

Knowledge transfer mechanisms and capacity development strategies for National Irrigation Administration (NIA) CALABARZON irrigation project development

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Abstract

This study evaluated the National Irrigation Administration's (NIA) CALABARZON implementation of knowledge transfer mechanisms and capacity development strategies and their connection to the organization's performance in irrigation project development across the Regional Irrigation Management Offices. It tested the hypothesis that there is no significant relationship between knowledge transfer mechanisms and organizational performance, no significant relationship between capacity development and organizational performance, and no significant difference in organizational performance across profile groups. A descriptive correlational design was used with 135 respondents selected through purposive sampling. Data was gathered using a validated survey questionnaire covering knowledge transfer, capacity development, and organizational performance indicators. Statistical treatments used include frequency, percentage, weighted mean, Pearson's correlation, t-test and one way ANOVA. Findings showed that knowledge transfer mechanisms and capacity development strategies were implemented at *high* to *very high* levels, indicating strong organizational support for learning and development. Organizational performance was rated very high in stakeholder engagement, while technical performance showed moderate challenges in output revisions. Results revealed significant positive relationships between knowledge transfer mechanisms, capacity development strategies, and organizational performance. Community of practice and after-action review demonstrated strong associations with multiple performance dimensions. While performance was consistent across sex, unit and transfer history, office-based differences were observed in human capital performance and stakeholder engagement. The study concludes that effective knowledge transfer mechanisms and capacity development strategies enhance organizational performance in irrigation project development. Long-term sustainability requires institutionalizing systematic practices such as reflective reviews, mentoring, competency-based training, and digital repositories. Embedding localized leadership and leveraging digital platforms are essential to sustain technical expertise and organizational performance in irrigation project development.

Keywords: Capacity development, irrigation project development, knowledge transfer, organizational performance, public sector management

1. Introduction

The National Irrigation Administration (NIA) supports agricultural productivity and food security through irrigation development (RA 3601, 1963; EO 69, 2024). This process includes planning, design, implementation, and maintenance, which require a high level of technical accuracy and institutional continuity. However, NIA CALABARZON currently faces human resource challenges such as retirements and resignations of experienced personnel, generation gaps among employees, and frequent staff movement due to limited positions. These issues create knowledge gaps that threaten organizational efficiency and operational stability (Galan, 2023).

NIA CALABARZON relies heavily on the tacit expertise of senior engineers, project implementers, and planners developed to navigate complex field conditions and ensure project quality. As these professionals approach retirement, the risk of losing critical operational and technical knowledge increases (APQC, 2024) while younger employees face steep learning curves, particularly when transferred between units, complicating knowledge continuity (Fasbender et al, 2022; Rui et al 2022). These challenges mirror global concerns regarding knowledge loss in public sector infrastructure agencies, where continuity gaps directly lead to implementation delays and declined service quality.

To address these challenges, NIA institutionalized knowledge management practices aligned with ISO 9001:2015 through Memorandum Circulars (MC) 31 s. 2018, 60 s. 2019 and 135 s. 2024, mandating the establishment of knowledge management teams to identify, maintain, and share essential organizational knowledge for operational continuity. As established by the United Nations Development Program (UNDP, 2009), capacity development must encompass individual, organizational, and institutional dimensions to support improved competencies and sustainable project implementation.

Despite these frameworks, the transition from policy to performance remains a critical challenge. Effective knowledge transfer requires deliberate strategies tailored to each region's unique operational context. This study explores the implementation of knowledge transfer mechanisms and capacity development strategies within NIA CALABARZON to determine how they can be leveraged to reduce technical bottlenecks and ensure that personnel are equipped to sustain regional irrigation development.

1.1. Theoretical Framework

This study is anchored on interrelated theories that explain how knowledge is transferred and how capacities at the individual, organizational, and institutional levels are developed to ensure the continuity of expertise and performance.

The Knowledge-Based View (KBV) by Grant (1996) identifies knowledge as the most valuable organizational resource, and that the ability to create, transfer and apply knowledge is important for sustained performance. In irrigation project development, success relies on the availability and continuity of technical, procedural, and experiential knowledge across personnel and units. KBV emphasizes that systematic capturing, codifying, and sharing of information minimizes capability gaps. Within NIA CALABARZON, a robust knowledge transfer framework is vital to preserve institutional memory amidst organizational pressures such as retirements, staff turnover, and complex project lifecycles.

Knowledge management theory (Nonaka & Takeuchi, 1995) emphasizes that organizational knowledge is created through a dynamic interaction between tacit and explicit knowledge, mediated by processes of socialization, externalization, combination, and internalization (the SECI model). Socialization, transmits tacit knowledge through direct interaction, such as mentoring and coaching. In NIA CALABARZON, mechanisms and strategies facilitate the transfer and application of technical knowledge in irrigation project development. The model supports the study by showing how knowledge transfer mechanisms strengthen competencies, organizational systems, and institutional continuity.

Human Capital Theory (Becker, 1964) suggests that an individual's knowledge, skills, and competencies contribute to productivity and organizational performance. Continuous learning through trainings, mentoring, and professional development strengthens personnel capability in managing complex irrigation projects, particularly amid workforce transitions and reassignment of experienced staff. The theory supports the study's focus on developing staff expertise and preserving organizational knowledge.

The Capacity Development Framework (UNDP, 2009) suggests that sustainable organizational performance is achieved by enhancing capabilities at individual, organizational, and institutional levels. At the individual level, capacity development involves improving knowledge, skills, and competencies to enable personnel to perform their tasks. At the organizational level, it strengthens systems, processes, and structures that support coordinated operations. At the institutional level, capacity development emphasizes creating an

enabling environment, including policies, governance, and strategic alignment to sustain performance. Effective knowledge transfer mechanisms and capacity building strategies equip staff with technical knowledge and practical experience, strengthen organizational systems and support continuity despite workforce transitions. Capacity Development Framework aligns directly with the study's objectives of examining how knowledge transfer mechanisms influence capacity development needed to sustain irrigation project development.

1.2. Conceptual Framework

The conceptual framework of this study illustrates the relationship among demographics, knowledge transfer mechanisms, and capacity development strategies in relation to the organizational performance of irrigation project development in NIA CALABARZON. Figure 1 presents the conceptual framework of this study.

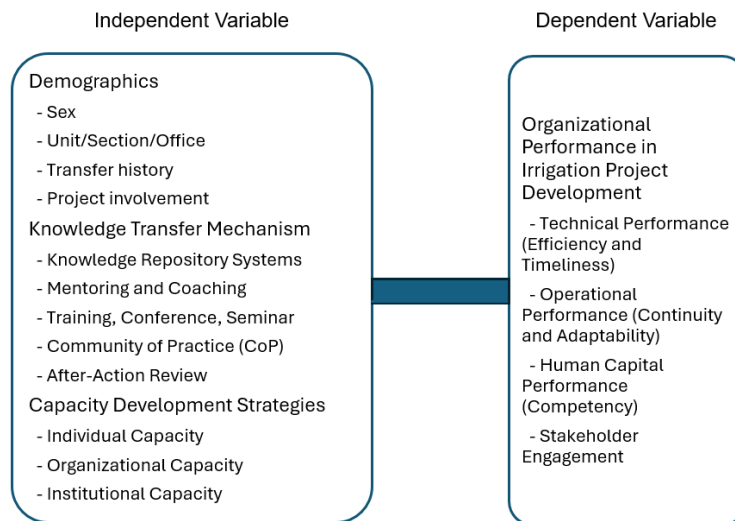


Figure 1. Conceptual Framework of the Study

The independent variables include personnel demographics, knowledge transfer mechanism, and capacity development strategies. Demographic factors such as sex, office assignment, transfer history, and project involvement shape personnel's experience and exposure to knowledge. Knowledge transfer mechanisms such as knowledge repository systems, mentoring and coaching, training, conferences and seminars, community of practice, and after-action review, along with capacity development strategies at the individual, organizational, and institutional levels, support the sharing, storage, and application of technical and experiential knowledge within the organization.

The dependent variable is organization performance in irrigation project development and is measured in terms of technical, operational, human capital, and stakeholder engagement. The framework examines the relationships among these identified independent and dependent variables.

1.3. Statement of the Problem

The study aims to examine the relationship between knowledge transfer mechanisms, capacity development strategies, and organizational performance in irrigation project development within NIA CALABARZON. Specifically, it aims to answer the following research questions:

1. What is the respondent's profile in terms of:
 - a. Sex;
 - b. Unit/Section/Office;
 - c. Transfer history;
 - d. Project involvement?
2. What is the current status of implementing knowledge transfer mechanisms in NIA CALABARZON in terms of:
 - a. Knowledge Repository Systems;
 - b. Mentoring and Coaching;
 - c. Training, Conferences and Seminars;
 - d. Community of Practice (CoP);
 - e. After-Action Review (AAR)?
3. What is the current status of implementing capacity development strategies regarding:
 - a. Individual capacity (knowledge, skills, competency);
 - b. Organizational capacity (collaboration, structure, systems);
 - c. Institutional capacity (external partnerships)?
4. What is the status of organizational performance in irrigation project development within NIA CALABARZON with respect to:
 - a. Technical performance (efficiency and timeliness);
 - b. Operational performance (continuity and adaptability);
 - c. Human capital performance (competency);
 - d. Stakeholder engagement?
5. Is there a significant relationship between knowledge transfer mechanisms and organizational performance in irrigation project development?
6. Is there a significant relationship between capacity development strategies and organizational performance in irrigation project development?
7. Is there a significant difference in organizational performance when respondents are grouped according to profile?
8. What strategic interventions can be proposed to improve knowledge transfer and capacity development for irrigation project development within NIA CALABARZON?

1.4. Research Hypotheses

There is no significant relationship between knowledge transfer mechanisms and organizational performance in irrigation project development.

There is no significant relationship between capacity development strategies and organizational performance in irrigation project development.

There is no significant difference in organizational performance when respondents are grouped according to their demographic profile.

1.5. Significance of the Study

This study holds relevance to both the practice of public administration and operational efficiency of NIA CALABARZON

NIA Management: The findings will serve as a basis for designing structured knowledge transfer mechanism and capacity development programs to sustain irrigation project development performance and succession readiness. It will provide insights into improving institutional knowledge continuity, succession planning, and human resource development policies.

Employees: The study highlights the importance of mentoring, continuous learning, and professional growth to enhance technical and managerial competence. It will promote a culture of learning and collaboration, enabling both senior and junior staff to share expertise and adapt to evolving operational needs.

Administrative Unit: Results can inform institutional policies on human resource development and knowledge continuity across regional and irrigation management offices. Results can serve as basis for designing sustainable capacity-building frameworks that address generational transitions.

Public Administration Scholars and Future Researchers: This research contributes to growing body of literature on governance, human capital development, and organizational learning in the public sector. It contributes to the body of literature on knowledge management and capacity development in public infrastructure agencies.

Ultimately, the study supports the objectives of good governance, institutional resilience, and sustainable public service delivery in irrigation project development.

1.6. Scope and Limitation

This study focused on the employees of the National Irrigation Administration (NIA) CALABARZON encompassing the Regional Office and its respective Irrigation Management Offices. It covers personnel engaged in irrigation project planning, design, implementation, operation and maintenance. It examined the various knowledge transfer mechanisms and capacity development strategies and determined their relationship with organizational performance in irrigation project development.

The study is limited to the perceptions and experiences of NIA CALABARZON personnel, and results may not be generalized to other regions. Evaluation is based on existing practices during the study period. Additional limitations include potential variation in respondents' perceptions and the study's focus on a single regional cluster. External factors such as budget constraints, organizational restructuring, and limited plantilla positions may also influence knowledge transfer practices beyond the researcher's control. Despite these limitations, the study provides valuable insights for informing institutional policies that support knowledge continuity and workforce development.

1.7. Review of Related Literature and Studies

Demographics have long been recognized as important influences on organizational performance, knowledge transfer, and capacity development in irrigation project development. Variables such as sex, office assignment, transfer history, and project involvement influence exposure to technical tasks and learning opportunities.

Sex-based differences in participation and leadership affect decision-making and knowledge sharing practices in water management institutions (FAO, 2025). Unit or section assignment determines the nature of tasks performed which influences opportunities for skills development and knowledge transfer (ADB, 2025). Transfer history has been associated with organizational learning but frequent movement may also disrupt operational continuity (World Bank, 2022). Project involvement directly affects competency development, as multiple project exposure builds experiential knowledge that enhances technical capability and organizational adaptability (IWMI, 2024).

Years of experience strongly influence capacity development. Employees with longer work experience often learn faster during training and contribute through mentoring and coaching, but retirement or transfer without proper handovers risks losing key knowledge and skills (Galán 2023). Positive employee experiences increase organizational commitment which can be related to performance (Lee and Kim, 2023). Personnel mobility, including promotions and reassignments, can weaken continuity unless supported by documentation, digital records, and structured handover processes. (Galán 2023, de Arruda et al 2024; Igoa-Iraola and Diez, 2024).

Unit of assignment influence learning and performance. Employees in different units have different

knowledge needs. Formal knowledge handover and communication systems help ensure that knowledge flows across units and improves performance across the whole organization (Igoa-Iraola et al, 2024). Literature shows that demographic factors influence how personnel engage in knowledge transfer and benefit from capacity development initiatives. Addressing staff turnover, retirement, and varying expertise requires demographic-informed strategies that align mechanisms with workforce composition. Such integration sustains technical expertise, prevents knowledge loss, and reinforces organizational resilience, directly supporting irrigation project development.

Knowledge transfer mechanisms refer to formal and informal processes for creating, sharing, storing and applying knowledge. Effective knowledge transfer is essential for ensuring operational continuity, reducing learning curves, and improving project outcomes (Johansson, 2022; UKRI, 2023; Zhou et al, 2022). By converting individual expertise into organizational assets, these mechanisms strengthen decision-making, knowledge retention, and performance (Lombardi, 2019; Ogunsola et al, 2023).

Knowledge repository systems serve as centralized platforms for technical documents, manuals, databases, project reports, and lessons learned. Such systems enhance efficiency, standardize processes, and mitigate knowledge loss from staff turnover (Galan, 2023; Mariano, 2023; Tran et al, 2024). In infrastructure agencies, repository systems facilitate access to historical project data, design standards, and operational guidelines, improving consistency and efficiency. The National Irrigation Master Plan (NIMP) 2020-2030 highlights the role of geospatial databases in improving planning and monitoring of irrigation projects. Digital knowledge repositories support evidence-based decision-making and promote transparency in public organizations (Digital Regulation Platform, 2025; OECD, 2025). In project-based organizations, repositories contribute to the standardization of practices, reduce duplication of effort, and strengthen organizational learning by enabling employees to reuse proven solutions and adapt best practices to new projects (Bosfield et al, 2025).

Repositories reduce redundancy and improve technical accuracy (Biersteker and Marrewijk, 2023; Alam et al, 2025). Knowledge repositories sustain operational performance by capturing lessons learned (Murtiningrum et al, 2019) and improve service delivery when centralized in portals (Doguiles, 2023). It also supports human capital development through onboarding and competency tracking (Alam et al, 2025) and strengthen stakeholder engagement in sustainable infrastructure projects (Tumpa and Naeni, 2025). Proper documentation ensures continuity despite staff changes (Malgard, 2024).

Integration with digital platforms further enhances accessibility. Online mentoring and communication tools improve skills, productivity, and responsiveness (Chatterjee et al, 2023; Chen et al, 2024; Karim et al, 2024). Lall et al (2022) further found that digital mentoring increases engagement and work quality. Combined documentation and digital systems support innovation and service quality (Mohaghegh et al, 2024; Atobishi et al, 2024). For NIA CALABARZON, digital repositories can strengthen learning across irrigation management offices, sustain technical expertise, support staff development, and ensure continuity in irrigation project management.

Repository systems and digital platforms improve efficiency, accuracy, and resilience. Their success depends on leadership support, updated records, and a culture of sharing (Atobishi et al, 2024). Strengthening documentation practices and digital platforms can greatly enhance knowledge sharing, employee competence, and organizational performance in irrigation development.

Mentoring and coaching are interpersonal mechanisms for transferring tacit knowledge, which includes skills, professional judgment, and experiential insights, particularly important in irrigation project development (Ingram and Maye, 2020; Boateng et al, 2019). Mentoring ensures continuity of expertise, builds confidence, and supports succession planning, while coaching provides real-time feedback to strengthen problem-solving and adaptability (Weinberg and Scandura, 2024; Maunula et al, 2025; Kowalczyk-Kroenke, 2025).

Many studies agree that mentoring and coaching help individuals learn faster, build confidence, and adapt to changes at work (Gamage et al 2021; Kumari et al 2022; Odunayo 2022). Structured mentoring

programs help build teamwork, support succession planning, and encourage a culture where employees help and learn from each other (Barinua and Mabel, 2022; Wikstrom et al 2023). When paired with documentation and continuous learning platforms, institutions become more prepared for future challenges and can serve communities more effectively (Asampong et al 2023).

Studies finally show that organizations with mentoring programs report higher productivity, stronger leadership, and better employee retention, while coaching programs help workers meet performance goals and improve service quality (Soegiarto et al 2024; Luong, 2025). For NIA CALABARZON, integrating mentoring and coaching together with other knowledge-transfer practices like training and digital platforms can help enhance project planning, irrigation system management and service to farmers.

Training, conferences, and seminars are structured learning mechanisms designed to enhance technical, managerial, and professional competencies. Training aligns employee skills with evolving technological and policy requirements (Kosasih, 2025). Conferences and seminars expose employees to emerging practices, innovations, and networks beyond their organizations (Mora et al, 2024). These activities support learning, motivation, and knowledge sharing, which are important for performance improvement (Garavan et al 2021).

Continuous professional development strengthens adaptability and service delivery in project-based and public organizations (Denicol et al, 2022; Osei-Asibey et al, 2021; Barbosa et al, 2025; Nor, 2025; United Nation, 2025). Effectiveness depends on relevance, transfer of learning, and organizational support (Fegade et al, 2023). Research also finds that training increases employee confidence, productivity, and work quality, especially when tailored to tasks and supported by follow-up systems (Aiesyah et al, 2024; Tumacole, 2024; Uslu et al, 2021; Saleh et al, 2025).

At the organizational level, training builds capacity by improving standard processes, strengthening human resources, while conferences and seminars reinforce learning through exposure to best practices and new technologies (Saputra et al 2024). Institutional benefits include stronger policies, teamwork, and collaboration, particularly when lessons are documented and integrated into official plans (Kaheeru et al, 2024; Cui, 2025).

These mechanisms enhance individual skills, organizational systems, and institutional processes, leading to better performance and service delivery (Garavan et al, 2020; Saputra et al, 2024). For NIA CALABARZON, structured learning programs, regular seminars, and effective knowledge-sharing can help improve staff capacity and irrigation project implementation, especially when supported by follow-up coaching and documentation (Kaheeru et al, 2024).

Communities of Practice (CoPs) are effective platforms for knowledge transfer, organizational learning, and capacity development. CoPs are often informal but can evolve into semi-formal structures when supported by organizations (Bicchi, 2024). Individuals typically connect around common professional roles or thematic interests, supporting peer mentoring, mutual learning, and experience sharing that enhance organizational practices and knowledge repositories (Iswati, 2025; Zamiri et al, 2024).

As social learning spaces, CoPs promote collective problem-solving, cross-unit coordination, and innovation by breaking silos (Zamiri and Emaeli, 2024; Bissessar, 2021; Lim and Ong, 2019). CoPs support everyday learning by letting experts and new staff interact, making knowledge transfer easier than through manuals alone (Wegner-Trayner 2020; Silverstein et al, 2022). Studies show CoPs build confidence, problem-solving skills, and adaptability, supporting new staff in technical offices (Rowe et al, 2023; Sahay et al, 2022).

At the organization level, CoPs retain critical skills, reduce errors, and improve teamwork, even with staff transfers or retirements (Mladkova, 2023). CoPs also influence policies and institutional practices by connecting different units and spreading innovations in agriculture and water systems (Elbrink et al, 2024).

CoPs strengthen collaboration, innovation and consistent work standards (Silverstein et al, 2022; Sahay et al, 2022). For NIA CALABARZON, CoPs provide strategic mechanism to sustain knowledge transfer during staff turnover and enhance irrigation project development.

After-Action Review (AAR) is a structured knowledge transfer mechanism designed to capture

lessons learned from completed activities, projects, or critical events, with the objective of improving future performance. It emphasizes reflective learning by systematically examining plans, outcomes, gaps, and improvements, transforming individual insights into organizational knowledge (Layland et al, 2020). In project-based settings like irrigation, timely AARs identify technical bottlenecks and coordination issues critical for efficiency (Paul, 2021).

Effective AARs promote open communication, accountability, and adaptability, strengthening organizational learning and workplace development (Paul, 2021). They succeed when linked to decision-making, supported by leadership, and conducted in psychologically safe environments (Fletcher et al, 2023). The Federal Emergency Management Agency (FEMA, 2023) institutionalizes AARs as tools for resilience, ensuring outputs feed into improvement plans and policies.

Meta-analytical studies by Keiser and Winfred in 2020 and 2021 show AARs significantly enhance learning and performance when reflection is process-based reflection lessons are applied to future tasks. They institutionalize experiential knowledge preventing recurring issues across project cycles (Vukanović-Dumanović et al, 2022). Structured reviews also extract value from failures, improving adaptive learning in uncertain environments (Pak et al, 2025; Flynn and Levie, 2021; Rode et al, 2024).

Consistent application of AARs is linked to higher project management maturity and sustainable outcomes (Mehri et al., 2025). They strengthen technical performance, operational adaptability, human capital competency, and stakeholder engagement, making them a critical mechanism for improving organizational performance in irrigation project development. By systematically capturing and applying lessons, AARs reinforce organizational resilience and capacity development in dynamic public sector context (Ilias, et al, 2025).

Individual capacity focuses on enhancing employees' knowledge, skills, attitudes, and competencies, directly influencing infrastructure and water resource project performance (Saputra et al, 2024). Individual skill development is a strategic investment that supports broader organizational outcomes (Kim and Bang, 2025). Structured learning improves cognitive agility and decision-making in complex environments (Fegade and Sharma, 2023; Audia et al, 2024; De Andreis, 2020).

Learning investments increase absorptive capacity, enabling employees to recognize, assimilate external knowledge and drive innovation, especially in volatile, technology-driven sectors (Xiong et al, 2024). Competency frameworks highlight adaptability and resilience as essential in volatile, uncertain, complex, and ambiguous (VUCA) environments (Shet, 2024). In irrigation, both technical and adaptive skills are vital for sustainability, integrated water management, and climate-resilient practices (Sørensen et al, 2021; Hasan et al, 2023; Frimpong et al, 2023).

Capacity development programs must consider differences in age, experience, and background, as younger staff adapt quickly to digital tools but need guidance on institutional practices (Salajegheh et al, 2024). Training works best with hands-on practice, clear goals, and follow-up support (Aryee et al, 2024), while mentoring and coaching build confidence, teamwork, and practical judgment (Geletu, 2023; Wikstrom et al, 2023). Documentation and digital platforms further support independent learning and standardization (Giannakos et al, 2022; Aryee et al 2024).

Communities of Practice (CoPs) enhance skills through peer learning and collaboration across locations (Silverstein et al, 2022). Individual growth translates into organizational performance when supported by leadership, systems, and incentives (Bachani et al, 2025; Hauptfled et al, 2022). For NIA CALABARZON, combining training, mentoring, documentation, and digital tools is crucial to strengthen technical skills and improve irrigation project delivery (Klein and Rosch, 2024; Salajegheh et al, 2024).

Organizational capacity refers to the systems, processes, structures, and resources that enable effective functioning. Building organizational capacity improves efficiency and performance through structured systems and adaptable mechanisms (Saputra et al, 2024; Mwangi et al, 2022). Innovation, supported by resource allocation and process redesign, strengthens resilience in changing environments (Wakisú and Kinyua, 2025; Asghar et al, 2025). Strong organizational capacity help overcome resource gaps

and operational challenges, as shown in development frameworks in the Philippines (Kim and Bang, 2025; Liwanag et al, 2024).

Capacities also influence project outcomes and organizational resilience, linking resources and governance structures to performance (Foarta and Ting, 2025; Moumin, 2024; Lv et al, 2023). Effective development requires leadership, technology, and knowledge systems (Saputra et al, 2024). Clear communication and collaboration across units are essential for coordination, decision-making, and teamwork (Massaro et al, 2019; Iftikhar & Lions, 2022; Drago et al, 2022).

Knowledge transfer mechanisms support communication and collaboration while trust and shared goals remain critical for success (Saputra et al, 2024; Iftikhar & Lions, 2022). Organizational improvements succeed when structural changes are combined with social practices that encourage learning and continuous improvement (Barker Scott and Manning, 2024).

In government and public infrastructure settings like irrigation services, strong coordination among units enhances service delivery, problem-solving, and community trust (Williams 2022; He et al 2025). Effective communication, collaboration, and knowledge flow make organizations more efficient, innovative, and responsive to challenges (Saputra et al 2024; Drago 2022).

Institutional capacity encompasses policies, governance structures, and regulatory frameworks that guide organizational actions. Strong institutions enhance accountability, consistency, and sustainability in multi-stakeholder environments, enabling coherent decision-making and effective partnerships (Domorenok et al, 2021; Fan, 2024). Governance reforms and regulatory alignment improve efficiency and adaptability, enhancing collaboration in project implementation (Saputra et al, 2024). Strong institutional contexts also enhance capacity-building outcomes in shared resource management (Kacou, 2024), while fragmented governance and weak monitoring undermine coordination (Kim and Bang, 2025).

Leadership and civil servant development reinforce institutional frameworks for negotiation, partnership management, negotiation, and knowledge exchange (Ilias et al, 2025). Adaptive capability and alignment between structures and performance models sustain long-term infrastructure projects (Mwangi et al, 2022; Moumin, 2024). Policy coherence and inter-agency collaboration are therefore critical for sustainable irrigation project development.

Institutional capacity development involves strengthening systems, procedures, and organizational culture to ensure effective service delivery. Standardized processes clarify roles, improve accountability, and reduce errors, especially during digital transformation (APO, 2024; Haug, 2024). Regular updates to procedures sustain adaptability and performance in irrigation and infrastructure projects. Digital tools further enhance data management and decision-making, but require integration with governance systems and staff development (Alaerts, 2022; Haug, 2024).

A learning-oriented culture supports institutional capacity by promoting knowledge sharing and innovation. Structured systems support knowledge retention and empower employees to adapt and improve processes (Zamiri et al, 2024; Elbawab, 2024).

Institutional capacity strengthens when clear procedures, modern digital tools, and continuous learning are combined. These elements create a foundation for accountability, resilience, and sustainable performance in agencies like NIA CALABARZON, ensuring effective irrigation project development and public service delivery.

Technical performance is often measured through efficiency and timeliness, reflecting how well organizations apply technical knowledge, manages resources, and delivers services.

Efficiency refers to the optimal water use and streamlined processes. Documentation, digital platforms, and knowledge repositories improve planning and system optimization (Kelley et al, 2025; Kumar et al, 2025). Mentoring, coaching, and training enhance staff capability (Carrico et al, 2025), while monitoring systems and automated tools supports continuous improvement (Zaakour et al, 2025; Ali et al, 2025). Efficiency indicators are widely used in Philippine irrigation projects (Presto and Murcia, 2020; Clemente et al, 2019).

Timeliness measures the ability to complete projects within planned schedules. Effective knowledge transfer reduces delays and improves coordination (Inocencio and Inocencio, 2020). Timely service delivery supports cropping schedules and prevents cost escalation, while delays undermine productivity and stakeholder trust (Kelley et al, 2025; Clemente et al, 2019; Separa and Salapa, 2025).

Studies identify delays as a major threat, often caused by poor planning, weak coordination, and contractor issues (Gashaahun and Abiy, 2023; Mekonen et al, 2025). Sound engineering design and optimized hydraulic layouts improve efficiency and sustainability (Garcis-Espinal et al, 2024). Integrated planning supports rehabilitation and upgrades (Eraky and Ageeb, 2025). Proactive risk identification and strong institutional arrangements further enhance efficiency and timeliness (Kabutiei et al, 2022); Rola et al, 2020). Knowledge sharing also strengthens coordination and decision-making (Christabel et al, 2024).

Capacity development literature links training, mentoring, and after-action reviews to improved technical judgment and adaptability. Agencies that institutionalize learning processes demonstrate higher efficiency and timelier completion than those relying solely on individual expertise (OECD, 2020; UNDP, 2025).

Technical performance in irrigation project development depends on effective planning, robust engineering design, risk management, institutional coordination, and knowledge sharing. Efficiency reflects optimized processes and informed decisions, while timeliness demonstrates strong coordination and adaptability ensuring sustainable irrigation service delivery.

Operational performance is often described in terms continuity and adaptability, which reflects the ability to sustain service delivery while responding to change.

Continuity reflects continuous irrigation services supported by institutional learning, maintenance practices, and governance arrangements (Bueno, 2022). Farmer participation strengthens coordination and reliability (Separa and Salapa, 2025), while governance approaches that integrate technical and climate considerations sustain operations under environmental constraints (El-Nashar and Elyamany, 2022).

Adaptability is the capacity to adjust practices and processes in response to internal or external changes. It is linked to absorptive capacity and knowledge integration (Mwangi et al, 2022), workforce learning orientation and behavioral flexibility (Ybarra, 2023), and mentoring or reflective practices that balance adaptability with stability (Billett and Le, 2024; Mapansa and Baguio, 2025).

Continuity and adaptability are interrelated. Structured knowledge transfer, onboarding, and succession planning reduce disruptions during personnel changes (Bauer et al, 2025; Fosu, 2025). Climate-responsive scheduling and monitoring systems further sustain service delivery amid variability (Hsieh, 2024; El-Nashar and Elyamany, 2022).

Knowledge sharing practices enhance coordination and reduce disruptions, enabling organizations to maintain service delivery (Christabel et al, 2024). Climate studies in the Philippines highlight the need for adaptive planning to address rainfall variability and water availability (Alejo et al, 2021). Strategic adaptability, reinforced by organizational learning and iterative management, allows agencies to adjust operations based in feedback and evolving conditions (Ma, 2024; Roux et al., 2022).

Operational performance is strengthened through continuous knowledge sharing, climate-responsive planning, and adaptive management practices. Within the proposed framework, continuity is achieved through effective coordination and institutional memory, while adaptability is enhanced by learning-oriented strategies that allow organizations to adjust operations in response to uncertainty. These capabilities are essential for sustaining irrigation services and improving long-term organizational performance.

Human capital performance, particularly competency, is a critical determinant of organizational effectiveness in irrigation project development. Competency encompasses technical skills, adaptive capacity, and professional behaviors that enable efficient service delivery and responsiveness to stakeholder and environmental needs (FAO, 2023; IFAD, 2023). National irrigation policies emphasize competency development as a core element of institutional capacity and governance. The National Irrigation Master Plan 2020-2030 highlights the need to align staff competencies with operational requirements across planning,

design, construction, and participatory management functions (NEDA et al, 2020). Competency frameworks strengthen accountability, farmer participation, and scheme sustainability, while reducing inefficiencies under climate challenges (Separa and Salapa, 2025; Hayatuddin et al, 2025).

Engineering and climate-resilience literature highlights competency as essential for managing complex projects, combining technical expertise with learning agility, ethics, and collaboration (University of Queensland, 2025; FCDO, 2025). Competency and national skills frameworks guide recruitment, training, and performance management, supporting retention and resilience (HREAP, 2023; IFAD, 2023).

Competency development also links to broader governance outcomes. Comparative studies highlight their usefulness in standardizing expectations and guiding capacity-building initiatives (Richter and Kjellgren, 2025). International organizations emphasize competency development in agricultural water management for sustainability and socio-economic benefits (FAO, 2023; Sisay, 2025).

Knowledge sharing practices enhance competency by translating individual expertise into collective performance gains (Christabel et al., 2024). Mentoring and leadership-oriented development strategies accelerate skill acquisition, confidence, and collaborative problem-solving (Jaiswal and Kumar, 2025; Lin, 2024). Continuous professional development, supported by authentic leadership, sustains workforce growth and organizational success (Akwatey, 2025; Damit, 2025).

Human capital competency yields the greatest benefits when aligned with organizational systems and strategic objectives (Giamos and Stroehle, 2024). Within the framework, it directly supports technical efficiency, operational adaptability, and sustainable service delivery. Strengthening employee competency through knowledge sharing, mentoring, leadership, and continuous development is essential for improving organizational performance in irrigation project development.

Stakeholder engagement in irrigation governance goes beyond consultation, involving structured participation of farmers, local institutions, and agencies throughout the project cycle. Higher engagement levels improve coordination, service delivery consistency, and organizational learning (World Bank, 2019).

Participatory governance in Asia and Africa has been linked to stronger accountability, legitimacy, and sustainability (Chattopadhyay et al, 2022; Lema, 2025). Water User Associations and regular consultations align technical interventions with community needs, while farmer empowerment strengthens service delivery and sustainability in NIA-assisted systems (Bjornlund et al, 2025; Separa and Salapa, 2025).

In the Philippines, fragmented planning and weak coordination remain challenges, but engagement mechanisms improve institutional coordination and outcomes such as service coverage and cropping intensity (Rola, 2019). Inclusive participation also supports knowledge transfer, institutional memory, and adaptability (World Bank, 2019; Lema 2025).

Stakeholder participation fosters social learning by integrating local knowledge with technical expertise, although power imbalances may limit effectiveness (Allasiw et al., 2023). Participatory action research enhances ownership and accountability through iterative feedback (Eelderink et al., 2025), while strong farmer organizations and clear institutional arrangements are essential for effective irrigation governance (Rola et al, 2020; Separa and Salapa, 2025).

Interorganizational collaboration and digital platforms further broaden engagement. Knowledge sharing among diverse stakeholders improves innovation and project performance (He, 2024), while digital tools enhance transparency communication, and trust (Chung et al., 2025).

Effective stakeholder engagement strengthens technical efficiency, operational adaptability, and institutional learning, making it a vital component of sustainable irrigation project development.

2. Methodology

2.1. Research Design

This study employed descriptive-correlational research design to examine the relationships among

knowledge transfer mechanisms, capacity development strategies, and organizational performance in the irrigation project development in CALABARZON. The descriptive component assessed the existing status of variables, while the correlational component measured the extent to which demographic factors, knowledge transfer mechanisms and capacity development strategies relate to organizational performance. This design enabled the measurement of respondents' perceptions and experiences and allowed for the statistical examination of relationships.

2.2. Population and Sampling Techniques

The respondents of the study consisted of NIA CALABARZON personnel directly involved in irrigation project development, including employees involved in planning, design, construction, operations and maintenance. Target respondents included regular, casual, contractual, and job-order personnel involved in engineering and operations in NIA CALABARZON Regional and Irrigation Management Offices.

A purposive sampling technique was employed to ensure that respondents possessed relevant experience and direct involvement in irrigation project development. To achieve adequate representation across organizational units, respondents were selected from the Regional Office, Cavite-Batangas Irrigation Management Office, Laguna-Rizal Irrigation Management Office, and Quezon Irrigation Management Office. This sampling approach ensured that perspectives from different operational areas within NIA CALABARZON were sufficiently captured and meaningfully represented.

2.3. Research Instrument

A researcher made questionnaire using a five-point Likert scale was administered covering four sections: (1) demographic information, (2) knowledge transfer mechanisms, (3) capacity development strategies, and (4) organizational performance in irrigation project development. The instrument underwent expert validation to ensure relevance, clarity, and appropriateness of content, and was tested using Cronbach's Alpha to ensure consistency and reliability.

Research Procedure

Necessary approval from management and respondents was obtained prior to the conduct of data gathering activities. NIA CALABARZON Regional and Irrigation Management Office personnel involved in engineering and operations were requested to complete the researcher-made questionnaire. Confidentiality and anonymity of responses were strictly maintained.

The data gathered were checked for completeness, encoded and systematically organized. Data were analyzed and interpreted using appropriate statistical tools to draw conclusions and formulate evidence-based recommendations for enhancing knowledge transfer mechanisms.

2.4. Statistical Treatment

Descriptive and inferential statistics were employed in the study. Frequency and percentage were used to summarize the demographics while mean and standard deviation were applied to other variables. Pearson's correlation was used to examine the relationships among knowledge transfer mechanisms, capacity development strategies, and organizational performance. The t-test was employed to determine significant differences in responses when respondents were grouped into two categories based on demographic variables, while Analysis of Variance (ANOVA) was used for demographic variables with three or more categories.

Guilford developed the Pearson Correlation Coefficient "r" test in 1956 in an effort to quantify and analyze the linear relationship between two variables. It is used to determine whether a linear relationship exists and to assess its strength (as indicated by the p-value and coefficient r, respectively). This test is applied only when the underlying assumptions are met.

The Rule of Thumb presented by Guildford (1973) was adopted for interpreting the relationship strength. Table 1 summarizes Guildford's (1973) Rule of Thumb for interpretation of correlation coefficient (r)

Table 1. Guildford's (1973) Rule of Thumb for Interpretation of Correlation Coefficient

r	Interpretation
< .20	Slight, almost negligible relationship
.20 - .40	Low correlation, definite but small relationship
.40 - .70	Moderate correlation, substantial relationship
.70 - .90	High correlation, marked relationship
> .90	Very high correlation, very dependable relationship

3. Results and Discussion

This chapter presents the data collected from respondents, analyzes their demographic profiles, examines the status of implementation of knowledge transfer mechanisms and capacity development strategies, and evaluates the organizational performance of NIA CALABARZON. It also explores the relationship between knowledge transfer mechanisms, capacity development strategies, and organizational performance in irrigation project development within NIA CALABARZON.

3.1. Demographic Profile of the Respondents

The demographic profile of the 135 respondents from NIA CALABARZON is presented in Tables 2 to 5.

Table 2. Profile of Respondents in Terms of Sex

Category	Frequency (f)	Percentage (%)
Male	73	54.1%
Female	62	45.9%
Total	135	100%

Table 2 shows the distribution of respondents by sex. Out of 135 respondents, 73 (54.1%) are male, while 62 (45.9%) are female. The profile of the respondents is relatively balanced with a slightly higher representation of male employees. This indicate that both male and female participate in irrigation project development process within NIA CALABARZON. Such inclusivity ensures that diverse perspectives are integrated into the regional initiatives.

Table 3. Profile of Respondents in Terms of Unit/Section/Office

Unit / Section	Office				Total
	Cavite Batangas IMO	Laguna Rizal IMO	Quezon IMO	Regional Office	
Planning	8	6	6	5	25 (18.5%)

Unit / Section	Office				Total
	Cavite Batangas IMO	Laguna Rizal IMO	Quezon IMO	Regional Office	
Design	3	7	5	6	21 (15.6%)
Construction	9	10	7	8	34 (25.2%)
Operations and Maintenance	11	1	5	6	23 (17.0%)
Institutional Development	7	7	11	7	32 (23.7%)
Total	38(28.1%)	31(23.0%)	34(25.2%)	32(23.7%)	135(100%)

The largest group of respondents came from Cavite-Batangas IMO (28.1%), but the distribution shows that all NIA CALABARZON offices were represented, ensuring that perspectives across different geographic and operational contexts were captured. The highest proportion of respondents belongs to Construction (25.2%) and Institutional Development Unit (23.7%), indicating that employment and organizational focus are concentrated on implementation and stakeholder engagement functions.

Table 4. Profile of Respondents in Terms of Transfer History

Transfer History	Frequency (f)	Percentage (%)
No Transfer History	65	48%
One	26	19%
Two	17	13%
Three	15	11%
Four or more	12	9%
Total	135	100%

Table 4 presents staff mobility within the organization. Nearly half (48%) of the respondents reported no transfer history, yet a notable segment has experienced mobility across units, potentially contributing to broader knowledge transfer and organizational learning. Transfers allow employees to carry tacit and explicit knowledge across units. This suggest that while stability ensures specialization and consistency, mobility enriches organizational learning by broadening employee networks, diversifying skills, and strengthening institutional resilience. Data reflects this balance: anchored staff provide continuity, while mobile staff act as conduits for knowledge transfer across the organization.

Table 5. Profile of Respondents in Terms of Project Involvement

Project Involvement	Frequency	Percentage
Planning	37	27%
Design	44	33%
Construction	54	40%
Operation and Maintenance	61	45%

Note. N=135. A respondent can be involved in more than one activity

Since project involvement is not limited to unit assignments, the responses were recorded as multiple entries per individual in Table 5. The highest proportion of respondents are engaged in Operation and

Maintenance (45%), indicating that a significant number of personnel are focused on sustaining and ensuring the continuity of irrigation systems. Long-term viability of irrigation projects relies heavily on operational efficiency beyond initial infrastructure delivery. Construction involvement (40%) is also high, indicating the presence of staff in the implementation phase where physical infrastructure is developed.

Construction activities require technical expertise, project coordination, and adherence to engineering standards, highlighting the operational and implementation-oriented functions of the organization. Staff involvement in planning (27%) and design (33%) demonstrate that a portion of the workforce is involved in project conceptualization, technical design preparation, and strategic planning. Although these phases recorded lower percentages compared to construction and operation, they remain fundamental to ensuring technically sound and sustainable project implementation. The distribution of project involvement highlights NIA CALABARZON's operational orientation, with human capital largely focused on project implementation and post-construction sustainability.

The demographic profile provides a balanced representation for the study. The distribution indicated a balanced gender representation and comprehensive cross-section of personnel across various units and field offices, enabling diverse operational perspectives. Respondents' transfer history and project involvement reflect a combination of organizational stability and operational mobility. This suggests a workforce capable of maintaining continuity in critical functions while facilitating institutional knowledge sharing across different developmental phases of irrigation projects.

3.2. Knowledge Transfer Mechanisms

Respondents' assessment of the implementation status of various knowledge transfer mechanisms within NIA CALABARZON is presented in Tables 6 to 10. Each mechanism was evaluated using multiple indicators, with responses rated on a five-point Likert scale.

As shown in Table 6, the mean score for Knowledge Repository Systems is 4.06, indicating a high level of implementation. The highest-rated item is the use of past projects as references ($\bar{x} = 4.28$), which achieved a very high implementation. This is closely followed by the consistent archiving of technical documents ($\bar{x} = 4.12$) and the availability of updated Standard Operating Procedures ($\bar{x} = 4.10$). The indicator regarding regularly updating and sharing of data through digital platforms received the lowest mean score ($\bar{x} = 3.83$). While still considered high in implementation level, it indicates a relative disparity compared to the organization's more established archival and reference practices.

Table 6. Status of Implementation of Knowledge Transfer Mechanisms in Terms of Knowledge Repository Systems

	Indicator	Mean	SD	Implementation Level
1.	Technical documents, manuals, and project files are easily retrieved within the office.	4.01	0.77	High
2.	Project related data are regularly updated and shared through digital platforms like portals, shared folders, databases, spreadsheets and GIS.	3.83	0.88	High
3.	Standard operating procedures (SOPs) are available and updated for core project development processes.	4.10	0.76	High
4.	Technical documents are consistently archived after project milestones.	4.12	0.80	High
5.	Past projects are used as references for current tasks.	4.28	0.86	Very High

	Indicator	Mean	SD	Implementation Level
6.	Lessons learned from previous irrigation projects are stored in an organized knowledge repository.	4.01	0.89	High
	Overall	4.06	0.70	High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Slight, 1.00-1.80=Rare

The high level of implementation for archival practices at NIA CALABARZON aligns with contemporary research emphasizing the need of institutional memory in public engineering. Mohaghegh et al (2024) argue that the maturity of a knowledge repository is a primary determinant of organizational resilience, allowing agencies to mitigate technical risks by applying historical insights to new challenges. Alam et al (2025) emphasize that well-established knowledge management systems are indispensable for long-term sustainability, particularly in infrastructure agencies where technical specifications must be preserved across multi-year project lifecycles. The lower score in digital data sharing reflects a broader industry challenge. Biersteker and Marrewijk (2023) highlight that the transition from static physical or digital archives to dynamic, real-time sharing platforms is critical for reducing the spread of misinformation. Without real-time integration, even the best-archived data can remain underutilized during active project phases. Malgard et al (2024) suggests that systematic documentation, specifically through GIS and integrated databases, transforms individual expertise into collective organizational assets, thereby improving project management efficiency.

Results suggest that NIA CALABARZON possesses a strong culture of reference, where personnel value and utilize the organization's historical knowledge base. However, the finding regarding digital platform utilization suggests a technological bottleneck. While the organization is excellent at archiving, there is an opportunity to improve real-time sharing. The study implies that to move from "High" to "Very High", NIA CALABARZON must bridge the gap between archives and active digital collaboration. Enhancing the frequency and ease of data sharing through digital platforms will likely lead to better inter-unit coordination and ensure that the practical insights from operation and maintenance are integrated into the planning and design of future projects.

Table 7 presents the status of implementation of Mentoring and Coaching with a mean of 4.17, also interpreted as highly implemented. The strongest indicator is the perceived effectiveness of mentoring in enhancing staff capabilities ($\bar{x} = 4.45$), which is the only indicator to reach a "Very High" implementation level. Indicators regarding senior staff providing guidance ($\bar{x} = 4.18$) and employees receiving mentoring related to their specific responsibilities ($\bar{x} = 4.17$) also scored highly. While the indicators for structured mentoring sessions ($\bar{x} = 4.09$), the pairing of experienced and less experienced staff ($\bar{x} = 4.07$), and on-the-job coaching ($\bar{x} = 4.06$) are also high; they represent the lower end of the spectrum, suggesting that while the act of mentoring is prevalent, the formalized structure of these pairings is slightly less developed. These findings also suggest that mentoring and coaching serve as important mechanisms for transferring technical knowledge, skills, and work practices within the organization.

Table 7. Status of Implementation of Knowledge Transfer Mechanisms in Terms of Mentoring and Coaching

	Indicator	Mean	SD	Implementation Level
1.	Senior staff provide guidance to new or junior employees.	4.18	0.85	High
2.	On-the-job coaching is practiced in project development activities.	4.06	0.84	High
3.	I receive mentoring/coaching related to my responsibilities.	4.17	0.80	High

	Indicator	Mean	SD	Implementation Level
4.	Mentoring sessions are structured with clear learning objectives.	4.09	0.81	High
5.	There is a clear practice of pairing experienced and less experienced staff.	4.07	0.87	High
6.	Coaching contributes to improved work performance.	4.45	0.77	Very High
	Overall	4.17	0.71	High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Slight, 1.00-1.80=Rare

These findings are supported by recent literature emphasizing the role of mentoring and coaching in knowledge transfer and workforce development. Studies have shown that structured mentoring programs significantly enhance employee capability, promote continuous learning, and improve job performance in both public and private organizations (Odunayo, 2022). Wikstrom et al (2023) highlighted that mentoring facilitates the transfer of tacit knowledge, which is often difficult to codify but essential for effective performance. Research underscores that coaching and mentoring strengthen organizational learning cultures by fostering collaboration, engagement, and professional growth (Turyahikayo et al, 2021). In knowledge-intensive environments, these mechanisms are valuable as they enable continuous development and support succession planning (de Arruda et al, 2024).

Despite the overall high level of implementation, the slightly lower ratings of some indicators suggest that mentoring practices may still be partly informal or unevenly applied across units. This indicates an opportunity for the organization to further strengthen formal mentoring frameworks by establishing clearer guidelines, structured learning objectives, and monitoring of mentoring outcomes. Strengthening these systems can further improve knowledge continuity, workforce capability, and overall organizational performance.

Training, Conference, and Seminar received the highest rating among all knowledge transfer mechanisms with mean of 4.27, indicating a very high implementation level. Respondents particularly valued the applicability of training ($\bar{x} = 4.38$), which suggests that learning interventions are practical and relevant to the agency's technical demands. Respondents believe trainings improved their ability to perform duties ($\bar{x} = 4.33$) and that NIA provides adequate learning opportunities ($\bar{x} = 4.27$). While still rated as High, the indicator for actual attendance at relevant training ($\bar{x} = 4.07$) was the lowest in this category. This indicates that, while the quality and perceived value of the programs are high, a segment of the workforce may still have not accessed these opportunities.

Table 8. Status of Implementation of Knowledge Transfer Mechanisms in Terms of Training, Conference and Seminar

	Indicator	Mean	SD	Implementation Level
1.	I have attended relevant training or seminars on irrigation project development.	4.07	0.97	High
2.	NIA provides adequate learning opportunities for technical and operational skills.	4.27	0.93	Very High
3.	Training is aligned with current project needs and roles.	4.24	0.92	Very High
4.	I can apply knowledge gained from training to actual project work.	4.38	0.90	Very High
5.	Trainings I attended improved my ability to perform my project related duties.	4.33	0.90	Very High

	Indicator	Mean	SD	Implementation Level
6.	Conference participation provides new knowledge applicable to work.	4.32	0.90	Very High
	Overall	4.27	0.84	Very High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Slight, 1.00-1.80=Rare

The strong alignment between training content and project roles at NIA CALABARZON is consistent with recent findings by Manu et al (2025), who suggest that specialized technical training is the most effective predictor of organizational productivity in infrastructure sectors. Hosen et al (2024) highlight that for knowledge transfer to be successful, employees must be able to apply learned skills, as reflected in the high application scores in this study. Saputra et al (2024) argue that structured capacity-building initiatives are essential for enhancing the delivery of large-scale infrastructure projects, as they bridge the gap between emerging engineering technologies and traditional practices. Kaheeru et al (2024) emphasize that professional development through conferences and seminars fosters innovative work behavior, allowing public sector employees to adopt more efficient methodologies for water resource management and irrigation sustainability.

The results of this study suggest that Training, Conference, and Seminar programs are the primary drivers of capacity development within NIA CALABARZON. The organization has successfully created a learning environment where training offered is not merely a formality but is directly translated into improved field performance. The *very high* rating for training alignment and application implies that the agency's human capital is being effectively prepared for the technical complexities of irrigation project development.

The slight disparity in the perceived value of training and actual attendance suggests a capacity-access gap. The study implies that while the existing training are excellent, the organization could further improve by expanding the reach of these programs. Ensuring that broader cross-section of junior and field-level staff can participate is important to maintain very high implementation level.

Community of Practice (CoP) has a mean of 4.06 suggesting high implementation. The most positively rated item is its contribution to problem solving ($\bar{x} = 4.27$) emphasizing the value of collaborative technical discussions. Encouragement of knowledge sharing across units ($\bar{x} = 4.13$) and sharing of lessons learned across IMOs ($\bar{x} = 4.04$) also demonstrate strong performance. However, active participation in discussing issues and solutions ($\bar{x} = 3.94$) and the development of shared standards and tools ($\bar{x} = 3.99$) received slightly lower scores. This suggests that while the environment is collaborative, the transition from discussion to standardization is less frequent.

Table 9. Status of Implementation of Knowledge Transfer Mechanisms in Terms of Community of Practice

	Indicator	Mean	SD	Implementation Level
1.	There are regular meetings where staff share experiences on irrigation projects.	4.01	0.91	High
2.	Knowledge sharing among staff across units and offices is encouraged.	4.13	0.89	High
3.	CoP discussions lead to shared standards or tools adopted across units.	3.99	0.80	High
4.	CoP sessions allow sharing of lessons learned across IMOs and divisions.	4.04	0.90	High
5.	Participation in CoP improves problem-solving in on-going projects.	4.27	0.77	Very High

	Indicator	Mean	SD	Implementation Level
6.	I actively participate in groups or committees that discuss project issues and solutions.	3.94	0.87	High
	Overall	4.06	0.75	High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Slight, 1.00-1.80=Rare

These findings are supported by recent literature emphasizing the role of Community of Practice in facilitating knowledge sharing, collaboration, and innovation within organizations. CoPs provide platforms for professionals to exchange experiences, solve problems collectively, and develop best practices, enhancing both individual and organizational performance (Silverstein et al, 2022). Rowe et al (2023) highlighted that collaborative learning environments foster teamwork and continuous learning, particularly in complex, knowledge-intensive sectors such as infrastructure and public service organizations.

Studies also indicate that CoPs' effectiveness depends on active participation and the ability to translate shared knowledge into actionable outputs, such as standardized procedures, tools, and policies. The challenge of converting CoP discussions into standardized tools is a known hurdle in knowledge management. Sahay et al (2022) emphasize that without a structured formative evaluation and institutional support, CoPs may remain discussion-based rather than engines for evidence-based practice.

Based on these findings, it can be inferred that CoPs serve as valuable platforms for collaborative problem-solving and knowledge exchange, particularly in addressing ongoing project concerns. The study implies however that there is a gap between collaborative dialogue and institutional integration. To enhance performance, NIA CALABARZON may formalize CoPs' outputs. By creating a mechanism to review and adapt the best solutions identified in CoP sessions into official standard operating procedures, tools, or templates, the agency can ensure that individual breakthroughs lead to permanent improvements in organizational efficiency.

Table 10. Status of Implementation of Knowledge Transfer Mechanisms in Terms of After-Action Review

	Indicator	Mean	SD	Implementation Level
1.	After action reviews are conducted after major project activities or milestones.	3.99	0.87	High
2.	Lessons learned from AARs are documented and disseminated to the offices concerned.	3.92	0.82	High
3.	Recommendations from AAR are applied in subsequent irrigation projects.	3.95	0.83	High
4.	AAR sessions openly discuss what went well and what needs improvement.	4.04	0.83	High
	Overall	3.97	0.78	High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Slight, 1.00-1.80=Rare

Table 10 presents the status of implementation of After-Action Review (AAR) as a knowledge transfer mechanism within the organization. AAR had the lowest mean among the knowledge transfer mechanisms at 3.97, though it was still within the high implementation range. The data suggests that while AAR sessions effectively discuss what went well ($\bar{x} = 4.04$), there is room for improvement in documenting and disseminating lessons learned to other offices ($\bar{x} = 3.92$).

These findings are consistent with recent literature highlighting the importance of structured AAR

processes in strengthening organizational learning and improving project outcomes. Studies show that AARs enable teams to capture experiential knowledge, evaluate performance, and identify areas for improvement, enhancing future decision-making and project efficiency (Keiser and Winfred, 2020). Vukanović-Dumanović et al (2022) emphasized that the effectiveness of AARs depends on proper documentation, knowledge dissemination, and the integration of lessons learned into subsequent activities. In project-based organizations, the systematic use of past experiences has been found to reduce risks, improve planning accuracy, and enhance overall performance (Pak et al, 2025).

Based on these findings, it can be inferred that AAR practices in NIA CALABARZON contribute to reflective learning and continuous improvement at the project level. The high score for open discussion indicates the employees are willing to engage in assessment, but a lower score for dissemination suggest that these insights remain trapped within the specific group that conducted the review. There is a need to strengthen the documentation, dissemination, and application of lessons learned across units. Enhancing these processes can improve knowledge continuity, support evidence-based decision-making, and reduce the likelihood of recurring issues in future irrigation projects.

Data indicate that knowledge transfer mechanisms are generally well implemented across NIA CALABARZON, reflecting a strong institutional foundation for knowledge sharing and capacity development. Training and mentoring are emerging as the most implemented mechanisms. Real-time data sharing, active CoP participation, formalization of CoP outputs, and consistent application of AAR recommendations offer opportunities for strategic improvement and continuous organizational learning.

3.3. Capacity Development Strategies

Tables 11 to 13 present the respondents' assessment of the implementation status of capacity development strategies within NIA CALABARZON. Each strategy was evaluated using multiple indicators, with responses rated on a five-point Likert scale.

The mean for Individual Capacity is 4.19, indicating a high level of implementation. Findings reveal a self-assured workforce, with the highest-rated indicators being the application of lessons learned from the past projects ($\bar{x} = 4.39$) and confidence in task performance ($\bar{x} = 4.30$). Respondents strongly believe they possess the technical skills needed for their roles ($\bar{x} = 4.24$). While rated as high, the lowest indicators were the regular assessment or evaluation of competencies ($\bar{x} = 4.00$) and the extent to which capacity-building activities address specific competency gaps ($\bar{x} = 4.09$). This suggests that while individual skill levels and confidence are high, the formal mechanisms used to measure these competencies and tailor training to specific needs are less implemented.

Table 11. Status of Implementation of Capacity Development Strategies in Terms of Individual Capacity

	Indicator	Mean	SD	Implementation Level
1.	I have the technical skills needed for my role.	4.24	0.71	Very High
2.	I feel confident performing my assigned technical tasks.	4.30	0.71	Very High
3.	I receive feedback that helps improve my performance.	4.13	0.79	High
4.	I receive opportunities for personal skills improvement.	4.16	0.88	High
5.	Capacity-building activities address my competency gaps.	4.09	0.81	High
6.	My competencies are regularly assessed or evaluated.	4.00	0.86	High

	Indicator	Mean	SD	Implementation Level
7.	I apply lessons learned from past projects to new tasks.	4.39	0.74	Very High
	Overall	4.19	0.67	High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Slight, 1.00-1.80=Rare

These findings are supported by recent literature emphasizing the importance of continuous capacity development in enhancing employee performance. Studies show that structured learning opportunities, mentoring, and feedback mechanisms significantly improve employee competence, confidence, and job performance over time (Wikstrom et al, 2023). Continuous professional development and experiential learning enable employees to effectively apply knowledge and adapt to evolving work demands (Klein and Rosch, 2024). Hauptfeld et al (2022) emphasized that systematic evaluation of employee competencies helps identify skill gaps and align training interventions.

Results suggest a technically proficient and highly motivated workforce. The Very High ratings for skill application and confidence indicate that personnel are active practitioners who take ownership of their professional technical growth. However, findings imply a need for more rigorous competency management. The study suggests that to elevate individual capacity to *very high* level, the organization should move beyond generalized capacity building toward targeted competency intervention. Addressing employees' unique competency gaps may be addressed by strengthening formal evaluation processes and personalized training pathways.

Table 12. Status of Implementation of Capacity Development Strategies in Terms of Organizational Capacity

	Indicator	Mean	SD	Implementation Level
1.	Resources are provided for capacity development.	3.95	0.88	High
2.	Coordination among units involved in irrigation projects is effectively facilitated.	4.10	0.83	High
3.	Work processes in my office support learning and knowledge sharing.	4.19	0.82	High
4.	Clear competency frameworks exist for key roles.	4.09	0.85	High
5.	NIA CALABARZON has structured programs to enhance staff capacity on irrigation project development.	4.19	0.86	High
6.	Succession planning and role handover are systematically managed.	3.98	0.86	High
7.	The organization provides clear guidelines for knowledge transfer.	3.96	0.88	High
	Overall	4.06	0.75	High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Slight, 1.00-1.80=Rare

Organizational Capacity has a mean of 4.06 which is also interpreted as high. The highest rated indicators are work processes ($\bar{x} = 4.19$) and structured programs ($\bar{x} = 4.19$) that support learning and knowledge sharing within the organization, indicating strong internal systems for capacity development. Resources ($\bar{x} = 3.95$), succession planning ($\bar{x} = 3.98$), and knowledge transfer guidelines ($\bar{x} = 3.96$) received slightly lower ratings pointing to areas where organizational support mechanisms could be strengthened and

institutionalized.

Emphasis on work processes as driver of capacity aligns with research by Scott and Manning (2022), who argue that organizational performance is highest when embedded into daily workflows rather than treated as an external activity. Structured capacity development programs are essential for public sector agencies to maintain technical standards in large-scale infrastructure projects (Saputra et al, 2024). The lower scores for succession planning and guidelines reflect a broader institutional challenge identified by He et al (2025), who suggests that institutional continuity is frequently threatened by a lack of formalized handover protocols. Without clear guidelines for knowledge transfer, technical expertise is lost during staff transitions.

Results suggest a strong level of organizational capacity, particularly in terms of internal processes and structured development programs. To further enhance its capacity development strategies, the organization should strengthen resource allocation, formalize knowledge transfer guidelines, and improve succession planning systems. Reinforcing these areas will help ensure continuity of knowledge, support workforce sustainability, and enhance overall organizational performance in irrigation project development.

As shown in Table 13, the Institutional Capacity implementation has a mean of 4.20, indicating high implementation among the respondents. Results suggest that monitoring and evaluation ($\bar{x}$ = 4.28) and external collaborations ($\bar{x}$ = 4.27) are among the strongest institutional enablers supporting capacity development across the region. Policies supporting knowledge management ($\bar{x}$ = 4.16) and the preservation of institutional knowledge despite staff turnover ($\bar{x}$ = 4.02) were rated slightly lower, suggesting opportunities to strengthen mechanisms for knowledge continuity.

Table 13. Status of Implementation of Capacity Development Strategies in Terms of Institutional Capacity

Indicator		Mean	SD	Implementation Level
1.	Policies support effective knowledge management.	4.16	0.77	High
2.	Leadership promotes a culture of learning.	4.22	0.83	Very High
3.	Institutional knowledge is preserved despite staff transfers or turnover.	4.02	0.88	High
4.	Capacity development programs are aligned with agency goals.	4.23	0.75	Very High
5.	Partnerships with external institutions support skills development.	4.27	0.77	Very High
6.	Inter-agency coordination mechanisms function effectively for project delivery.	4.21	0.81	Very High
7.	Monitoring and evaluation systems like reports and audits are used to improve future projects.	4.28	0.81	Very High
Overall		4.20	0.73	High

Note. *N*=135. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Slight, 1.00-1.80=Rare

Findings are supported by recent literature emphasizing the role of institutional capacity in sustaining organizational performance and development outcomes. Strong institutional policies, leadership commitment, and coordinated partnerships have been shown to enhance organizational effectiveness and sustain long-term performance in public institutions (APO, 2024; Alaerts and Kaspersma, 2022). Effective monitoring, evaluation, and inter-agency coordination mechanisms are essential in ensuring continuous improvement, accountability, and adaptive organizational performance (Haug et al, 2024; Elbawab, 2024).

Results suggest strong institutional capacity, particularly in terms of leadership support, strategic alignment, partnerships, and performance monitoring systems. The organization is highly successful at learning from its external environment and its own internal reports. To transition into a Very High

implementation level across all indicators, the office should focus on codifying its knowledge management practices. Results suggest that the agency may prioritize creation of explicit policies to mandate knowledge preservation during staff movements.

The data indicates that capacity development strategies are actively implemented across all three dimensions, demonstrating a strong framework for strengthening workforce competence and organizational effectiveness. Institutional capacity and individual empowerment emerged as key strengths reflecting leadership support, alignment of programs with organizational goals, and employees' ability to apply knowledge and skills. Resource adequacy, succession planning, and formal competency assessments offer opportunities to strengthen sustainability, continuity, and long-term organizational performance. Addressing these will enable the agency institutionalize learning, retain critical expertise, and adapt effectively to evolving demands.

3.4. Organizational Performance

Tables 14 to 17 show the respondents' assessment of organizational performance in irrigation project development within NIA CALABARZON. The indicators are categorized into Technical Performance, Operational Performance, Human Capital Performance, and Stakeholder Engagement.

Table 14. Status of Organizational Performance in Terms of Technical Performance

	Indicator	Mean	SD	Performance Level
1.	Output has no revisions, rework, or technical problems.	3.37	0.87	Moderate
2.	Irrigation project development activities are completed within planned timelines.	3.56	0.85	High
3.	Project decision-making is timely and does not cause implementation bottlenecks.	3.74	0.78	High
4.	Processes eliminate unnecessary duplication of works.	3.85	0.74	High
	Overall	3.63	0.70	High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Low, 1.00-1.80=Very Low.

Technical Performance has a mean of 3.63 interpreted as high performance. The highest-rated indicator shows that processes eliminate unnecessary duplication of works ($\bar{x} = 3.85$), suggesting that operational workflows are relatively well-structured, standardized, and effectively coordinated across units. Indicators with lower ratings indicate challenges in efficiency ($\bar{x} = 3.37$) and timeliness ($\bar{x} = 3.56$).

The moderate rating for rework and technical problems align with recent findings of Mekonen et al (2025), who suggest that in large-scale irrigation projects, technical rework is often an indicator of fragmented knowledge transfer between the design and construction phases. Gashaahun and Abiy (2023) highlight that delays and technical bottlenecks in public infrastructure are frequently linked to inadequate historical data referencing, which forces teams to correct errors that could have been avoided through better archival consultation. Effective risk management is also a critical factor in technical performance. Kabutiei et al (2022) emphasize that proactive technical planning and early-stage risk identification are essential to minimizing implementation bottlenecks.

Results suggest that while NIA CALABARZON is operationally efficient in its coordination, it faces technical quality control gap. The moderate score for rework indicates that resources are being diverted to correct errors, which may be contributing to the lower scores in timeline adherence. This implies that the current level of performance is being sustained through reactive corrections rather than proactive precision. Root causes of rework must be addressed by strengthening technical peer review processes and ensuring the

effective use of lessons learned from After-Action Reviews. A shift from corrective to preventive approaches may improve efficiency, reliability and long-term sustainability of projects.

Table 15. Status of Organizational Performance in Terms of Operational Performance

	Indicator	Mean	SD	Performance Level
1.	The office adapts quickly to new policies or directives.	4.13	0.77	High
2.	Work processes continue despite personnel changes.	4.13	0.72	High
3.	Project operations remain consistent even during organizational changes or challenges.	4.16	0.72	High
4.	Staff adapt quickly to new technologies, tools, or procedures.	4.17	0.69	High
	Overall	4.15	0.65	High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Low, 1.00-1.80=Very Low.

Operational Performance has a mean of 4.15 interpreted as high performance. The data indicate a consistent level of performance across all indicators. The highest rated indicator was the ability of staff to adapt quickly to new technologies, tools and procedures ($\bar{x} = 4.17$) and consistency of project operations during organizational changes ($\bar{x} = 4.16$). The organization also demonstrated continuity of work processes despite personnel changes ($\bar{x} = 4.13$) and a high capacity for adapting to new policies or directives ($\bar{x} = 4.13$).

Findings are supported by recent literature emphasizing the importance of adaptability and resilience in organizational performance. Studies show that organizations with strong knowledge-sharing practices, flexible workforce structures, and adaptive management systems are better able to sustain operations and respond effectively to environmental and organizational changes (Christabel et al, 2024; Ma, 2024). Such capabilities are particularly important in public infrastructure organizations, where service continuity and responsiveness to policy and environmental shifts are critical. Adaptive management approaches enable organizations to continuously learn, adjust strategies, and improve operational outcomes in the face of uncertainty and complexity (Roux et al, 2022).

Findings demonstrate strong operational performance, characterized by resilience, flexibility, and service continuity. To further enhance performance, the organization may continue to strengthen adaptive systems, invest in technological readiness, and promote continuous learning practices. Sustaining these efforts ensure long-term operational effectiveness and responsiveness.

As shown in Table 16, Human Capital Performance has a mean of 4.13 also interpreted as high performance. The highest rated category is the perception that staff competencies improve through ongoing knowledge transfer activities ($\bar{x} = 4.19$). While still rated as High, the indicator for workload distribution ($\bar{x} = 4.05$) received the lowest rating. This suggests that while there are strong individual and collective competencies, management of time and tasks is a potential area for optimization to prevent burnout and ensure sustained output quality.

Table 16. Status of Organizational Performance in Terms of Human Capital Performance

	Indicator	Mean	SD	Performance Level
1.	Staff involved in irrigation projects possess the required technical skills.	4.14	0.68	High
2.	Staff competencies improve through ongoing knowledge transfer activities.	4.19	0.75	High
3.	Team members collaborate effectively to meet project requirements.	4.13	0.70	High

	Indicator	Mean	SD	Performance Level
4.	Workload distribution supports quality and on-time delivery.	4.05	0.75	High
	Overall	4.13	0.64	High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Low, 1.00-1.80=Very Low.

These findings are supported by recent studies that highlight the importance of human capital for organizational performance. Research shows that knowledge sharing, continuous learning, and collaborative work environments help improve employee skills, teamwork, and overall performance (Christabel et al, 2024; Lin, 2024). Effective human resource management practices are essential in maintaining productivity and efficiency in project-based organizations (Akwatey, 2025). Continuous investment in employee development also helps staff adapt to new challenges, improve innovation, and stay committed to organizational goals.

Results suggest that NIA CALABARZON has a highly capable and collaborative workforce that is actively growing through the agency's knowledge transfer initiatives. The high ratings across skill possession and improvement indicate that the organization's investment in human capital is reflected in employee readiness and technical proficiency. The study, however, implies that the organization is at risk of overextending its human resources.

The lower score for workload distribution suggests that the current high performance is reliant in staff commitment rather than an optimized administrative system. Improving workload management can further enhance employee performance and project outcomes. Strengthening human resource systems and continuing capacity development efforts will help sustain workforce productivity and support the successful implementation of irrigation projects.

Table 17. Status of Organizational Performance in Terms of Stakeholder Engagement

	Indicator	Mean	SD	Performance Level
1.	Farmer organizations and stakeholders are consulted at key stages of project development.	4.41	0.77	Very High
2.	Feedback from stakeholders is integrated into project decisions.	4.27	0.82	Very High
3.	Stakeholder concerns are addressed promptly and clearly.	4.18	0.81	High
4.	The office communicates project progress and issues to stakeholders.	4.30	0.76	Very High
5.	The office coordinates with farmers' associations and stakeholders.	4.41	0.76	Very High
6.	Engagement activities contribute to better project outcomes.	4.40	0.70	Very High
	Overall	4.33	0.70	Very High

Note. $N=135$. The mean is interpreted as follows: 4.21 – 5.00=Very High, 3.41-4.20=High, 2.61-3.40=Moderate, 1.81-2.60=Low, 1.00-1.80=Very Low.

Table 17 presents the status of organizational performance in terms of stakeholder engagement, with a mean score of 4.33, indicating very high engagement. Findings show a remarkably strong commitment to inclusive governance with the highest indicators being consultation at key project stages ($\bar{x} = 4.41$) and coordination with farmers' associations ($\bar{x} = 4.41$). The indicator with the lowest rating is the prompt and clear addressing of stakeholder concerns ($\bar{x} = 4.18$), suggesting room for improvement in responsiveness and communication during operational challenges such as delays or technical adjustments.

These findings are supported by recent literature emphasizing the importance of stakeholder

participation in improving project effectiveness. Studies show that active engagement of stakeholders enhances project relevance, strengthens accountability, and improves resource management outcomes in irrigation and infrastructure development (Allasiw et al, 2023; Separa and Salapa, 2025). Research further emphasizes that strong institutional coordination and knowledge sharing among stakeholders are critical factors in achieving effective irrigation governance and project success (Rola et al, 202; He, 2024).

Results suggest that stakeholder engagement is a major strength of NIA CALABARZON, contributing to the success of irrigation project development. However, improving the speed and clarity of responses to stakeholder concerns can further enhance engagement quality. Strengthening feedback mechanisms and communication channels will help ensure more responsive, transparent, and inclusive project management.

Results show that stakeholder engagement and operational performance are the strongest dimensions of organizational performance, reflecting high levels of adaptability, coordination, and workforce responsiveness. Technical performance, though still rated highly, has a relatively lower score in areas related to reducing rework and strictly adhering to project timelines. This indicates that, while NIA CALABARZON excels in collaboration, adaptability, and human capital development, targeted improvements in technical efficiency may further boost irrigation project outcomes.

3.5. Relationship Between Knowledge Transfer Mechanisms and Organizational Performance

Table 18 presents the correlation results between knowledge transfer mechanisms and organizational performance in irrigation project development. The analysis used Pearson's correlation coefficient to measure the strength of relationships, with significance tested through p-values.

Table 18. Relationship Between Knowledge Transfer Mechanisms and Organizational Performance

Knowledge Transfer Mechanism	Organizational Performance			
	Technical Performance	Operational Performance	Human Capital Performance	Stakeholder Engagement
Knowledge Repository Systems	r = 0.58*** moderate <.001	r = 0.65*** moderate <.001	r = 0.70*** high <.001	r = 0.69*** moderate <.001
Mentoring and Coaching	r = 0.55*** moderate <.001	r = 0.66*** moderate <.001	r = 0.72*** high <.001	r = 0.63*** moderate <.001
Training, Conference, Seminar	r = 0.43*** moderate <.001	r = 0.59*** moderate <.001	r = 0.68*** moderate <.001	r = 0.67*** moderate <.001
Community of Practice (CoP)	r = 0.62*** moderate <.001	r = 0.72*** high <.001	r = 0.74*** high <.001	r = 0.73*** high <.001
After-Action Review	r = 0.63*** moderate <.001	r = 0.68*** moderate <.001	r = 0.64*** moderate <.001	r = 0.70*** high <.001

Note. Cell contains Pearson *r* correlation coefficient, interpretation of its strength, and its corresponding *p* value. Degree of freedom is 133.

p*<.05. *p*<.01. ****p*<.001.

All correlation results are positive, indicating a direct association. Given that all p-values are less than the significance level, the null hypothesis is rejected. There is a statistically significant positive relationship (*p* < .001) between all knowledge transfer mechanisms and organizational performance across all

dimensions. The strength of relationships ranges from moderate to high, indicating that as knowledge transfer mechanisms are implemented, there is a predictable improvement in organizational performance. Community of practice emerged as the most influential mechanism, showing high correlation with human capital performance ($r = 0.74$), stakeholder engagement ($r = 0.73$), and operational performance ($r = 0.72$). After-Action Reviews ($r = 0.63$) had the strongest correlations with technical performance, indicating that structured reflection and documentation processes contribute to improved efficiency, learning, and timeliness in project implementation.

The high correlation between CoP and human capital is supported by Sahay et al (2022) and He (2024) who argue that collaborative problem-solving platforms accelerate the development of workforce competencies more effectively than isolated training. Systematic knowledge management practices such as documentation and review mechanisms have been shown to enhance project performance and reduce operational inefficiencies (Kabutiei et al, 2022; Gashaaahun and Abiy, 2023). Jaiswal and Kumar (2025) and Akwatey (2025) emphasize that the synergy between formal training and informal mentoring creates a performance multiplier effect, whereby individual skills are rapidly translated into institutional success. Results suggest that the organization's performance is linked to its ability to capture, share, and apply knowledge. While all mechanisms are beneficial, the agency should prioritize institutionalizing Community of Practice and After-Action Reviews, as they have the greatest statistical impact on workforce competency and technical precision.

3.6. Relationship Between Capacity Development Strategies and Organizational Performance

Table 19 presents the correlation results between capacity development strategies and organizational performance in irrigation project development. The analysis used Pearson's correlation coefficient to measure the strength of relationships, with significance tested through p-values.

Table 19. Relationship Between Capacity Development Strategies and Organizational Performance

Capacity Development Strategies	Organizational Performance			
	Technical Performance	Operational Performance	Human Capital Performance	Stakeholder Engagement
Individual Capacity	$r = 0.56^{***}$ moderate <.001	$r = 0.78^{***}$ high <.001	$r = 0.78^{***}$ high <.001	$r = 0.80^{***}$ high <.001
Organizational Capacity	$r = 0.66^{***}$ moderate <.001	$r = 0.81^{***}$ high <.001	$r = 0.84^{***}$ high <.001	$r = 0.82^{***}$ high <.001
Institutional Capacity	$r = 0.63^{***}$ moderate <.00116	$r = 0.83^{***}$ high <.00135	$r = 0.84^{***}$ high <.001	$r = 0.82^{***}$ high <.001

Note. Cell contains Pearson r correlation coefficient, interpretation of its strength, and its corresponding p value. Degree of freedom is 133.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Given that all correlation coefficients are positive and all p-values are less than the significance level, the null hypothesis is rejected. There is a statistically significant positive relationship ($p < .001$) between all capacity development strategies and organizational performance. This indicates that stronger capacity development strategies are associated with higher levels of organizational performance.

Both organizational and institutional capacity show very strong correlations ($r > 0.80$) with operational, human capital, and stakeholder performance. This suggests that effective organizational systems, leadership support, policies, and institutional mechanisms contribute greatly to improving agency

performance and coordination in irrigation project development. Technical Performance consistently showed a moderate correlation, indicating that while capacity strategies are essential, technical outcomes may also be influenced by external project variables not captured by this study.

These findings are supported by recent literature that emphasizes that capacity development plays a critical role in strengthening organizational effectiveness, particularly in public sector and infrastructure-related institutions. Studies show that strong institutional arrangements, leadership systems, and governance mechanisms significantly enhance organizational learning and performance outcomes (Ma, 2024; Roux et al, 2022). In irrigation and water management sectors, effective capacity development is essential for ensuring coordinated planning, technical efficiency, and stakeholder collaboration, all of which contribute to project sustainability and successful implementation (Rola et al, 2020).

Results highlight that capacity development strategies are key drivers of organizational performance in irrigation project development. Strengthening individual competencies, organizational systems, and institutional frameworks collectively enhances efficiency, coordination, and stakeholder engagement, ultimately leading to improved project outcomes and long-term sustainability.

3.7. Difference in Organizational Performance When Grouped According to Profile

Results presented in Table 20 indicate that there is no significant difference in the perception of organizational performance between male and female respondents across all measured dimensions, including technical performance, operational performance, human capital performance, and stakeholder engagement. This reflects consistent experiences and shared standards in the implementation of irrigation project activities within the organization.

Table 20. Means and Results of Independent Samples t-Tests on Organizational Performance Variables when Respondents are Grouped According to Sex

Organizational Performance Variable	Female		Male		t (132)	p-value	Remarks
	Mean	SD	Mean	SD			
Technical Performance	3.59	0.66	3.66	0.73	-0.63	0.527	Not Significant
Operational Performance	4.10	0.68	4.18	0.63	-0.68	0.499	Not Significant
Human Capital Performance	4.11	0.67	4.14	0.62	-0.31	0.755	Not Significant
Stakeholder Engagement	4.33	0.71	4.33	0.69	0.01	0.988	Not Significant

Findings are consistent with previous studies, which emphasize that gender differences are often minimal in structured organizational systems where processes, training, and performance standards are clearly defined. Equitable organizational practices, standardized competency frameworks, and transparent performance evaluation systems help ensure consistent employee performance regardless of gender (Besana et al, 2025). Research further indicated that competency-based training systems and uniform organizational policies reduce performance variability and promote equal participation in organizational activities (Akwatey, 2025; Giamos and Stroehle, 2024). Results reflect a gender-responsive organizational environment where both male and female employees contribute effectively to irrigation project development.

Table 21. Means and One-Way Analyses of Variance of Organizational Performance Variables when Respondents are Grouped According to Office

Organizational Performance Variable	Office	$\bar{x}$	SD	F	p	Remarks
Technical Performance	Regional Office	3.54	0.67	0.80	.495	Not Significant
	Cavite-Batangas IMO	3.55	0.74			
	Laguna-Rizal IMO	3.76	0.73			
	Quezon IMO	3.69	0.63			
Operational Performance	Regional Office	4.16	0.80	1.79	.153	Not Significant
	Cavite-Batangas IMO	3.97	0.63			
	Laguna-Rizal IMO	4.32	0.60			
	Quezon IMO	4.18	0.52			
Human Capital Performance	Regional Office	4.22 _{AB}	0.79	2.70*	.049	Significant
	Cavite-Batangas IMO	3.90 _B	0.67			
	Laguna-Rizal IMO	4.31 _A	0.55			
	Quezon IMO	4.13 _{AB}	0.46			
Stakeholder Engagement	Regional Office	4.35 _{AB}	0.82	3.25*	.024	Significant
	Cavite-Batangas IMO	4.05 _B	0.67			
	Laguna-Rizal IMO	4.53 _A	0.75			
	Quezon IMO	4.43 _{AB}	0.44			

Note. Means with common trailing letters are not significantly different.

* $p < .05$. ** $p < .01$. *** $p < .001$

Results presented in Table 21 show that there are no significant differences in Technical Performance ($p = .495$) and Operational Performance ($p = .153$) when respondents are grouped according to office. This indicates that these aspects of organizational performance are consistently implemented across the offices. However, results reveal significant differences in Human Capital Performance ($p = .049$) and Stakeholder Engagement ($p = .024$) across offices. Laguna-Rizal IMO recorded higher means compared to Cavite-Batangas IMO in these areas.

These results are supported by recent studies emphasizing that differences in organizational performance across units are often influenced by contextual factors such as leadership practices, resource availability, and local stakeholder engagement strategies (Ma, 2024). In irrigation and public sector organizations, stakeholder engagement and human capital performance are sensitive to localized management approaches and field conditions (Rola et al, 2020).

Results of this study suggest that NIA CALABARZON has achieved a harmonized technical and operational framework, but faces disparities in human and social capital. It implies that the agency's core engineering and process standards are being upheld consistently across the region. Findings highlight the importance of balancing standardization with localized management strategies that respond to each office's unique operational conditions.

The One-Way Analysis of Variance (ANOVA) results in Table 22 indicate that there is no significant difference in performance ratings across units or sections. While minor fluctuations in mean scores are observable, these variations do not reach statistical significance. This suggests that personnel from different functional areas demonstrate relatively uniform and comparable levels of performance across all organizational performance dimensions. Although mean scores vary, these differences are not statistically significant. The absence of significant differences suggests that these variations do not represent meaningful gaps in performance across units. Findings imply that the organization maintains standardized systems, procedures, and performance expectations across different functional areas.

Table 22. Means and One-Way Analyses of Variance of Organizational Performance Variables when Respondents are Grouped According to Unit/Section

Organizational Performance Variable	Unit/Section	$\bar{x}$	SD	F	p	Remarks
Technical Performance	Planning	3.49	0.61	1.18	.321	Not Significant
	Design	3.63	0.77			
	Construction	3.80	0.75			
	Operation & Maintenance	3.72	0.65			
	Institutional Development	3.49	0.67			
Operational Performance	Planning	4.07	0.64	0.57	.684	Not Significant
	Design	4.18	0.60			
	Construction	4.27	0.62			
	Operation & Maintenance	4.14	0.67			
	Institutional Development	4.05	0.72			
Human Capital Performance	Planning	4.04	0.62	1.40	.237	Not Significant
	Design	4.33	0.57			
	Construction	4.24	0.68			
	Operation & Maintenance	4.07	0.62			
	Institutional Development	3.98	0.66			
Stakeholder Engagement	Planning	4.39	0.55	0.58	.676	Not Significant
	Design	4.45	0.56			
	Construction	4.38	0.77			
	Operation & Maintenance	4.20	0.70			
	Institutional Development	4.24	0.80			

Results are supported by studies emphasizing that integrated organizational systems and standardized operating procedures contribute to consistent performance across units. In complex and project-based environments such as irrigation development, uniform processes and shared frameworks help maintain consistent performance across departments and functional units (Roux et al, 2022).

Findings suggest that NIA CALABARZON has achieved a high level of functional integration and organizational consistency. Maintaining these standardized practices will be essential in sustaining uniform performance, while continuous coordination across units can further enhance efficiency and project outcomes.

Results shown in Table 23 indicate no significant difference in organizational performance across all dimensions when respondents are grouped by transfer history. This implies that the number of transfers or staff mobility does not greatly affect how employees view organizational performance.

Table 23. Means and One-Way Analyses of Variance of Organizational Performance Variables when Respondents are Grouped According to Transfer History

Organizational Performance Variable	Transfer History	$\bar{x}$	SD	F	p	Remarks
Technical Performance	None (0)	3.57	0.73	0.86	.492	Not Significant
	One (1)	3.86	0.66			
	Two (2)	3.59	0.66			
	Three (3)	3.60	0.64			
	Four (4) or more	3.56	0.68			
Operational	None (0)	4.11	0.73	0.48	.751	Not Significant

Organizational Performance Variable	Transfer History	$\bar{x}$	SD	F	p	Remarks
Performance	One (1)	4.29	0.56	0.39	.814	Not Significant
	Two (2)	4.04	0.60			
	Three (3)	4.18	0.55			
	Four (4) or more	4.15	0.54			
Human Capital Performance	None (0)	4.12	0.71	0.16	.958	Not Significant
	One (1)	4.26	0.60			
	Two (2)	4.06	0.53			
	Three (3)	4.08	0.53			
Stakeholder Engagement	Four (4) or more	4.04	0.64	0.16	.958	Not Significant
	None (0)	4.35	0.80			
	One (1)	4.38	0.61			
	Two (2)	4.24	0.56			
	Three (3)	4.29	0.57			
	Four (4) or more	4.26	0.64			

Although slight variations in mean scores are observed across groups, these differences are not statistically significant. This suggests that the organization maintains consistent performance standards regardless of staff movement between units or offices. Personnel seem to adapt effectively to new assignments, indicating the presence of strong institutional systems, standardized procedures, and knowledge transfer mechanisms that support ongoing performance.

These results are supported by recent studies emphasizing that effective knowledge management systems, standardized workflows, and organizational learning practices help sustain performance even in the presence of staff mobility. Organizations with strong systems for documentation, training, and knowledge sharing are better able to retain institutional knowledge and ensure consistent performance across different assignments (Ma, 2024; Damit, 2025).

Findings suggest that NIA CALABARZON has established strong systems that minimize the impact of staff transfers on performance. Maintaining and strengthening these systems will be important in ensuring continuity, adaptability, and sustained organizational performance in irrigation project development.

3.8. Strategic Interventions Proposed to Improve Knowledge Transfer and Capacity Development for Irrigation Project Development

Responses were grouped into four major themes: capacity building and continuous learning; operational and process improvements; organizational culture; and strategic continuity and sustainability.

The most frequently cited recommendation is the conduct of continuous training, seminars, and refresher courses to strengthen technical competencies in irrigation project development. Respondents emphasized the importance of sustained professional development to ensure personnel remain up to date with evolving technologies, standards, and project requirements. Continuous learning supports workforce adaptability and enhances service delivery effectiveness in public sector organizations (Fegada and Sharma, 2023; Nor, 2025).

Participants also highlighted the need to expand knowledge and ensure equitable access to training opportunities across offices. This finding aligns with the human capital theory, which suggests that investments in education and skills development improve employee productivity and organizational performance. Strengthening employee competencies through structured capacity development programs is essential for improving institutional performance and supporting long-term organizational sustainability.

(Saputra et al, 2024).

Respondents recommended operational and process improvements through digitalization, standardized procedures, and structured documentation practices. Establishing centralized knowledge repositories, upgrading information systems, and improving documentation processes were identified as key strategies to preserve institutional memory and ensure continuity of technical knowledge. Digital knowledge management systems enable organizations to capture and disseminate information efficiently, enhancing organizational agility and decision-making capacity (Karim et al, 2024; Alam et al, 2025).

The need for structured turnover procedures and documentation is particularly relevant in government agencies experiencing workforce transitions and staff mobility. Studies have shown that employee turnover can lead to significant knowledge loss if institutional knowledge is not properly documented and transferred (Galan; 2023; Mariano, 2023). The increasing rate of workforce retirement has heightened the importance of knowledge retention strategies to sustain organizational performance and service delivery (APQC, 2024).

Respondents also emphasized the importance of monitoring and evaluation mechanisms, including competency assessments and after-action reviews, to identify operational gaps and promote continuous organizational learning. After-action reviews are recognized as effective tools for capturing lessons learned and improving future project performance (Fletcher et al, 2023; FEMA, 2023).

Another major theme is the organizational culture, which highlights the importance of teamwork, communication, mentoring, and collaborative learning environments in strengthening knowledge transfer. Respondents recommended implementing peer learning systems, mentoring programs, and regular coordination meetings to facilitate knowledge sharing between experienced and newly hired personnel. Mentoring and coaching initiatives support the transfer of tacit knowledge, particularly in technical and project-based organizations where experiential learning plays a critical role (Ogunsola et al, 2023; Weinberg and Scandura, 2024).

The emphasis on teamwork and communication reflects the importance of a supportive organization promoting effective knowledge transfer. Research indicated that trust, collaboration, and positive interpersonal relationships enhance knowledge sharing behaviors and improve organizational outcomes (Rui and Ju, 2022; Barker Scott and Manning, 2022). Fostering inclusive and participatory work environments encourages employee engagement and strengthens organizational commitment (Lee and Kim, 2023).

The last theme is strategic continuity and sustainability. Respondents emphasized the importance of sustaining existing capacity development initiatives and strengthening institutional support for knowledge management mechanisms. The repeated suggestion to “continue” successful initiatives reflect the recognition that knowledge transfer mechanisms and capacity development strategies are long-term organizational processes that require sustained investment and leadership commitment. Institutionalizing best practices helps organizations maintain continuity, improve operational stability, and adapt to changing organizational demands (UK Research and Innovation, 2023; World Bank, 2022).

Sustained capacity development is important in infrastructure and irrigation management agencies, where technical expertise and institutional knowledge directly influence project implementation and service reliability. Strengthening organizational capacity has been shown to improve performance, resilience, and service delivery in the public sector (Ilias et al, 2025; Mwangi et al, 2022). In irrigation development, building institutional capacity supports effective water resource management, infrastructure sustainability, and long-term agricultural productivity (FAO, 2025; IWMI, 2024).

These findings reinforce the principle that organizational performance in irrigation project development depends not only on technical resources but also on the effective management of knowledge, skills, and institutional processes. Strengthening these areas will help ensure continuity of expertise, improve operational efficiency, and support the long-term sustainability of irrigation services.

4. Summary, Conclusions, and Recommendations

4.1. Summary of Findings

The following are the key findings based on the data gathered from 135 respondents involved in irrigation project development within NIA CALABARZON.

1. The demographic profile of the respondents shows a relatively balanced representation, with a slightly higher percentage of male employees (54.1%). A significant portion of staff is concentrated in the Cavite-Batangas and Quezon IMOs. The construction and institutional development units are the largest functional groups. Notably, 48% of staff have no transfer history, and 45% are actively engaged in operation and maintenance of projects.
2. All identified knowledge transfer mechanisms are implemented at a High to Very High level. Training, Conference and Seminar emerged as the most implemented mechanism ($\bar{x} = 4.27$). After Action Review (AAR) received the lowest relative score ($\bar{x} = 3.97$), specifically in disseminating documented lessons to other offices.
3. Capacity development strategies are implemented at a high level across Individual ($\bar{x} = 4.19$), Organizational ($\bar{x} = 4.06$), and Institutional ($\bar{x} = 4.20$) dimensions, indicating strong support systems for staff development. Institutional capacity was strongest, driven by systems and partnerships. Individual capacity showed strong confidence and application of lessons, though competency assessment was weaker. Organizational capacity was also rated positively, but resource adequacy, succession planning, and guidelines for knowledge transfer were rated lower.
4. In terms of organizational performance, the organization excels in Stakeholder Engagement ($\bar{x} = 4.33$), particularly in consulting farmer organizations. However, Technical Performance showed a “Moderate” level regarding the frequency of revisions and reworks ($\bar{x} = 3.37$), indicating a need for higher precision in technical outputs and coordination in technical planning and implementation processes.
5. Results of the correlational analysis showed a significant positive relationship ($p < .001$) between all knowledge transfer mechanisms and organizational performance variables, as well as between all capacity development strategies and organizational performance variables. These findings indicate that stronger implementation of knowledge transfer and capacity development initiatives is linked to higher levels of organizational performance in irrigation project development. After-action reviews displayed the strongest correlation with technical performance ($r = 0.63$), while Community of Practice showed high correlations with operational performance ($r = 0.72$) and human capital performance ($r = 0.74$). Organizational and institutional capacity also exhibited strong correlations with operational performance, human capital performance, and stakeholder engagement, emphasizing the importance of governance systems and collaborative frameworks in sustaining organizational performance.
6. The study found no significant difference in organizational performance ratings when respondents were grouped by sex, unit or section, and transfer history, indicating that standardized procedures enable consistent performance. However, a notable difference exists in Human Capital and Stakeholder Engagement when grouped by Office, with the Laguna-Rizal IMO exhibiting higher performance levels than the Cavite-Batangas IMO.

4.2. Conclusions

Based on the statistical analysis and findings of the study, the following conclusions were drawn:

1. Knowledge transfer mechanisms and capacity development strategies are widely practiced within NIA CALABARZON, as reflected by the high levels of implementation reported by respondents. The agency's strongest current strategy for knowledge movement is Training, Conferences and Seminars.

2. Organizational performance is strong in stakeholder engagement, operations, and human capital, but technical efficiency requires improvement. Revisions and rework received a relatively lower rating suggesting that while personnel feel confident, there are still bottlenecks in the precision of technical output.
3. Both knowledge transfer mechanisms and capacity development strategies are significantly and positively linked to organizational performance, indicating that differences in these mechanisms and strategies are associated with differences in performance levels. Improved knowledge-sharing practices are connected to better performance outcomes. The strong link between knowledge transfer mechanisms like Community of Practice and performance demonstrates that NIA CALABARZON's ability to share knowledge among staff relates to its operational efficiency and stakeholder satisfaction. Results show high correlation between After Action Review (AAR) and technical performance, yet AAR had the lowest use among transfer mechanisms. This suggests that while AARs are highly valued for enhancing technical efficiency, they are not yet fully utilized or systematically shared across offices.
4. Organizational performance remains consistent across different demographic groups, indicating that standardized procedures, training programs, and knowledge management systems help sustain performance stability within the organization. The notable difference in human capital performance and stakeholder engagement between IMOs suggests that localized leadership and management practices are more effective than others.

4.3. Recommendations

Based on the findings of the study, the following recommendations are proposed to sustain knowledge transfer mechanisms, capacity development strategies, and organizational performance in irrigation project development within NIA CALABARZON.

The organization could strengthen the implementation of After-Action Reviews (AAR) systems. Although AAR showed the strongest link to technical performance, they received the lowest implementation rating among knowledge transfer mechanisms. This highlights the need to go beyond informal discussions and establish standardized procedures for conducting, documenting, and sharing AAR outputs. Lessons learned from project implementation may be formally recorded and systematically shared across all Irrigation Management Offices (IMOs). Incorporating AAR findings into project planning, design, and evaluation processes will help reduce repetitive technical errors, lower rework, and improve overall project efficiency and infrastructure quality. Conducting semiannual office performance reviews could be institutionalized as a formal mechanism not only to evaluate achievements and identify gaps but also to systematically share best practices, lessons learned, and successful technical approaches among offices. These periodic reviews will offer a structured platform for presenting performance results, sharing innovations, and ensuring that improvement actions are clearly documented and monitored across all offices.

The organization may enhance its knowledge repository systems by developing more robust, reliable, and accessible digital platforms. Findings indicate that data updating and sharing through digital systems received comparatively lower ratings in this category, suggesting the need for improved system functionality and user accessibility. To address this, NIA CALABARZON may invest in real-time digital knowledge portals and Geographic Information System (GIS)-based databases to facilitate efficient data management, project monitoring, and coordination among units and field offices.

These systems may go beyond passive archiving by enabling active coordination, field validation, and decision support for engineers and planners. Digitizing project records, standard operating procedures, design data, and lessons learned will ensure that knowledge is not only stored but also actively used for planning, design, and operational improvements. This will improve transparency, reduce duplication of work, and enhance the efficiency of technical decision-making.

Mentoring and coaching programs may be further strengthened by formalizing structured mentoring frameworks that pair experienced personnel with less experienced staff to facilitate systematic knowledge and

skill transfer. Establishing clear guidelines, schedules, and performance indicators will help ensure consistency and accountability in program implementation. The organization may establish a formal knowledge handover protocol for personnel undergoing transfer, reassignment, or retirement. Standardized handover clearance forms may document ongoing assignments or responsibilities, pending deliverables, files and records, and key operational issues requiring follow-up. This will help preserve institutional memory, maintain operational continuity, and reduce the risk of knowledge loss associated with staff mobility.

The Regional Office may facilitate Best Practice Exchange initiatives to promote organizational learning and performance improvement. Sharing successful strategies, operational innovations, and technical solutions across offices will help address performance disparities and strengthen institutional collaboration. High-performing offices may serve as learning models by documenting and presenting their effective practices to other offices. Such collaborative mechanisms will foster a culture of continuous improvement, knowledge sharing, and collective problem-solving within the organization.

In line with findings on moderate technical performance and technical rework issues, NIA CALABARZON may continue and expand its capacity development programs by shifting to competency-based, targeted refresher courses. The agency may continue implementing regular training programs, seminars, and technical workshops to enhance technical competencies and keep personnel up to date on evolving technologies, engineering standards, and project management practices. Training initiatives may be aligned with emerging irrigation technologies and tailored to address specific competency gaps identified through systematic skills assessments. Emphasis may be placed on competency-based training programs that directly address technical challenges, particularly those related to planning, design accuracy, and construction quality. Strengthening succession planning and leadership development programs will also ensure continuity of technical expertise and organizational stability.

Institutional capacity can be enhanced through more integrated policies, systems, and learning mechanisms. AAR results, mentoring outputs, and repository data should be combined into a single knowledge management system to support evidence-based decision-making. Monitoring and evaluation systems may also be strengthened to better assess the effectiveness of knowledge transfer and capacity development initiatives. This approach will ensure that organizational learning is continuously incorporated into planning and implementation processes.

The organization and future researchers may consider age as a demographic variable in the design and implementation of knowledge transfer and capacity development initiatives. Differences in age groups may influence learning preferences, technology adoption, knowledge retention, and readiness for leadership and succession roles. Younger personnel may demonstrate greater adaptability to digital systems and emerging technologies, while more experienced personnel often possess valuable institutional knowledge, technical expertise, and historical project insights. Considering age as a variable will enable the organization to decide more targeted mentoring, training, and succession planning strategies that address the specific developmental needs of different workforce segments. This approach will also support workforce sustainability, facilitate smoother knowledge transfer between generations of employees, and strengthen organizational continuity.

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