will to do so.

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND PRACTICAL OUTPUT

This final chapter presents the summary of key findings across all nine research questions, the researcher's conclusions drawn from the evidence, recommendations for future research and for policy, practice, and curriculum development, and the study's proposed scholarly output, the Occupational Health Nursing Digital Competency Framework, or OHN-DCF, Version 1.0. The OHN-DCF represents the most direct and actionable translation of these findings for the profession.

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Section 1: Summary of Key Findings

1.1 Demographic Profile of Respondents

The study enrolled 236 BOSH-trained occupational health nurses from all regions of Luzon, Philippines. The majority of respondents were between 30 and 39 years of age, at 53.81 percent. Female respondents comprised 56.78 percent of the sample. The largest experience group was two to five years of OHN practice at 30.93 percent. Construction and Infrastructure was the most represented industry at 36.02 percent, followed by Manufacturing at 22.46 percent and BPO at 17.80 percent. Notably, no respondents reported 16 to 20 years of experience, and the category was retained in the table with a frequency of zero. The most consequential demographic finding was that 54.24 percent of respondents, or 128 of 236 nurses, had attended no technological competency-related training in the three years before the study was conducted.

1.2 Perceived Level of Technological Competency

The overall mean for Technological Competency was 3.30 with a standard deviation of 0.32, interpreted as Very High on the four-point Likert scale. Among the three domains, Technological Connectedness scored highest at 3.36, followed by Expression of Caring at 3.28, both rated Very High. Technological Knowing scored 3.25, which placed it in the High range and made it the only domain below the Very High threshold. The lowest-scoring individual item across the entire competency variable was the use of digital tools for systematic and holistic worker health assessment, which received a mean of 3.09.

1.3 Perceived Level of Technology Self-Efficacy

The overall mean for Technology Self-Efficacy was 3.13 with a standard deviation of 0.66, interpreted as High. Technology Use Self-Efficacy was the highest-scoring domain at 3.30, which entered the Very High range. Technology Learning Self-Efficacy scored 3.13 in the High range. Technology Problem-Solving Self-Efficacy was the lowest domain at 2.95, also rated High but meaningfully below the other two. The two lowest-scoring items in the entire self-efficacy variable were troubleshooting errors in digital health systems at 2.76 and identifying the cause of technical problems at 2.85.

1.4 Perceived Barriers to Technology Utilization

The overall barriers score was 2.17 with a standard deviation of 0.43, interpreted as Moderate Barriers across all four domains. Availability of Occupational Health Technology Training ranked as the most prominent barrier at a mean of 2.07 and was designated Rank 1. Integration of Technology into OHN Practice followed at 2.08 and was Rank 2. Institutional and Technical Support scored 2.23 and was Rank 3. Access to Technology-Related Learning Resources scored 2.29 and was Rank 4 as the least prominent barrier domain. Across the entire study, the item describing difficulty accessing OHN technology training due to scarcity, cost, or geographic distance produced the lowest mean of any item, at 1.53.

1.5 Significant Differences by Demographic Profile

Age was significantly associated with Technological Knowing and Expression of Caring but not Technological Connectedness in the competency variable. Age was significant for Technology Learning and Problem-Solving Self-Efficacy but not Technology Use. Age was not significantly associated with any barrier domain. Sex produced a significant difference only in Technological Knowing within the competency variable and was not significant for any self-efficacy or barrier domain. Years of experience were significant across all three competency domains and in Technology Learning and Problem-Solving Self-Efficacy, but only in the Training Availability barrier domain. Industry was the sole demographic variable associated with statistically significant differences across all three central variables and all measurable domains, establishing it as the master differentiating variable of the study. Number of additional trainings attended was not significant in any competency domain, was significant in Technology Learning and Technology Use Self-Efficacy, and was significant only in the Access barrier domain.

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1.6 Significant Relationships Among Variables

Spearman rank-order correlation analysis revealed that all three bivariate relationships among the central variables were statistically significant at the p less than .001 level. Technological Competency and Technology Self-Efficacy produced a correlation of rho equals .385, characterized as a Weak Positive Significant relationship. Technological Competency and Perceived Barriers produced rho equals .342, also Weak Positive Significant. Technology Self-Efficacy and Perceived Barriers produced rho equals .344, Weak Positive Significant. Because the Perceived Barriers instrument used reverse scoring, all positive correlations with barriers indicate that higher competency and higher self-efficacy were associated with fewer perceived barriers, a directionality consistent with TCCN Theory.

CONCLUSION

Occupational health nurses in Luzon demonstrated a high level of technological competency, but closer examination reveals that this competency was built more on compliance than on caring. The domain where OHNs scored highest, Technological Connectedness, is the one most directly driven by legal reporting requirements under Republic Act No. 11058. The domain where they scored lowest, Technological Knowing, is the one TCCN Theory considers most essential to knowing and caring for workers as whole persons. This gap tells us something important: OHNs have learned to use technology because they had to, not necessarily because they were prepared to do so in a purposeful, caring-oriented way.

The same pattern appears in self-efficacy. OHNs felt confident performing routine digital tasks but expressed significantly less confidence in their ability to troubleshoot problems when technology fails. For nurses who typically work alone in a company clinic without IT support nearby, this lack of problem-solving confidence is not a minor concern. It is a direct threat to their ability to deliver continuous care.

The most significant barrier identified in this study was not a personal limitation of the nurses themselves but a structural gap in the professional development system that is supposed to support them. More than half of the respondents had attended no technology-related training in the past three years, and training availability was consistently identified as the most prominent barrier across all domains. What makes this finding even more telling is that attending more trainings did not lead to higher competency scores, which suggests that the trainings currently available is not specifically designed for occupational health nursing practice. The problem is not that OHNs lack effort or motivation. The problem is that the right training, in the right context, at a cost and location they can access, largely does not exist.

This shifts the responsibility for OHN digital readiness away from the individual nurse and toward the institutions that govern and support her, including employers, OHNAP, DOLE, and the PRC. Of all the variables examined in this study, the industry where an OHN works proved to be the single most powerful predictor of her technological competency, self-efficacy, and perceived barriers. More than age, sex, years of experience, or number of trainings attended, the workplace context shaped everything. This finding has a direct and practical implication: programs and policies that treat OHN digital competency as a purely individual concern, and that focus only on training the nurse without changing the environment she works in, will produce limited results. Where an OHN practices matters. Any serious effort to improve OHN digital competency in the Philippines must account for the industry context.

Finally, the study found that technological competency, technology self-efficacy, and perceived barriers are all significantly related to one another, with nurses who scored higher on competency and confidence also tending to perceive fewer barriers. These relationships were consistent with the predictions of TCCN Theory, though all three were characterized as weak, indicating that the connections are real but not simple. One variable improving does not automatically pull the others along with it. This complexity is one of the reasons the OHN Digital Competency Framework developed from this study addresses all three dimensions together, rather than treating any one of them in isolation.

RECOMMENDATIONS

3.1 Recommendations for Future Research

Extend the study to the Visayas and Mindanao.

The present study was delimited to Luzon. A national replication would produce the first Philippines-wide profile of OHN technological competency, allowing inter-regional comparisons and enabling recommendations applicable beyond Luzon's industrial concentration.

Conduct longitudinal studies to track competency change over time.

The cross-sectional design of this study captured a single-point profile. Longitudinal designs tracking the same nurses over two to five years, particularly before and after structured training interventions anchored in the OHN-DCF, would establish whether and how quickly competency changes in response to professional development and organizational improvements.

Use mixed methods to explore the mechanisms behind the industry effect.

The finding that industry is the master differentiating variable warrants qualitative follow-up. In-depth interviews and ethnographic observation within specific industry sectors would reveal the organizational mechanisms, cultural factors, and structural conditions that produce the competency differences documented quantitatively in this study.

Develop and validate an objective, performance-based competency assessment tool.

All measurements in this study relied on self-reported perceptions. A performance-based assessment of actual technology use in OHN practice settings would complement the self-report data and provide a more complete picture of where self-perceptions align with or diverge from observed behavior.

Examine mediating and moderating variables not captured in this design.

The weak strength of the bivariate correlations suggests that organizational culture, quality of available technology, caring orientation, and professional identity each may mediate or moderate the relationships among competency, self-efficacy, and barriers. Structural equation modeling with a nationally representative sample would be the appropriate analytical approach for this next level of investigation.

3.2 Recommendations for Policy

Integrate digital competency standards into RA 11058 implementing rules.

The Department of Labor and Employment should initiate a review of Department Order 198-18 to include defined minimum digital competency standards for qualified occupational health nurses. These standards should specify the digital functions that all OHNs must demonstrate as a condition of qualified practice, grounded in the OHN-DCF proposed in this study.

Mandate OHN digital competency as a required CPD category under the CPD Act.

The Professional Regulation Commission should designate OHN-specific digital competency training as a required component of the CPD units necessary for nursing license renewal. This policy would create a regulatory incentive for training provision that currently does not exist.

Require employer-provided technology orientation before deploying new digital systems.

The finding that new systems were introduced without adequate orientation was among the most prominent individual barriers in the study. Department Order 198-18 should be amended to require that employers

provide structured orientation before deploying any new digital system in the OHN unit, consistent with the RA 11058 mandate to provide necessary facilities for OHN functions.

Fund OHN digital competency research through DOST and CHED.

The Department of Science and Technology and the Commission on Higher Education should designate OHN digital competency as a priority research area, consistent with the HNRDA 2022 to 2028 and NIBRA 2022 to 2028 mandates for health workforce research. Continued investment in this area will allow the baseline established by this study to be built upon systematically.

3.3 Recommendations for Practice

OHNAP should develop the OHN Technology Competency Certification Pathway aligned with the OHN-DCF.

This pathway should offer three certification levels corresponding to Foundational, Proficient, and Advancedcompetency, with defined learning outcomes, observable behavioral indicators, and CPD credit equivalences for each level. Regional delivery mechanisms are essential to address geographic accessibility, which was among the most prominent individual barriers identified.

Redesign training content to target competency outcomes, not awareness.

The non-significance of training frequency on competency scores indicates that current training formats do not produce meaningful gains in TCCN-grounded competency. Future training must be hands-on, scenario-based, and OHN-specific, using actual regulatory platforms, surveillance tools, and teleconsultation systems relevant to Philippine OHN practice.

Establish a structured OHN digital peer support network through OHNAP.

Given that social persuasion is a key source of self-efficacy and that professional isolation is a defining feature of OHN practice, a moderated digital peer network would allow OHNs to share troubleshooting approaches and digital solutions across industries and regions, directly addressing the problem-solving confidence gap.

3.4 Recommendations for Curriculum Integration

Integrate the OHN-DCF into nursing education curricula.

Schools of nursing offering OHN specialization courses should adopt the OHN-DCF as a competency reference for curriculum development. Specific modules addressing each of the three TCCN-derived domains, including digital health assessment for occupational populations, electronic DOLE reporting, and technology-mediated worker communication, should be incorporated into both undergraduate and graduate nursing programs.

Develop OHN-specific digital simulation scenarios for nursing laboratories.

Nursing simulation laboratories should include occupational health nursing technology scenarios, such as encoding DOLE Form 1 electronically, managing a digital occupational health surveillance database, and using teleconsultation platforms to coordinate worker referrals. Early exposure to OHN-specific technology tasks during nursing education would reduce the self-directed learning burden that currently falls on nurses after they enter OHN practice.

Practical Scholarly Output Occupational Health Nursing Digital Competency Framework OHN-DCF, Version 1.0

4.1 Background and Rationale

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The OHN-DCF is an evidence-based professional competency standard derived from the empirical findings of a descriptive-correlational study of 236 BOSH-trained occupational health nurses across all regions of Luzon, Philippines, conducted in 2026. It was developed in response to the documented absence of any competency standard specifically addressing digital readiness for occupational health nursing in the Philippine regulatory and professional landscape. While RA 11058 and Department Order 198-18 mandate extensive digital health functions for OHNs, no prior standard existed to define what those functions require in terms of competency, how competency should be assessed, or how it should be developed. The OHN-DCF is grounded solely in Locsin's Technological Competency as Caring in Nursing Theory, published in 2005 and subsequently refined through 2017. TCCN Theory holds that technological competency in nursing is not merely a technical skill but a mode of caring through which nurses come to know persons more fully. Within this philosophical orientation, the OHN-DCF treats digital competency not as a bureaucratic qualification but as the capacity to use technology in ways that deepen the nurse's knowledge of workers as whole persons, express genuine caring through digital interactions, and maintain the connectivity essential to coordinated workplace health protection.

4.2 Philosophical Foundations

Technology as caring, not as a substitute for it.. Competent technology use is how OHNs extend their capacity to know and respond to workers as whole persons. Digital documentation, surveillance, and teleconsultation are not departures from caring. They are expressions of it.

Competency is contextually embedded.. The finding that industry is the master differentiating variable across all three central variables confirms that competency does not develop in isolation from the environment. Competency standards must acknowledge context, not treat it as irrelevant.

Barriers are structural, not personal.. The training accessibility findings confirm that the primary obstacles to OHN digital competency development are organizational and systemic, not individual. The framework places responsibility for enabling conditions on institutions and organizations, not solely on individual nurses.

4.3 Framework Architecture

Three Core Competency Domains

The framework is organized around three domains derived directly from Locsin's TCCN Theory, corresponding to the three domains measured in this study.

Domain 1, Technological Knowing, covers the use of digital health tools to gather, integrate, and interpret worker health data in ways that deepen the nurse's knowing of each worker as a whole, dynamic person. It is the foundational domain and the one that scored lowest in this study, indicating that it is also the domain most in need of targeted development.

Domain 2, Expression of Caring Through Technology, covers the deliberate and ethical use of digital tools as instruments through which the OHN expresses genuine caring for the worker, including personalized care planning, ethically grounded documentation, and technology-mediated health education.

Domain 3, Technological Connectedness, covers the use of technology to establish, maintain, and strengthen professional connections with workers, employers, healthcare professionals, and regulatory bodies, including DOLE reporting, teleconsultation, and inter-professional digital coordination.

Three Competency Levels

The OHN-DCF recognizes three developmental levels consistent with contemporary healthcare competency framework design.

Level 1, Foundational, describes the OHN who performs required digital health functions with consistent

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support or guidance. Technology use is primarily compliance-driven. This level corresponds to nurses in early career phases or those in technology-limited industrial environments.

Level 2, Proficient, describes the OHN who independently performs all required digital functions and begins to integrate technology into caring practice beyond compliance, including person-centered data interpretation and caring expression through digital tools. This level corresponds to mid-career OHNs in mainstream industry environments.

Level 3, Advanced, describes the OHN who independently performs all required digital functions, troubleshoots system failures, innovates digital solutions for practice problems, and mentors others. This level corresponds to experienced OHNs or those in technology-rich environments with strong institutional support.

4.4 Domain Competency Standards

Tables 1 through 3 present the competency standards for each domain. Each table specifies competency indicators, observable behaviors, performance descriptors, and recommended assessment methods across the three levels.

Table 1. OHN-DCF: Domain 1, Technological Knowing

Level	Indicator Code	Observable Behaviors	Performance Descriptor	Assessment
Foundational	TK1.1 Basic data entry and retrieval TK1.2 Guided risk identification TK1.3 Assisted record navigation	Encodes worker health data accurately. Retrieves records when needed. Uses surveillance tools with guidance to identify risks. Completes DOLE forms in required digital format.	Performs digital data tasks when required. Relies on templates. Technology use is reactive and compliance-driven.	Supervisor checklist. Record quality audit. Self-assessment scale.
Proficient	TK2.1 Integrated assessment TK2.2 Trend analysis TK2.3 Data-informed decisions TK2.4 Whole-person digital knowing	Assesses workers holistically using digital tools. Monitors health trends over time. Translates data into individualized care decisions. Uses records to understand each worker as a whole person, not just a complaint.	Independently integrates data from multiple digital sources. Makes proactive health decisions based on digital evidence.	Portfolio of digital case analyses. Peer review of assessment documentation. Simulated scenario rubric.
Advanced	TK3.1 Predictive surveillance TK3.2 Population-level analysis TK3.3 System evaluation TK3.4 Mentorship in knowing	Uses digital surveillance to predict occupational health risks. Analyzes aggregated worker data for population-level trends. Evaluates and improves available surveillance tools. Mentors junior OHNs on technology as a mode of knowing workers.	Leads population health analyses. Recognized as digital resource among peers. Connects technology explicitly to the caring mission of OHN practice.	Population health impact documentation. Peer recognition survey. Leadership evaluation rubric.

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Table 2. OHN-DCF: Domain 2, Expression of Caring Through Technology

Level	Indicator Code	Observable Behaviors	Performance Descriptor	Assessment
Foundational	EC1.1 Accurate digital documentation EC1.2 Technology-assisted health education EC1.3 Worker-centered records	Documents worker encounters accurately and respectfully. Uses digital tools to deliver health education. Ensures records reflect the worker's individual situation, not a generic template. Maintains professional presence while performing digital tasks.	Completes digital caring tasks accurately. Aware of the worker while performing documentation. Technology use is respectful and worker-centered even when compliance-driven.	Documentation quality review. Worker satisfaction survey. Self-assessment against EC indicators.
Proficient	EC2.1 Individualized digital care planning EC2.2 Balanced technology and caring EC2.3 Clinical decision support use EC2.4 Person-centered digital communication	Uses digital tools to plan individualized occupational health programs. Maintains conscious focus on the worker as a whole person during digital encounters. Uses decision-support tools for evidence-based, worker-appropriate interventions. Communicates digital findings in caring and accessible ways.	Workers experience digital interactions as personalized and respectful. Balances efficiency and humanistic caring in digital practice.	Reflective practice portfolio. Worker narrative feedback. Peer observation with caring behavior checklist.
Advanced	EC3.1 Advocacy through digital systems EC3.2 Ethical digital leadership EC3.3 Theory-informed practice modeling EC3.4 Technology design consultation	Advocates for digital system modifications that better serve worker-centered caring. Leads discussions on ethical use of worker health data. Consults on selection of digital tools to ensure caring values are embedded in design. Models TCCN Theory in digital practice for peers.	Recognized as a caring-oriented technology practitioner. Influences institutional technology decisions. Mentors others in integrating TCCN Theory into digital practice.	Leadership impact documentation. Ethics case presentations. Mentorship and modeling evaluation.

Table 3. OHN-DCF: Domain 3, Technological Connectedness

Level	Indicator Code	Observable Behaviors	Performance Descriptor	Assessment
Foundational	TC1.1 DOLE digital reporting TC1.2 Digital record maintenance TC1.3 Basic digital communication	Submits required DOLE occupational health reports through designated platforms accurately and on time. Maintains legally compliant digital records. Responds to worker health queries	Meets all regulatory digital reporting requirements. Maintains compliant records. Requires guidance for non-routine digital connection tasks.	DOLE submission records audit. Digital record compliance review. Regulatory timeliness tracking.

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		through available digital communication tools. Documents referrals and inter-professional communications in digital records.		
Proficient	TC2.1 Teleconsultation and digital referral TC2.2 Inter-professional digital coordination TC2.3 Health communication TC2.4 Care continuity through technology	Uses teleconsultation platforms independently to connect workers with physicians and specialists. Coordinates with occupational physicians and safety officers through digital platforms. Communicates workplace health findings to management and workers through digital means. Uses technology to maintain continuity of care even when face-to-face interaction is limited.	Independently manages all digital connectivity functions of OHN practice. Uses technology proactively to strengthen worker-nurse-employer health relationships.	Teleconsultation log review. Coordination quality audit. Worker care continuity tracking.
Advanced	TC3.1 Digital network leadership TC3.2 Health system digital integration TC3.3 Privacy-conscious connectivity TC3.4 Cross-industry digital collaboration	Leads development of digital communication protocols for OHN practice in complex industrial environments. Integrates OHN digital systems with broader workplace health information systems. Develops and implements privacy-protective communication practices consistent with RA 10173. Collaborates with OHNs across industries to share digital practice innovations.	Leads institutional digital connectivity improvements. Recognized as a resource for digital communication practice. Actively models worker privacy rights protection in digital documentation.	Leadership outcome documentation. System integration records. Privacy practice audit.

4.5 Cross-Cutting Organizational Enablers

The OHN-DCF recognizes that individual competency development cannot occur in an organizational vacuum. The barriers analysis confirmed that structural and institutional conditions are significantly associated with competency and self-efficacy levels. The following four organizational enablers are specified as the

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institutional preconditions for competency development at all levels. They reflect the barrier domains identified as most prominent by study respondents.

Table 4. OHN-DCF: Organizational Enablers and Institutional Responsibilities

Enabler	Standard	Required Institutional Actions	Responsible Body	Legal Basis
A. Access to Digital Learning Resources	OHNs have access to updated OHN-relevant digital learning materials, functional devices, and reliable internet for professional development purposes.	Provide OHN with device and reliable connectivity. Develop or subscribe to OHN digital learning repositories. Fund regional access to CPD digital programs. Ensure physical access across all Luzon regions.	Employers, OHNAP, DOLE, CHED	RA 11058, DO 198-18, CPD Act, RA 10173
B. Availability of OHN Technology Training	Structured, contextualized, OHN-specific technology training is available, affordable, accessible, and delivered with adequate orientation before new systems are deployed.	Develop OHN-DCF Certification Pathway. Require orientation before new system deployment. Include OHN tech competency in CPD mandates. Fund regional training access. Integrate into nursing curricula.	OHNAP, Employers, PRC, DOLE, CHED	RA 11058, CPD Act, DO 198-18, PhilHealth Accreditation Standards
C. Institutional and Technical Support	OHNs have access to functional, reliable digital systems and technical support when systems fail. Institutional leadership actively supports technology use in OHN practice.	Provide functional IT infrastructure in all OHN units. Establish IT helpdesk access for OHN practitioners. Allocate adequate budget for OHN digital health tools. Prohibit deployment of new systems without technical support provisions.	Employers, DOLE, Joint compliance body	RA 11058, DO 198-18, OSHS Standards
D. Technology Integration into OHN Practice	Digital tools are compatible with OHN workflows. Data privacy protections for workers are clearly established. Technology supports rather than burdens OHN practice.	Select digital tools with OHN workflow compatibility. Develop institutional data privacy protocols for OHN records. Train OHNs on RA 10173 in the OHN context. Design digital systems that reduce, not increase, documentation burden. Conduct regular OHN digital workflow evaluation.	Employers, NPC, DOLE, OHNAP	RA 10173, RA 11058, DO 198-18, NPC Guidelines

4.6Stakeholder Applications

For individual occupational health nurses, the OHN-DCF provides a self-assessment tool to identify current competency level across three domains and to develop a personalized digital professional development plan,

using the observable behavioral indicators at each level as concrete performance targets.

For OHNAP, the OHN-DCF provides the competency standard for a Technology Competency Certification Pathway offering Foundational, Proficient, and Advanced certification, with training programs designed around each domain's indicators and assessed through the methods specified in the framework tables. The framework also gives OHNAP a standardized language for communicating OHN digital competency requirements to employers, regulators, and educational institutions.

For employers covered by RA 11058, the OHN-DCF provides a basis for annual digital competency assessment, training needs identification, budget allocation, and performance appraisal in the technology dimension of OHN practice. The Organizational Enablers table specifies their specific institutional obligations.

For policymakers and regulatory bodies, the OHN-DCF provides the evidence-based foundation for revising RA 11058 implementing rules and PRC CPD requirements to include defined digital competency standards, along with the operationally defined indicators needed to translate those standards into regulatory language.

For schools of nursing, the OHN-DCF provides a curriculum alignment reference for OHN specialization courses, mapping each domain's competency indicators to specific learning outcomes, formative assessment activities, and summative performance criteria.

4.7 Framework Validation Roadmap

The OHN-DCF Version 1.0 presented in this chapter is an evidence-based draft framework grounded in the empirical findings of this study and in TCCN Theory. Full validation requires four additional steps consistent with established competency framework development methodology.

Step 1 is expert panel content validation. The OHN-DCF will be submitted to a validation panel of at least five experts in TCCN Theory, occupational health nursing, digital health, and nursing competency framework development. Each domain's competency standards will be evaluated for content validity using the I-CVI method, with an item threshold of 0.80 and an overall S-CVI threshold of 0.90.

Step 2 is stakeholder consultation. Focus group discussions with OHNAP members across diverse industries and regions will evaluate the practical applicability, cultural fit, and language clarity of the competency indicators. Employer representatives and DOLE occupational health officers will be included in the consultation.

Step 3 is pilot implementation. The OHN-DCF will be used as a self-assessment tool with a representative sample of OHNs across industry sectors, followed by a reliability assessment of the assessment instruments associated with each competency level.

Step 4 is national endorsement. The validated OHN-DCF will be submitted to OHNAP for formal endorsement as the association's official digital competency standard, and to DOLE for consideration as a reference document in the revision of occupational health nursing qualification standards under DO 198-18.

4.8 Revision Cycle and Custodianship

Digital health technology evolves rapidly. To ensure the OHN-DCF remains responsive to technological change, regulatory developments, and emerging evidence, the framework should be reviewed and updated on a three-year cycle, or more frequently when major changes in DOLE digital reporting requirements or national digital health policy occur. OHNAP is recommended as the institutional custodian, responsible for convening revision panels and disseminating updated versions to its membership and to relevant regulatory bodies.

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APPENDIX A

G*Power Sample Size Computation

The following presents the G*Power 3.1.9.7 sample size computations for the two inferential statistical tests employed in this study: the One-Way Analysis of Variance (ANOVA) and the Pearson Product-Moment Correlation Coefficient. The larger of the two computed values was adopted as the minimum required sample size.

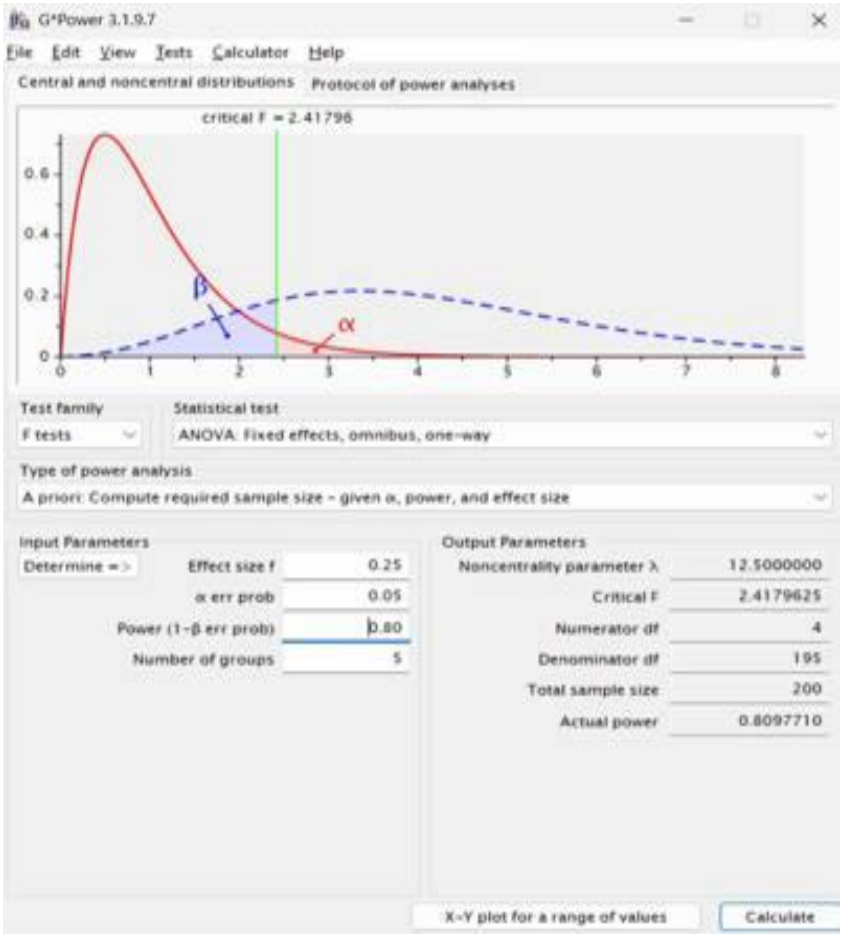
Computation 1: One-Way ANOVA

Input Parameters	**Input Parameters**
Test Family	F tests
Statistical Test	ANOVA: Fixed effects, omnibus, one-way
Type of Power Analysis	A priori: Compute required sample size
Effect Size (f)	0.25 (Medium)
α Error Probability	0.05
Power (1-β Error Prob)	0.80
Number of Groups	5
Output Parameters	**Output Parameters**
Noncentrality Parameter (λ)	12.5000000
Critical F	2.4179625
Numerator df	4
Denominator df	195
Total Sample Size	200
Actual Power	0.8097710

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Interpretation: A minimum of 200 respondents is required to detect a medium effect size (f = 0.25) across five groups at 80.97% statistical power (α = 0.05) using One-Way ANOVA.

Figure 1. G*Power Output — Computation 1: One-Way ANOVA



Adopted Sample Size
Minimum Required Sample Size: 200 respondents

APPENDIX B

Survey Questionnaire

Technological Competency Among Occupational Health Nurses in the Philippines: A Descriptive-Correlational Study of Technology Self-Efficacy and Perceived Barriers

Dear Respondent,

You are invited to participate in a research study conducted in partial fulfillment of the requirements for the degree of Master of Arts in Nursing at the University of Perpetual Help System DALTA (UPHSD) Graduate School. This study examines the technological competency, technology self-efficacy, and perceived barriers to technology utilization among occupational health nurses in Luzon who have completed OHNAP-recognized Basic Occupational Safety and Health (BOSH) training.

Your participation is voluntary. All information you provide will be kept strictly confidential and will be used solely for academic research purposes. No personally identifying information was collected. Your responses were reported only in aggregate form.

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By proceeding with this questionnaire, you confirm that you have read and understood the above information and voluntarily agree to participate.

Estimated completion time: 15–20 minutes

PART I: DEMOGRAPHIC PROFILE

Directions: Please provide the following information about yourself by placing a check (✓) in the appropriate box or writing your response in the space provided.

1. Age

☐ 20–29 years

☐ 30–39 years

☐ 40–49 years

☐ 50 years and above

2. Sex

☐ Male ☐ Female

3. Years of Occupational Health Nursing Experience

☐ Less than 2 years

☐ 2 to 5 years

☐ 6 to 10 years

☐ 11 to 15 years

☐ 16 to 20 years

☐ More than 20 years

4. Industry (Current Employer)

☐ Construction and Infrastructure

☐ Business Process Outsourcing (BPO) and Corporate Services

☐ Manufacturing and Industrial

☐ Government and Public Services

☐ Healthcare and Hospitals

☐ Education and Schools/Universities

☐ Transportation and Logistics

☐ Others (please specify): _____

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5. Number of Technological Competency-Related Trainings Attended Within the Last Three (3) Years

(Do not count your BOSH training. Count only trainings, seminars, workshops, continuing professional development activities, or other structured learning activities specifically related to the development or use of technology in occupational health nursing practice that you attended within the last three (3) years.)

☐ None

☐ 1 to 2 competency-related trainings

☐ 3 or more competency-related trainings

PART II: PERCEIVED LEVEL OF TECHNOLOGICAL COMPETENCY

Directions: The following statements describe how you use technology in your current occupational health nursing practice. Please indicate how much you agree or disagree with each statement by placing a check (✓) in the column that best reflects your response.

Scale:

4	3	2	1
Strongly Agree (SA)	Agree (A)	Disagree (D)	Strongly Disagree (SD)

(Researcher-constructed instrument grounded in Locsin's Technological Competency as Caring in Nursing [TCCN] Theory and informed by the Technological Competency as Caring in Healthcare Providers Instrument (TCCHI; Yamanaka et al., 2025; 2026). The items were independently developed by the researcher to reflect the specific technological tasks and responsibilities of occupational health nurses in Philippine workplace settings.)

Domain A: Technological Knowing

This domain refers to the use of technology to gather comprehensive information about workers, enabling the occupational health nurse to know and understand each worker as a whole, dynamic person rather than merely as a clinical case.

No.	Statement	SA (4)	A (3)	D (2)	SD (1)
1	I use digital health records and information systems to gather comprehensive data about the health status of the workers I serve.				
2	I use technology to monitor changes in workers' health conditions over time, allowing me to recognize emerging health concerns early.				
3	I use health surveillance technologies to identify occupational health risks and hazards that may affect the overall well-being of workers.				
4	I use digital tools and systems to assess workers' physical, mental, and occupational health needs in a thorough and systematic manner.				
5	I use technology to analyze occupational health data and translate findings into meaningful information that guides my nursing decisions.				
6	I am able to use digital health records to develop a comprehensive understanding of each worker as a whole person, beyond their immediate health complaint.				
7	I use technology-based assessment tools to identify workers who may be at risk for occupational illness or injury before symptoms become apparent.				

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Domain A Subtotal: _____ ÷ 7 = _____ (Domain A Mean)

Domain B: Expression of Caring

This domain refers to the use of technology as a deliberate and ethical expression of caring in occupational health nursing practice — using digital tools not as ends in themselves but as means through which the nurse demonstrates genuine concern for the workers' health, safety, and holistic well-being.

No.	Statement	SA (4)	A (3)	D (2)	SD (1)
8	I use technology as a tool for caring — not merely for efficiency, but to provide more individualized and responsive health services to the workers I serve.				
9	I use digital health records and documentation systems to ensure that the care I provide to workers is continuous, accurate, and respectful of their individual health needs.				
10	I use technology to deliver health education and wellness information to workers in a way that is personalized to their specific occupational health concerns.				
11	When I use technology in occupational health nursing practice, I remain focused on the worker as a whole person rather than on the technology itself.				
12	I use digital tools to plan and implement workplace health programs that address the specific health needs of the workers in my care.				
13	I am able to balance the demands of using technology competently with maintaining a caring and person-centered approach to occupational health nursing.				
14	I use technology-supported clinical decision-making tools to ensure that the health interventions I recommend are appropriate, safe, and responsive to workers' individual conditions.				

Domain B Subtotal: _____ ÷ 7 = _____ (Domain B Mean)

Domain C: Technological Connectedness

This domain refers to the use of technology to establish, maintain, and strengthen communication and professional connections between the occupational health nurse, the workers in their care, and other healthcare providers.

No.	Statement	SA (4)	A (3)	D (2)	SD (1)
15	I use digital communication platforms to maintain regular and accessible communication with the workers I serve regarding their occupational health concerns.				
16	I use technology to coordinate with occupational physicians, safety officers, and other health professionals regarding the management of workers' health conditions.				
17	I use teleconsultation or digital referral systems to connect workers with appropriate healthcare services when their needs exceed the scope of my occupational health nursing practice.				
18	I use digital reporting and documentation systems to maintain accurate, timely, and legally compliant occupational health records for the workers in my care.				
19	I use technology to submit required occupational health reports to the				

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	Department of Labor and Employment (DOLE) and other regulatory bodies efficiently and accurately.				
20	I use digital platforms to communicate workplace health findings, surveillance results, and health promotion materials to workers and management in a clear and accessible manner.				
21	I am able to use technology to maintain the continuity of occupational health nursing care for workers even when face-to-face interaction is limited or not immediately possible.				

Domain C Subtotal: _____ ÷ 7 = _____ (Domain C Mean)

Overall Technological Competency Score: (Domain A Mean + Domain B Mean + Domain C Mean) ÷ 3 = _____

PART III: PERCEIVED LEVEL OF TECHNOLOGY SELF-EFFICACY

Directions: The following statements describe your confidence in performing specific technology-related tasks in your occupational health nursing practice. Please indicate how confident you feel about each statement by placing a check (✓) in the column that best reflects your response.

Scale:

4	3	2	1
Completely Confident (CC)	Very Confident (VC)	Slightly Confident (SC)	Not at All Confident (NAC)

(Researcher-constructed instrument grounded in Bandura's Self-Efficacy Theory and informed by the Digital and Technological Self-Efficacy Scale [Digitech-S; Conte et al., 2023]. The items were independently developed by the researcher to measure technology self-efficacy in the context of occupational health nursing practice.)

Domain A: Technology Learning Self-Efficacy

This domain measures your confidence in your ability to learn new technologies and digital tools relevant to your occupational health nursing practice.

No.	Statement	CC (4)	VC (3)	SC (2)	NAC (1)
1	I am confident that I can learn to use a new digital health record system for occupational health nursing documentation even if I have had no prior training on it.				
2	I am confident that I can independently learn to operate a new digital workplace health surveillance platform when it is introduced in my workplace.				
3	I am confident that I can acquire the technological skills needed to use new digital tools for occupational health assessments through self-study or online resources.				
4	I am confident that I can update my technology-related knowledge and skills to keep pace with the digital tools being used in occupational health nursing practice.				
5	I am confident that I can learn to use digital communication platforms for occupational health service delivery even without formal instruction.				
6	I am confident that I can complete online training programs or tutorials to develop my digital competencies in occupational health nursing when opportunities are available.				

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Domain A Subtotal: _____ ÷ 6 = _____ (Domain A Mean)

Domain B: Technology Use Self-Efficacy

This domain measures your confidence in your ability to effectively use technology in your routine occupational health nursing tasks.

No.	Statement	CC (4)	VC (3)	SC (2)	NAC (1)
7	I am confident that I can accurately encode, update, and retrieve worker health records using electronic health record systems used in my workplace.				
8	I am confident that I can use digital tools to conduct and document occupational health assessments accurately and efficiently.				
9	I am confident that I can prepare and submit occupational health reports using digital or electronic reporting systems.				
10	I am confident that I can use digital health surveillance systems to monitor and track the health status and occupational health risks of the workers in my care.				
11	I am confident that I can effectively use digital communication technologies to deliver occupational health services and referrals.				
12	I am confident that I can use technology to access and apply evidence-based occupational health guidelines and reference materials in my daily practice.				
13	I am confident that I can navigate and operate the digital systems required in my workplace to fulfill my occupational health nursing responsibilities without requiring frequent assistance.				

Domain B Subtotal: _____ ÷ 7 = _____ (Domain B Mean)

Domain C: Technology Problem-Solving Self-Efficacy

This domain measures your confidence in your ability to identify and resolve technology-related problems or difficulties that arise in your occupational health nursing practice.

No.	Statement	CC (4)	VC (3)	SC (2)	NAC (1)
14	I am confident that I can identify the cause of a technical problem affecting the digital tools I use in my occupational health nursing practice.				
15	I am confident that I can resolve minor technical difficulties with digital health systems independently, without always needing to contact technical support.				
16	I am confident that I can find alternative ways to complete my occupational health nursing tasks when a digital system I normally use becomes unavailable or malfunctions.				
17	I am confident that I can troubleshoot problems with digital occupational health records, surveillance tools, or reporting systems when I encounter errors or unexpected issues.				
18	I am confident that I can adapt quickly when a digital tool I use in my occupational health nursing practice is updated, changed, or replaced by a different system.				
19	I am confident that I can seek out and apply appropriate technical support resources to resolve technology problems that I cannot address on my own.				

Domain C Subtotal: _____ ÷ 6 = _____ (Domain C Mean)

Overall Technology Self-Efficacy Score: (Domain A Mean + Domain B Mean + Domain C Mean) ÷ 3 = ____

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PART IV: PERCEIVED BARRIERS TO TECHNOLOGY UTILIZATION

Directions: The following statements describe conditions in your work environment that may affect your use of technology in your occupational health nursing practice. Please indicate how much you agree or disagree with each statement by placing a check (✓) in the column that best reflects your experience.

Scale:

5	4	2	1
Strongly Agree (SA)	Agree (A)	Disagree (D)	Strongly Disagree (SD)

(Researcher-constructed instrument grounded in Bandura's triadic reciprocal causation framework and informed by relevant literature. Items marked with an asterisk [*] are negatively worded and will be reverse-scored before analysis.)

Domain A: Access to Technology-Related Learning Resources

This domain measures the extent to which you perceive that adequate resources for developing technology-related knowledge and skills in occupational health nursing are accessible to you.

No.	Statement	SA (4)	A (3)	D (2)	SD (1)
1	I have sufficient access to online learning materials that can help me develop my digital skills for occupational health nursing practice.				
2	I have access to updated references, guidelines, and informational resources about the digital tools used in occupational health nursing.				
3	The equipment and devices I need to practice and develop my digital skills in occupational health nursing are available to me.				
4	Reliable internet connectivity is consistently available in my workplace, allowing me to access online resources for professional development.				
5	I am aware of professional development opportunities focused on technology use in occupational health nursing that I can access.				
*6	The cost of technology-related learning resources and professional development programs is a barrier to my digital skills development as an occupational health nurse.				

Domain A Subtotal: _____ ÷ 6 = _____ (Domain A Mean)

Domain B: Availability of Occupational Health Technology Training

This domain measures the extent to which you perceive that formal training opportunities specific to the digital tools used in occupational health nursing are available and adequate.

No.	Statement	SA (4)	A (3)	D (2)	SD (1)
7	My employer or organization provides formal training on the digital systems and technologies I am expected to use in my occupational health nursing practice.				
8	The technology-related training I have received has been sufficient to allow me to use digital tools effectively in my occupational health nursing work.				
9	OHNAP or other professional nursing organizations offer continuing education programs specifically focused on technology and digital				

	competency for occupational health nurses.				
*10	New digital systems or tools are introduced in my workplace without adequate orientation or training for occupational health nursing staff.				
*11	Training on technology use in occupational health nursing is difficult to access because it is rarely offered, too expensive, or geographically inaccessible.				
12	I have had opportunities to practice using digital health tools in a supervised or supported environment before being required to use them independently in practice.				

Domain B Subtotal: _____ ÷ 6 = _____ (Domain B Mean)

Domain C: Institutional and Technical Support for Technology Use

This domain measures the extent to which you perceive that your workplace provides adequate organizational support, technical assistance, and infrastructure for technology use in occupational health nursing practice.

No.	Statement	SA (4)	A (3)	D (2)	SD (1)
13	My employer actively supports and encourages the use of digital tools and technology in my occupational health nursing practice.				
14	Technical assistance is available to me when I encounter problems with the digital systems I use in my work.				
15	The digital systems and technologies available in my workplace are reliable and function consistently enough to support my occupational health nursing practice.				
*16	Insufficient budget allocation for technology infrastructure in my workplace limits my ability to use digital tools effectively in occupational health nursing.				
*17	I am required to use outdated or poorly maintained digital systems that make technology use in my occupational health nursing practice difficult or inefficient.				
18	My immediate supervisor or management team demonstrates an understanding of and support for the role of technology in occupational health nursing practice.				

Domain C Subtotal: _____ ÷ 6 = _____ (Domain C Mean)

Domain D: Integration of Technology into Occupational Health Nursing Practice

This domain measures the extent to which you perceive that digital tools and systems are compatible with and effectively integrated into your existing occupational health nursing workflows and responsibilities.

No.	Statement	SA (4)	A (3)	D (2)	SD (1)
19	The digital systems I use in my occupational health nursing practice are compatible with the established workflows and procedures of my workplace clinic or health unit.				
*20	Using digital tools in my occupational health nursing practice requires more time than traditional paper-based methods, making it difficult to integrate technology into my daily work.				
*21	The digital systems available in my workplace are too complicated or difficult to navigate to be used effectively in my daily occupational health				

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	nursing responsibilities.				
22	Technology has improved the efficiency and quality of the occupational health nursing services I provide to workers in my care.				
23	I am able to integrate the use of digital tools into my occupational health nursing practice without significantly disrupting my existing clinical routines.				
*24	Concerns about worker privacy and data confidentiality make me hesitant to use digital systems for managing occupational health records and surveillance data.				

Domain D Subtotal: _____ ÷ 6 = _____ (Domain D Mean)

Overall Perceived Barriers Score: (Domain A Mean + Domain B Mean + Domain C Mean + Domain D Mean)

÷ 4 = _____

Higher scores indicate higher perceived barriers to technology utilization.

SCORING SUMMARY SHEET

Variable	**Domain**	**Domain Mean**	**Overall Mean**
Technological Competency	A - Technological Knowing		
Technological Competency	B - Expression of Caring		
Technological Competency	C - Technological Connectedness		
Technological Competency	**Overall Technological Competency**		
Technology Self-Efficacy	A - Technology Learning		
Technology Self-Efficacy	B - Technology Use		
Technology Self-Efficacy	C -Technology Problem-Solving		
Technology Self-Efficacy	**Overall Technology Self-Efficacy**		
Perceived Barriers	A - Access to Learning Resources		
Perceived Barriers	B - Availability of Training		
Perceived Barriers	C - Institutional/ Technical Support		
Perceived Barriers	D - Technology Integration		
Perceived Barriers	**Overall Perceived Barriers**		

Interpretation of Mean Scores

Mean Score Range	**Descriptive Interpretation**
3.26 - 4.00	Very High
2.51 - 3.25	High
1.76 - 2.50	Low
1.00–1.75	Very Low

For Perceived Barriers: Very High = Very High Barriers; Very Low = Very Low Barriers

Thank you for completing this questionnaire. Your responses contributed to improving technological readiness among occupational health nurses in the Philippines.

Instrument Specifications

Appendix C

INSTRUMENT SPECIFICATIONS

Part	Variable	No. of Items	No. of Domains	Scale	Source
I	Demographic Profile	5 items	N/A	Categorical	Researcher-constructed
II	Technological Competency	21 items	3 domains (7 items each)	4-point Likert (SD to SA)	Researcher-constructed informed by TCCHI (Yamanaka et al., 2025; 2026)
III	Technology Self-Efficacy	19 items	3 domains (6,7,6 items)	4-point Likert (NAC to CC)	Researcher-constructed informed by Digitech-S (Conte et al., 2023)
IV	Perceived Barriers	24 items	4 domains (6 items each)	4-point Likert (SD to SA)	Researcher-constructed
	Total	**69 items**			

Items marked with asterisk (*) in Parts IV are negatively worded and require reverse-scoring before analysis. Reverse-scoring key: SA=1, A=2, D=3, SD=4 after recoding for negatively worded items.

APPENDIX C

VALIDITY AND RELIABILITY

Content validity was established for the researcher-adapted instruments in Parts II, III, and IV of the survey questionnaire, and for the researcher-constructed instrument in Part IV, prior to the main data collection phase. Three expert validators independently assessed each item using a four-point rating scale, where 1 indicated Not Acceptable or Not Relevant, 2 indicated Somewhat Acceptable, 3 indicated Acceptable with Minor Revisions, and 4 indicated Highly Acceptable with No Revision Needed.

Ratings of 3 or 4 were classified as relevant for the purpose of computing the Item-level Content Validity Index (I-CVI). The Scale-level Content Validity Index averaged across all items (S-CVI/Ave) was subsequently calculated for each instrument. The minimum acceptable thresholds were I-CVI of 0.80 per item and S-CVI of 0.90 for the overall instrument, following the standards established by Polit and Beck (2021).

Items falling below the threshold were to be revised or removed. Validators also provided qualitative comments and an overall recommendation. All completed validation forms were returned within the period of August 10 to August 19, 2026.

EXPERT VALIDATOR PROFILES

Table 1. Expert Validator Profiles

No.	Name and Credentials	Institutional Affiliations	Field of Expertise	Date
1	**Raymond D. Papa, MOH, RN**	Occupational Health Nurses Association of the Philippines, Inc. (OHNAP)	Occupational Health Nursing	August 10, 2026
2	**Ryan Salamera Mora, RN**	American Crescent Healthcare Centre	Occupational Health, Nursing Administration, Nursing Education	August 19, 2026
3	**Drexel Heinz**	Biñan Doctors' Hospital (Nursing	Nursing	August

	Magpantay Cruz, PhD, RN, RM, CHA, CIN, CLSSYB, CHRA, FISQua	Director). Crestmont Metropolitan University and FEU (Adjunct Professor). ISQua (Fellow). Sigma Global Nursing Excellence, Phi Gamma Chapter (VP). Wiley Nursing Open (Peer Reviewer).	Administration, Nursing Research and Education	15, 2026

Note. Validator 1 is the President of the Occupational Health Nurses Association of the Philippines, the professional organization whose networks facilitated respondent recruitment in this study. Validator 2 is an active OHN practitioner providing a practical perspective. Validator 3 is the thesis adviser providing methodological and theoretical evaluation.

Content Validity Results

3.1 Item-Level and Scale-Level Content Validity Indices

Tables 2 through 4 present the computed I-CVI and S-CVI values for Parts II, III, and IV. All ratings were based on the Relevance criterion, as it is the primary determinant for I-CVI computation following Polit and Beck (2021). Mean ratings across all four criteria (Relevance, Clarity, Simplicity, and Ambiguity) are also reported to provide a comprehensive profile of instrument quality.

Table 2. Content Validity Results: Part II, Technological Competency Instrument (21 Items, 3 Domains)

Domain	**n Items**	**V1 Rating**	**V2 Rating**	**V3 Rating**	**Mean Rating**	**I-CVI**	**S-CVI**
Mean ratings reflect the average of all four criteria (Relevance, Clarity, Simplicity, Ambiguity) across all items within each domain	Mean ratings reflect the average of all four criteria (Relevance, Clarity, Simplicity, Ambiguity) across all items within each domain	Mean ratings reflect the average of all four criteria (Relevance, Clarity, Simplicity, Ambiguity) across all items within each domain	Mean ratings reflect the average of all four criteria (Relevance, Clarity, Simplicity, Ambiguity) across all items within each domain	Mean ratings reflect the average of all four criteria (Relevance, Clarity, Simplicity, Ambiguity) across all items within each domain	Mean ratings reflect the average of all four criteria (Relevance, Clarity, Simplicity, Ambiguity) across all items within each domain	Mean ratings reflect the average of all four criteria (Relevance, Clarity, Simplicity, Ambiguity) across all items within each domain	Mean ratings reflect the average of all four criteria (Relevance, Clarity, Simplicity, Ambiguity) across all items within each domain
Technological Knowing (Items 1 to 7)	7	4.00	4.00	4.00	4.00	1.00	
Expression of Caring (Items 8 to 14)	7	4.00	4.00	4.00	4.00	1.00	
Technological Connectedness (Items 15 to 21)	7	4.00	4.00	4.00	4.00	1.00	
Part II Overall	21	4.00	4.00	4.00	4.00	1.00	1.00

Note. V1 = Raymond D. Papa, V2 = Ryan Salamera Mora, V3 = Drexel H. M. Cruz. All items received ratings of 4 (Highly Acceptable) from all three validators on all four criteria. I-CVI = 1.00 for all 21 items. S-CVI/Ave = 1.00, exceeding the required threshold of 0.90. Decision: All 21 items retained without revision.

Table 3. Content Validity Results: Part III, Technology Self-Efficacy Instrument (19 Items, 3 Domains)

Domain	n Items	V1 Rating	V2 Rating	V3 Rating	Mean Rating	I-CVI	S-CVI
Technology Learning Self-Efficacy (Items 1 to 6)	6	4.00	4.00	4.00	4.00	1.00	
Technology Use Self-Efficacy (Items 7 to 13)	7	4.00	4.00	4.00	4.00	1.00	
Technology Problem-Solving Self-Efficacy (Items 14 to 19)	6	4.00	4.00	4.00	4.00	1.00	
Part III Overall	19	4.00	4.00	4.00	4.00	1.00	1.00

Note. All 19 items received ratings of 4 (Highly Acceptable) from all three validators across all four evaluation criteria. I-CVI = 1.00 and S-CVI/Ave = 1.00 for all domains and for the overall instrument. Decision: All 19 items retained without revision.

Table 4. Content Validity Results: Part IV, Perceived Barriers Instrument (24 Items, 4 Domains)

Domain	n Items	V1 Rating	V2 Rating	V3 Rating	Mean Rating	I-CVI	S-CVI
Access to Technology-Related Learning Resources (Items 1 to 6)	6	4.00	4.00	4.00	4.00	1.00	
Availability of OHN Technology Training (Items 7 to 12)	6	4.00	4.00	4.00	4.00	1.00	
Institutional and Technical Support (Items 13 to 18)	6	4.00	4.00	4.00	4.00	1.00	
Integration of Technology into OHN Practice (Items 19 to 24)	6	4.00	4.00	4.00	4.00	1.00	
Part IV Overall	24	4.00	4.00	4.00	4.00	1.00	1.00

Note. All 24 items received ratings of 4 (Highly Acceptable) from all three validators across all four evaluation criteria. I-CVI = 1.00 and S-CVI/Ave = 1.00 for all domains and the overall instrument. Decision: All 24 items retained without revision.

3.2 Validators' Overall Recommendations and Actions Taken

Table 5. Summary of Validators' Overall Recommendations and Researcher's Actions

Validator	Overall Recommendation	Key Feedback	Researcher's Action
Raymond D. Papa, MOH, RN OHNAP President	**Accept with Minor Revisions**	(1) Demographic Item 5 wording: suggested changing to "technological competency-related trainings within the last three years" to ensure currency alignment. (2) Four-point Likert scale recommended to prevent mid-point neutrality. (3) Noted that BOSH syllabus does not currently include technological competency.	(1) Demographic Item 5 revised to specify "technological competency-related trainings completed within the last three (3) years." (2) Instrument already uses a 4-point Likert scale (Strongly Disagree to Strongly Agree), consistent with the recommendation. (3) Feedback noted and addressed in the theoretical framing of the instrument rationale.

Ryan Salamera Mora, RN OHN Practitioner	**Accept with Minor Revisions**	(1) Demographic Item 5: suggested specifying "trainings related to OHS" for greater clarity. All other items rated Highly Acceptable (4) with no revision needed.	(1) Demographic Item 5 was revised to specify the training type, consistent with Papa's concurrent feedback. The revised wording addresses both validators' concerns simultaneously.
Drexel H. M. Cruz, PhD, RN, FISQua Thesis Adviser	**Accept Without Revision**	All 69 items across Parts I to IV were rated Highly Acceptable (4) on all four criteria. No items for deletion, no items to add, instructions and response options clear, instrument appropriate for Philippine OHNs.	No revisions required. Instrument confirmed as methodologically sound and theoretically aligned with TCCN Theory.

Note. Demographic Item 5 was the only item that prompted revision, based on concurrent feedback from Validators 1 and 2. All items in Parts II, III, and IV were retained in full with no wording changes. The revised Demographic Item 5 reads: "Number of Technological Competency-Related Trainings Completed Within the Last Three (3) Years." All changes were reviewed and confirmed by the thesis adviser (Validator 3) before instrument finalization.

SUMMARY OF CONTENT VALIDITY FINDINGS

Table 6. Summary of Content Validity Indices by Instrument Part

Instrument Part	n Items	Mean Rating (All Criteria)	I-CVI Range	S-CVI/Ave	Decision
Part I: Demographic Profile	5	3.93 to 4.00	1.00 for all items	1.00	All items retained. Item 5 wording revised.
Part II: Technological Competency	21	4.00	1.00 for all items	1.00	All 21 items retained without revision.
Part III: Technology Self-Efficacy	19	4.00	1.00 for all items	1.00	All 19 items retained without revision.
Part IV: Perceived Barriers	24	4.00	1.00 for all items	1.00	All 24 items retained without revision.
Combined Total	69	3.93 to 4.00	**1.00 for all 69 items**	1.00	68 of 69 items retained without change. Item 5 (Part I) wording revised.

Note. Minimum required thresholds: I-CVI of at least 0.80 per item; S-CVI/Ave of at least 0.90 per instrument (Polit and Beck, 2021). All thresholds were met and exceeded. The S-CVI of 1.00 across all instruments reflects complete consensus among the three expert validators that all items are relevant, clear, simple, and unambiguous. Rating scale: 1 = Not Acceptable, 2 = Somewhat Acceptable, 3 = Acceptable with Minor Revisions, 4 = Highly Acceptable, No Revision Needed. Ratings of 3 or 4 were classified as relevant for I-CVI computation. V1 = Raymond D. Papa; V2 = Ryan Salamera Mora; V3 = Drexel H. M. Cruz.

APPENDIX D

Pilot Reliability Testing Report

Prior to the main data collection phase, a pilot study was conducted to assess the internal consistency reliability of the three variable instruments. Fifteen (15) BOSH-trained occupational health nurses who met the inclusion criteria of the main study were recruited through the researcher's personal professional networks, separate from the OHNAP referral channels used for the main study, to prevent sample contamination. All 15 participants completed the full questionnaire, yielding a 100 percent completion rate.

Cronbach's coefficient alpha was used to measure internal consistency. It was computed using IBM SPSS Statistics 32. The following classification scale was adopted following Polit and Beck (2021):

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Cronbach's Alpha Range	Classification	Decision
0.90 and above	**Excellent**	Retain all items
0.80 to 0.89	**Good**	Retain all items
0.70 to 0.79	**Acceptable**	Retain, monitor
Below 0.70	**Inadequate**	Revise or remove

Note. Classification thresholds based on Polit and Beck (2021). A minimum Cronbach's alpha of 0.70 was required for all domains and overall instruments. Items would be revised or removed only if deletion substantially improved the overall scale alpha.

PILOT SAMPLE CHARACTERISTICS

Table 1. Demographic Profile of the Pilot Testing Sample (n = 15)

Characteristic	Frequency (f)	Percentage (%)
Sex	**Sex**	**Sex**
Male	6	40.00
Female	9	60.00
Years of OHN Experience	**Years of OHN Experience**	**Years of OHN Experience**
Less than 2 years	3	20.00
2 to 5 years	5	33.33
6 to 10 years	4	26.67
11 to 15 years	2	13.33
More than 15 years	1	6.67
Industry	**Industry**	**Industry**
Construction and Infrastructure	5	33.33
Manufacturing and Industrial	4	26.67
BPO and Corporate Services	3	20.00
Government and Other Sectors	3	20.00
Total	15	100.00

Note. Industry distribution was intentionally diversified to reflect the range of OHN practice contexts represented in the main study population.

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Reliability Results

3.1 Part II: Technological Competency Instrument

Table 2 presents the Cronbach's alpha coefficients for the Technological Competency instrument across its three domains and for the instrument as a whole.

Table 2. Cronbach's Alpha Coefficients: Part II, Technological Competency Instrument (n = 15)

Domain / Subscale	No. of Items	Cronbach's Alpha (α)	Classification	Decision
Domain A: Technological Knowing (Items 1 to 7)	7	0.867	**Good**	All items retained
Domain B: Expression of Caring (Items 8 to 14)	7	0.882	**Good**	All items retained
Domain C: Technological Connectedness (Items 15 to 21)	7	0.875	**Good**	All items retained
Part II Overall	21	0.913	**Excellent**	**All items retained**

Note. All three domain alpha values were classified as Good (0.80 to 0.89). The overall instrument alpha of 0.913 was classified as Excellent, exceeding the required minimum threshold of 0.70. All 21 items were retained.

3.2 Part III: Technology Self-Efficacy Instrument

Table 3 presents the Cronbach's alpha coefficients for the Technology Self-Efficacy instrument.

Table 3. Cronbach's Alpha Coefficients: Part III, Technology Self-Efficacy Instrument (n = 15)

Domain / Subscale	No. of Items	Cronbach's Alpha (α)	Classification	Decision
Domain A: Technology Learning Self-Efficacy (Items 1 to 6)	6	0.878	**Good**	All items retained
Domain B: Technology Use Self-Efficacy (Items 7 to 13)	7	0.891	**Good**	All items retained
Domain C: Technology Problem-Solving Self-Efficacy (Items 14 to 19)	6	0.852	**Good**	All items retained
Part III Overall	19	0.924	**Excellent**	**All items retained**

Note. All three domain alpha values were classified as Good. The overall instrument alpha of 0.924 was classified as Excellent. All 19 items were retained.

3.3 Part IV: Perceived Barriers to Technology Utilization Instrument

Table 4 presents the Cronbach's alpha coefficients for the Perceived Barriers instrument.

Table 4. Cronbach's Alpha Coefficients: Part IV, Perceived Barriers Instrument (n = 15)

Domain / Subscale	No. of Items	Cronbach's Alpha (α)	Classification	Decision
Domain A: Access to Technology-Related Learning Resources (Items 1 to 6)	6	0.812	**Good**	All items retained
Domain B: Availability of OHN Technology Training (Items 7 to 12)	6	0.834	**Good**	All items retained

Domain C: Institutional and Technical Support (Items 13 to 18)	6	0.803	**Good**	All items retained
Domain D: Integration of Technology into OHN Practice (Items 19 to 24)	6	0.821	**Good**	All items retained
Part IV Overall	24	0.891	**Good**	**All items retained**

Note. All four domain alpha values and the overall instrument alpha were classified as Good. All values exceeded the minimum required threshold of 0.70. All 24 items were retained.

Summary of Pilot Reliability Results

Table 5. Summary of Cronbach's Alpha Coefficients by Instrument Part (n = 15)

Instrument Part	**No. of Items**	**Cronbach's Alpha (α)**	**Classification**	**Decision**
Part II: Technological Competency	21	0.913	**Excellent**	All 21 items retained
Part III: Technology Self-Efficacy	19	0.924	**Excellent**	All 19 items retained
Part IV: Perceived Barriers	24	0.891	**Good**	All 24 items retained
Combined Total (Parts II to IV)	64	**0.891 to 0.924**	**All instruments met or exceeded the Good threshold. All 64 items retained.**	**All instruments met or exceeded the Good threshold. All 64 items retained.**

Note. Classification thresholds: 0.90 and above = Excellent, 0.80 to 0.89 = Good, 0.70 to 0.79 = Acceptable (Polit and Beck, 2021). Parts II and III achieved an Excellent classification. Part IV achieved Good classification. All 64 items across the three variable instruments were retained for the main data collection phase.

The pilot reliability analysis confirmed that all three variable instruments demonstrated adequate to excellent internal consistency across all domains and at the overall instrument level. No items required revision or removal. The instruments were administered in their finalized forms to the main study sample of 236 BOSH-trained occupational health nurses across all regions of Luzon, Philippines. The detailed pilot reliability results are presented in Appendix E.

APPENDIX E

Ethical AI Disclosure Statement

The responsible use of artificial intelligence tools in research requires explicit disclosure, justification, and

documentation of all AI-assisted processes, consistent with the UPHSD Graduate School Research Manual 2025–2030 and internationally recognized standards for academic integrity. This disclosure covers all AI tools employed during the preparation of this thesis, specifying the name, version, and provider of each tool, the specific tasks performed, the validation and human oversight processes applied, and the limitations encountered. The researcher affirms that no AI tool was used to generate research data, fabricate citations, perform statistical analysis, or independently determine research conclusions. All research decisions, variable definitions, analytical interpretations, and scholarly judgments are solely the researcher's own. AI tools were used exclusively in supporting capacities. drafting, language refinement, literature discovery, reference verification, and plagiarism screening.

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Summary of AI Tools Used

Table 1. Summary of Artificial Intelligence Tools Employed in Thesis Preparation

No.	Tool	Provider	Category	Primary Use
1	**Claude (claude-sonnet-4-6)**	Anthropic PBC	Grammar and language editing; manuscript drafting support	Manuscript drafting, literature organization, thematic structuring of the review of related literature, section-level writing support, language refinement, and formatting assistance throughout the preparation of this thesis.
2	**Grammarly Premium**	Grammarly, Inc.	Grammar and language editing	Grammar checking, sentence structure improvement, punctuation correction, stylistic consistency review, and APA 7th edition writing convention alignment throughout the manuscript.
3	**Elicit**	Elicit, Inc.	AI-supported literature search and mapping	Initial literature search and preliminary screening of peer-reviewed articles relevant to technological competency, technology self-efficacy, perceived barriers, and occupational health nursing.
4	**Connected Papers**	Connected Papers Ltd.	AI-supported literature mapping	Mapping the citation network surrounding key theoretical and empirical sources, particularly studies related to Locsin's TCCN Theory and the TCCHI instrument, to identify seminal works, citation clusters, and research lineages relevant to the theoretical framework.
5	**QuillBot**	Course Hero, Inc.	Grammar and language editing; paraphrasing support	Paraphrasing support and language clarity improvement for specific sections requiring substantial revision after initial drafting.
6	Scite.ai	Scite LLC	Reference validation tool	Reference validation and citation context verification for key references used in the literature review, particularly for recently published studies on technological competency and technology self-efficacy in nursing.
7	**Turnitin (iThenticate)**	Turnitin LLC	Plagiarism detection and AI-content screening	Plagiarism detection and similarity screening of the full manuscript prior to submission, as required by the UPHSD Graduate School Research Manual 2025–2030.

Note. All seven tools are classified as permitted AI practices under the UPHSD Graduate School Research

Manual 2025–2030. No prohibited practices — including AI-generated data, fabricated references, or undisclosed synthetic content — were employed in any phase of this research.

Detailed Disclosure By Tool

Tool 1: Claude (claude-sonnet-4-6) (Anthropic PBC, 2026)

Category	Grammar and language editing; manuscript drafting support
Purpose of Use	Manuscript drafting, literature organization, thematic structuring of the review of related literature, section-level writing support, language refinement, and formatting assistance throughout the preparation of this thesis. Claude was used across all chapters during the drafting

	phase.
Validation and Human Oversight	All AI-assisted outputs were critically reviewed, revised, and validated by the researcher prior to inclusion. All research decisions, variable operationalizations, statistical interpretations, conclusions, and scholarly judgments were made independently by the researcher. Claude did not generate research data, fabricate citations, or determine research direction.
Limitations Encountered	Claude may produce outputs that require correction for contextual accuracy, cultural specificity, or disciplinary precision. It cannot access real-time databases or verify the accuracy of empirical claims without human validation.

Tool 2: Grammarly Premium (Grammarly, Inc., 2024)

Category	Grammar and language editing
Purpose of Use	Grammar checking, sentence structure improvement, punctuation correction, stylistic consistency review, and APA 7th edition writing convention alignment throughout the manuscript. Used on all draft sections prior to adviser submission.
Validation and Human Oversight	All Grammarly suggestions were individually reviewed by the researcher and selectively accepted or rejected based on academic appropriateness and disciplinary convention. No automated changes were applied without manual review.
Limitations Encountered	Grammarly may not consistently recognize discipline-specific nursing or research terminology and may suggest changes that are grammatically acceptable but contextually inappropriate for scholarly writing.

Tool 3: Elicit (Elicit, Inc., 2025)

Category	AI-supported literature search and mapping
Purpose of Use	Initial literature search and preliminary screening of peer-reviewed articles relevant to technological competency, technology self-efficacy, perceived barriers, and occupational health nursing. Used to identify a broad pool of potentially relevant studies during the early phase of the literature review.
Validation and Human Oversight	All references suggested by Elicit were independently verified against original sources in Scopus, Google Scholar, and Philippine E-Journals before inclusion. No AI-suggested reference was cited without retrieval and reading of the original article by the researcher.
Limitations Encountered	Elicit may not index all relevant journals, particularly Philippine nursing journals and grey literature. Suggested papers required manual verification for relevance, methodological quality, and accuracy of abstracts.

Tool 4: Connected Papers (Connected Papers Ltd., 2025)

Category	AI-supported literature mapping
Purpose of Use	Mapping the citation network surrounding key theoretical and empirical sources, particularly studies related to Locsin's TCCN Theory and the TCCHI instrument, to identify seminal works, citation clusters, and research lineages relevant to the theoretical framework.
Validation and Human Oversight	Citation maps generated by Connected Papers were used for discovery purposes only. All identified sources were independently retrieved, read, and evaluated by the researcher before being incorporated into the review of related literature.
Limitations Encountered	Connected Papers visualizes citation relationships but does not evaluate the quality or relevance of individual sources. The researcher exercised independent judgment in selecting which identified works to include.

Tool 5: QuillBot (Course Hero, Inc., 2025)

Category	Grammar and language editing; paraphrasing support
Purpose of Use	Paraphrasing support and language clarity improvement for specific sections requiring substantial revision after initial drafting. Used selectively to rephrase complex passages for

	academic clarity while preserving the original meaning and researcher intent.
Validation and Human Oversight	All QuillBot-generated paraphrases were reviewed and substantially rewritten by the researcher to ensure accuracy, disciplinary appropriateness, and consistency with the overall manuscript voice. The tool was not used to generate new content, only to assist with rephrasing existing ideas.
Limitations Encountered	QuillBot may produce paraphrases that alter the intended meaning of technical or theory-specific content. All outputs required careful verification against the original source text.

Tool 6: Scite.ai (Scite LLC, 2025)

Category	Reference validation tool
Purpose of Use	Reference validation and citation context verification for key references used in the literature review, particularly for recently published studies on technological competency and technology self-efficacy in nursing. Used to confirm that cited works were being accurately represented in context.
Validation and Human Oversight	Scite.ai was used as a supplementary verification tool alongside direct retrieval of original sources. The researcher independently read all primary sources to confirm accuracy of representation and APA 7th formatting.
Limitations Encountered	Scite.ai's database coverage of Philippine nursing journals and newly published 2025–2026 studies was limited. Manual database searches were conducted to supplement its coverage.

This disclosure is made in full compliance with the following standards and regulations:

1. UPHSD Graduate School Research Manual 2025–2030, Sections 3.3.3 (Ethical AI Disclosure in Methodology and Literature Review), 3.3.4 (APA 7th Edition Formatting), and 3.5 (Proposal Review and AI Compliance Checks);
2. Data Privacy Act of 2012 (Republic Act No. 10173) - no personal data of respondents was processed through any AI system; all data files were handled exclusively by the researcher and thesis adviser;
3. Committee on Publication Ethics (COPE) Position Statement on Authorship and AI Tools (2023) - the researcher accepts full accountability for all content of this thesis and affirms that AI tools do not qualify as authors;
4. American Psychological Association (APA) Guidelines on AI Tool Citation (2023) - all AI-assisted content has been appropriately acknowledged; and
5. International Committee of Medical Journal Editors (ICMJE) Recommendations on AI in Research Reporting (2023) - the researcher maintains full responsibility for the integrity and accuracy of all reported findings.

The researcher affirms that all AI-generated or AI-assisted content in this thesis was reviewed, critically evaluated, and revised by the researcher before inclusion. No AI tool was permitted to make independent academic or research decisions. The use of AI tools in this study was limited strictly to permitted categories as defined by the UPHSD Graduate School Research Manual.

APPENDIX G

OHNAP Institutional Documents

H.1 OHNAP Research and Development Acknowledgment

G.2 OHNAP Research and Development Request to Conduct Research

OCCUPATIONAL HEALTH NURSES ASSOCIATION OF THE PHILIPPINES (OHNAP), INC.

AUGUST 22, 2026

RAYMOND D. PAPA, MOH, RN
National President
Occupational Health Nurses Association of the Philippines

Thru: **KIM JOSEPH R. BITO, RN**
Chairperson, Research and Development Committee

Re: Request to conduct research

Dear Mr. Papa,

Warm greetings!

I, **Kim Eric C. Gamba**, a student presently affiliated with **University of Perpetual Help System DALTA, Las Piñas Campus**, respectfully write to formally request your assistance in the conduct of my research study entitled **Technological Competency Among Occupational Health Nurses in the Philippines: A Descriptive-Correlational Study of Technology Self-Efficacy and Perceived Barriers**, involving occupational health nurses in **Luzon**.

This study aims to investigate and address critical aspects of occupational health nursing. Specifically, the objectives of the research are as follows:

The study aims to:

- Determine the technological competency and technology self-efficacy of Occupational Health Nurses in Luzon.
- Identify perceived barriers to technology utilization and the technology-related needs of Occupational Health Nurses.
- Provide a basis for developing a proposed Occupational Health Nursing Technology Development Plan responsive to the identified needs of Occupational Health Nurses.

The findings of this study aim to contribute valuable insights to the practice of occupational health nursing and align with the professional standards promoted by the Association. Rest assured that all data gathered will be handled with the utmost confidentiality, adhering strictly to data privacy regulations and ethical research guidelines.

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APPENDIX H

Call for Respondents Publication Material

