

Operations Management of Logistics Hubs in the Second District of Rizal

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Abstract

This study examined the operations management practices of logistics hubs in the Second District of Rizal, particularly in sorting operations and last-mile distribution. It aimed to describe the profile of employee-respondents and logistics hubs, determine the extent of operations management practices in terms of reliability, responsiveness, agility, cost, and asset management efficiency, identify significant differences in the assessment of practices when grouped according to respondent and business profiles, determine the operational challenges encountered, and provide a basis for an operations management improvement plan. The study employed a descriptive quantitative research design involving 100 employees engaged in sorting, dispatching, and last-mile delivery activities. Data were collected through a structured questionnaire based on the Supply Chain Operations Reference (SCOR) Model and analyzed using appropriate descriptive and inferential statistical techniques. The findings showed that the logistics hubs generally maintained a high level of operations management practices across the identified SCOR dimensions. The respondents were predominantly young, male, and moderately experienced, while the participating logistics hubs were generally provincial distribution hubs operating under high-volume parcel conditions. The results further showed that significant differences were observed in reliability and agility when respondents were grouped according to age, while facility type showed a significant difference in responsiveness. Other respondent and business profile variables did not demonstrate significant differences in the assessment of operations management practices. The study also identified operational challenges involving delayed line-haul shipments, sorting backlogs, data errors and misrouting, customer unavailability, capacity limitations, increasing operational costs, inadequate assets and infrastructure, and weather-related disruptions. Overall, the study found that although logistics hubs demonstrated strong operations management practices, operational constraints and external disruptions continued to affect sorting efficiency and last-mile distribution. Based on the findings, an operations management improvement plan was proposed focusing on workforce allocation, backlog management, route planning, customer communication, asset utilization, cost control, and contingency planning to support continuous improvement in logistics operations.

Keywords: Operations Management, Logistics Hubs, Sorting Operations, Last-Mile Distribution, SCOR Model, Logistics Efficiency, Second District Of Rizal, Operations Management Improvement Plan

1. Introduction

The rapid expansion of e-commerce has fundamentally reshaped logistics operations, intensifying the demand for reliable, responsive, and cost-efficient parcel distribution. Logistics hubs have become critical nodes within contemporary supply chains because they connect upstream transportation and sorting activities with last-mile delivery. As parcel volumes increase and customer expectations for faster and more reliable delivery become more stringent, logistics providers face growing challenges in coordinating sorting, dispatching, routing, labor, transportation assets, and delivery capacity. Recent logistics literature consequently emphasizes the need to improve operational coordination and integrate technological, human, and physical resources to sustain efficient last-mile distribution (Boysen et al., 2024; Mangiaracina et al., 2024). This operational requirement is consistent with broader evidence that organizations undergoing digital transformation must align technological adoption with organizational processes and existing operational capabilities to realize improvements in efficiency and service delivery (Binaluyo et al., 2024). Similarly, organizational transformation requires the systematic restructuring of processes and resources in response to changing market and operating conditions (Santos, 2023a).

Recent studies demonstrate that last-mile logistics performance is multidimensional and increasingly dependent on the coordination of technological, human, and physical resources. Research on emerging last-mile delivery technologies indicates that digitalization, automation, real-time information, and data-driven decision-making can improve delivery visibility and operational efficiency, although their effectiveness remains dependent on organizational and operational capabilities (Lim et al., 2023). The importance of digital capability is likewise reflected in research showing that technological systems must be supported by appropriate documentation, information management, and organizational coordination to achieve intended operational outcomes (Gamit et al., 2025). In addition, the growing role of mobile technologies in facilitating access to information and supporting organizational activities demonstrates how digital tools can strengthen communication and responsiveness when effectively integrated into operational processes (Tuliao et al., 2024). However, technological adoption also requires personnel who possess sufficient digital competencies and organizational readiness to use emerging technologies responsibly and effectively, particularly as data-driven and artificial intelligence-supported processes become more prevalent (De Guzman et al., 2025).

Similarly, research on delivery-station zoning and customer assignment demonstrates that appropriate allocation of delivery areas can improve delivery efficiency and workload distribution (Yu et al., 2025). Other studies examining last-mile distribution under uncertain demand emphasize the importance of balancing cost, flexibility, and responsiveness when designing delivery strategies (Pahwa & Jaller, 2025). These findings suggest that logistics efficiency cannot be reduced to delivery speed alone; rather, it depends on the capacity of logistics organizations to coordinate processes, respond to changing demand, allocate resources effectively, and maintain consistent service performance. From an organizational quality perspective, well-defined procedures, systematic resource management, performance monitoring, and continuous improvement are important mechanisms for strengthening operational performance (Gamit et al., 2024). This is particularly relevant to logistics hubs, where variations in parcel volume, manpower, vehicle availability, and delivery assignments require continuous coordination among multiple operational activities.

Effective resource utilization is also essential to operational efficiency. Although examined in a different sector, Santos and Constantino (2021) demonstrated that production and operational outcomes may be affected by the manner in which resources, work activities, and operational procedures are managed. This principle is applicable to logistics hubs, where inefficient allocation of manpower, vehicles, loading areas, and delivery capacity can create bottlenecks throughout sorting and dispatching operations. Broader business research likewise indicates that organizational performance is shaped by the ability of enterprises to identify critical operating factors and develop strategies appropriate to their immediate environment (Santos, 2023b). Consequently, logistics operations management requires not only technological capability but also effective workforce deployment, resource planning, procedural consistency, and adaptive decision-making.

The recent literature, however, reveals an important limitation. Much of the research has concentrated on technological solutions, mathematical optimization, network configuration, and urban last-mile delivery. Although these approaches provide valuable insights into system-level efficiency, they offer comparatively limited understanding of how logistics hubs operationalize these strategies under geographically dispersed and resource-constrained conditions. Studies of urban logistics frequently assume relatively dense customer locations and established transportation infrastructure, whereas provincial distribution environments may involve longer delivery distances, dispersed customers, variable road accessibility, and substantial fluctuations in parcel volumes. Thus, the operational realities of provincial logistics hubs warrant greater empirical attention. Research in other Philippine organizational contexts similarly demonstrates that local operating conditions, resource constraints,

institutional arrangements, and stakeholder environments can significantly affect how strategies and programs are implemented (Constantino & Santos, 2025; Santos et al., 2025). These observations underscore the importance of examining logistics performance within its actual geographic and organizational setting rather than relying exclusively on generalized models of distribution efficiency.

The Philippine logistics environment provides a particularly relevant context for examining this issue. The continuing expansion of e-commerce has increased the demand for parcel processing, distribution, and delivery services beyond major metropolitan areas. The broader expansion of digitally enabled business activities has similarly increased the need for organizations to adapt their operating systems, workforce capabilities, and service processes to changing customer expectations and technology-driven market environments (Binaluyo et al., 2024; Santos, 2026). Such transformation is particularly important in service-oriented operations where customers increasingly expect timely information, efficient transactions, and reliable fulfillment.

However, logistics operations in the Philippines are influenced by geographical fragmentation, traffic congestion, varying road conditions, and differences in transportation accessibility. Recent Philippine research has identified traffic congestion, communication difficulties, and package-handling concerns as operational issues affecting last-mile delivery (Bercacio et al., 2024). These findings demonstrate that logistics performance is shaped by local operational conditions. This is consistent with studies emphasizing that organizational outcomes depend partly on the capacity of institutions to adapt their processes and strategies to specific environmental and operational constraints (Santos, 2023a, 2023b). Quality-management research further suggests that standardized procedures, monitoring mechanisms, clearly assigned responsibilities, and continuous process improvement can help organizations maintain service consistency despite variations in operating conditions (Gamit et al., 2024).

Nevertheless, existing Philippine studies remain relatively limited in examining the internal operations management of provincial logistics hubs, particularly the relationship among sorting, dispatching, resource utilization, and last-mile distribution. While existing research provides substantial evidence concerning technology, routing optimization, digitalization, and delivery challenges, fewer studies have examined how these operational dimensions interact at the logistics-hub level in provincial environments. Given evidence that digital transformation, process documentation, quality-management systems, workforce capability, and adaptive organizational strategies contribute to improved organizational performance across different Philippine settings (Binaluyo et al., 2024; De Guzman et al., 2025; Gamit et al., 2024, 2025), examining these operational elements within provincial logistics hubs may provide a more comprehensive understanding of the factors that influence last-mile distribution performance. Such an investigation can contribute empirical evidence for developing strategies aimed at improving sorting efficiency, dispatch coordination, resource utilization, delivery responsiveness, and overall operational performance.

This limitation is particularly relevant to the Second District of Rizal, comprising Jalajala, Pililla, Tanay, Baras, Morong, Cardona, and Teresa. Logistics hubs serving these municipalities connect upstream sorting and transportation networks with customers distributed across urbanizing centers, rural communities, upland areas, and geographically dispersed barangays. Their operations involve parcel receiving, scanning, destination-based sorting, parcel grouping, rider assignment, dispatch scheduling, and last-mile delivery. Variations in parcel volume, workforce availability, facility capacity, transportation resources, and road accessibility may influence the efficiency and consistency of these processes. Despite the growing importance of provincial logistics networks, there is limited empirical evidence describing how these operational conditions are managed within the Second District of Rizal.

A further gap concerns the integrated assessment of logistics hub operations. Existing studies frequently focus on specific outcomes such as delivery time, routing efficiency, cost, technological adoption, or customer satisfaction. Less attention has been given to examining hub-level operations through an integrated set of dimensions encompassing reliability, responsiveness, agility, cost, and asset management efficiency. Reliability concerns the consistency and accuracy of sorting and distribution processes; responsiveness reflects the capacity to address operational and customer requirements promptly; agility refers to the ability to adapt to changing parcel volumes and delivery conditions; cost concerns the efficient use and control of operational resources; and asset management efficiency concerns the utilization of facilities, vehicles, equipment, and other logistics assets. Examining these dimensions collectively may provide a more comprehensive understanding of logistics hub performance.

The literature also provides limited evidence regarding how employee and hub characteristics influence assessments of sorting and last-mile distribution practices. Employee characteristics such as position, length of service, educational attainment, and employment status may shape exposure to and perceptions of operational processes. Similarly, hub characteristics such as facility type, platforms served, years of operation, workforce size,

parcel volume, and vehicle type may influence operational capacity and performance. Moreover, employees directly involved in sorting and delivery possess experiential knowledge of operational bottlenecks, resource constraints, and process inefficiencies that may not be captured by aggregate performance indicators. Incorporating their assessments may therefore provide a more grounded understanding of logistics operations at the hub level.

Taken together, recent literature establishes the importance of technology, routing, zoning, demand responsiveness, information coordination, and resource allocation in improving last-mile logistics. However, three interconnected gaps remain. First, there is a contextual gap concerning the limited empirical examination of provincial logistics hubs in semi-urban and geographically dispersed communities. Second, there is an operational gap in integrating reliability, responsiveness, agility, cost, and asset management efficiency into a comprehensive assessment of sorting and last-mile distribution. Third, there is an empirical gap concerning differences in operational assessments based on employee and hub characteristics and the challenges experienced by personnel directly engaged in logistics operations. Addressing these gaps is particularly important in developing logistics environments where operational conditions may differ substantially from those assumed in urban-centered logistics models.

In response to these gaps, the present study, entitled “Operations Management of Logistics Hubs in the Second District of Rizal,” assesses the extent of operations management practices related to sorting operations and last-mile distribution. Specifically, it examines the profiles of employee-respondents and logistics hubs; assesses operational practices in terms of reliability, responsiveness, agility, cost, and asset management efficiency; determines whether assessments differ according to employee and hub characteristics; identifies challenges encountered in sorting and last-mile distribution; and proposes an operations management plan based on the findings. The study contributes localized empirical evidence to the growing literature on e-commerce logistics by linking operational practices, employee perspectives, and hub characteristics within a provincial logistics context. It further provides a practical basis for strengthening the reliability, responsiveness, agility, cost efficiency, and asset utilization of logistics hubs in the Second District of Rizal.

2. Material and methods

2.1 Research Design

The study employed a quantitative descriptive research design to assess the operations management practices of logistics hubs in the Second District of Rizal, particularly in sorting operations and last-mile distribution. The design was appropriate because the study quantitatively described existing practices, compared assessments across respondent and hub profiles, identified operational challenges, and provided an empirical basis for the proposed operations management plan. The assessment was structured around the dimensions of reliability, responsiveness, agility, cost, and asset management efficiency, informed by the Supply Chain Operations Reference (SCOR) framework.

2.2 Locale of the Study

The study was conducted in selected provincial distribution hubs located in the Second District of Rizal, specifically in the municipalities of Jala-Jala, Pililla, Tanay, Baras, Morong, Cardona, and Teresa. The locale was selected because of its combination of semi-urban, rural, and geographically dispersed communities, which presents distinctive operational conditions for parcel sorting and last-mile distribution.

2.3 Respondents of the Study

The respondents were 100 employees from participating logistics hubs who were directly involved in or had substantial knowledge of sorting, dispatching, and last-mile distribution operations. They included supervisors, managers, operations personnel, sorting staff, delivery staff, and other qualified personnel who could provide relevant information regarding the operational practices and challenges of logistics hubs.

2.4 Sample and Sampling Procedure

The study employed purposive sampling to select logistics hubs and employees who satisfied the established inclusion criteria, particularly those directly involved in sorting and last-mile distribution activities. Seven participating hubs from Pililla, Tanay, Morong, Cardona, and Teresa were included, comprising 100 respondents; purposive selection ensured that participants possessed sufficient operational knowledge relevant to the objectives of the study.

2.5 Research Instrument

Data were gathered using a structured researcher-made questionnaire consisting of sections on respondent and logistics-hub profiles, operations management practices, and operational challenges. The operations management section assessed reliability, responsiveness, agility, cost, and asset management efficiency using a five-point Likert scale, and the instrument was pilot-tested among 10 qualified employees excluded from the final sample, yielding a Cronbach's alpha of 0.98, indicating excellent internal consistency.

2.6 Data Gathering Procedure

Prior to data collection, the researcher secured the necessary permissions from the concerned logistics hubs and obtained informed consent from all participating respondents. The questionnaires were administered personally or through an agreed distribution procedure, after which completed instruments were retrieved, checked for completeness, coded, and prepared for statistical analysis while maintaining respondents' confidentiality and voluntary participation.

2.7 Data Analysis Techniques

The collected data were analyzed using frequency and percentage for respondent and hub profiles and weighted mean for the assessment of operations management practices. A t-test was used for comparisons involving two groups, while one-way analysis of variance (ANOVA) was used for comparisons involving three or more groups, with open-ended responses analyzed thematically to identify recurring operational challenges; statistical computations were performed using Microsoft Excel and SPSS.

2.8 Ethical Considerations

The study observed ethical principles in conducting research involving human participants. Participation in the study was voluntary, and the respondents were informed about the purpose of the research before answering the questionnaire. The information gathered from the respondents was used solely for academic purposes and was treated with confidentiality. The researcher ensured that the respondents' identities and personal information were protected throughout the research process. The collected data were analyzed and reported objectively to maintain the integrity and credibility of the study.

3. Results and Discussion

3.1 Profile of the Employee-Respondents in Terms of Age, Sex, Civil Status, Educational Attainment, Position, and Length of Service

The results showed that the employee-respondents were predominantly young, male, and relatively early in their careers. Nearly half (48%) were aged 28–37 years, followed by 43% aged 18–27 years, while only 9% were 38–47 years old. In terms of sex, males comprised 80% of the respondents, whereas females accounted for 20%. Most respondents were single (61%), while 36% were married and 3% were separated. Regarding educational attainment, half were high school graduates (50%), followed by college graduates (25%), college-level employees (20%), and vocational graduates (5%). In terms of position, delivery staff constituted the largest group (53%), followed by sorting staff (22%) and operations staff (14%), while supervisors (6%), managers (4%), and other personnel (1%) represented smaller proportions. With respect to length of service, 56% had worked for 1–3 years, 24% for less than one year, 17% for 4–6 years, and 3% for seven years or more. Overall, the respondent profile reflects a workforce largely composed of young employees with relatively short organizational tenure who are directly engaged in frontline delivery, sorting, and operational activities, making them well positioned to provide firsthand assessments of logistics hub operations.

3.2 Profile of the Logistics Hubs in Terms of Facility Type, Platforms Served, Type of Business Organization, Years of Operation, Number of Employees, Average Daily Parcel Volume, and Type of Vehicle Used

The results showed that all seven participating logistics hubs were provincial distribution hubs, representing 100% of the facilities included in the study and confirming a consistent operational setting. In terms of platforms served, 71.4% catered to multiple e-commerce platforms, including Shopee, Lazada, TikTok Shop, Shein, and Temu, while 28.6% served Shopee exclusively, indicating that most hubs managed diversified parcel sources and potentially more complex sorting requirements. Regarding business organization, partnerships and corporations each accounted for 42.9%, while sole proprietorship represented 14.3%. In terms of operational longevity, 42.9% had been operating for less than three years, while 28.6% had operated for 3–5 years and another 28.6% for 6–10 years, suggesting a relatively developing logistics sector in the area. Most hubs (85.7%) employed 21–50 personnel, while 14.3% employed more than 100 workers. Similarly, 85.7% processed 1,001–5,000 parcels daily, whereas 14.3% handled more than 5,000 parcels, reflecting substantial and varying operational workloads. For

last-mile delivery, motorcycles accounted for 83.3% of the vehicles used, compared with 16.7% for motorized tricycles, highlighting the importance of flexible, relatively efficient transportation for navigating diverse road and delivery conditions. Overall, the profile indicates that logistics hubs in the Second District of Rizal are predominantly provincial, relatively young, multi-platform, small- to medium-scale operations handling substantial parcel volumes and relying heavily on motorcycle-based last-mile delivery, conditions that may have important implications for sorting efficiency, resource allocation, and delivery performance.

3.3 Extent of Operations Management Practices in Logistics Hubs in Terms of Reliability, Responsiveness, Agility, Cost, and Asset Management Efficiency

The findings revealed that operations management practices in logistics hubs in the Second District of Rizal were consistently implemented, as indicated by the general mean of 4.51, verbally interpreted as “Always Practiced.” Among the five dimensions, reliability obtained the highest overall mean of 4.59, with mean scores of 4.60 for sorting operations and 4.57 for last-mile distribution. This indicates that logistics hubs consistently prioritized accuracy, proper parcel handling, verification, standardized procedures, and the prevention of sorting and delivery errors. Agility and asset management efficiency both obtained an overall mean of 4.51, demonstrating that the hubs were capable of adjusting workflows, manpower, sorting arrangements, and delivery activities in response to changes in parcel volume and operational demands. The results also show that facilities, equipment, vehicles, technology, and other resources were effectively utilized to maintain smooth and continuous logistics operations.

Meanwhile, responsiveness obtained an overall mean of 4.49, with 4.48 for sorting operations and 4.51 for last-mile distribution, indicating that the logistics hubs consistently responded to urgent shipments, operational changes, customer inquiries, delivery delays, and route or schedule adjustments. The slightly higher rating for last-mile distribution suggests that communication and tracking mechanisms were particularly important in addressing delivery-related concerns. Cost management recorded the lowest overall mean of 4.46, with 4.45 for sorting and 4.46 for last-mile distribution; however, it was still interpreted as “Always Practiced.” This suggests that logistics hubs regularly implemented measures such as workload planning, equipment maintenance, expense monitoring, route optimization, fuel control, and other cost-saving strategies, although further opportunities may exist to improve labor allocation, routing efficiency, and operational expenditures. Overall, the consistently high ratings across all dimensions indicate that logistics hubs maintained a balanced approach to operations management, combining reliability, responsiveness, agility, cost control, and efficient asset utilization to support effective sorting operations and dependable last-mile delivery in the Second District of Rizal.

3.4 Significant Difference in the Assessment of Sorting and Last-Mile Distribution Practices when Respondents are Grouped According to Their Profile

The findings showed that age was the only respondent profile variable that resulted in statistically significant differences in the assessment of sorting and last-mile distribution practices. Significant differences were found in reliability ($p = 0.025$) and agility ($p = 0.006$), leading to the rejection of the null hypothesis for these two aspects. This indicates that respondents from different age groups had varying assessments of the consistency and adaptability of sorting and last-mile distribution operations. However, no significant difference was found in responsiveness, cost, and asset management efficiency, suggesting that these operational dimensions were generally assessed similarly regardless of respondents' age. In contrast, sex, civil status, educational attainment, position, and length of service did not produce statistically significant differences in any of the five operational dimensions, as all obtained p -values greater than 0.05. This suggests that the assessment of sorting and last-mile distribution practices was generally consistent across these respondent groups. The findings may be attributed to the implementation of standardized operating procedures, common training programs, defined work responsibilities, and uniform performance expectations within the organization. Overall, the results indicate that organizational systems and operational standards appear to promote consistency across employees, while age may have some influence on how reliability and agility are perceived and experienced in logistics operations.

3.5 Significant Difference in the Assessment of Sorting and Last-Mile Distribution Practices when Logistics Hubs are Grouped According to their Business Profile

The findings revealed that there were no statistically significant differences in the assessment of sorting and last-mile distribution practices across the different business profiles of logistics hubs. All p -values for reliability, responsiveness, agility, cost, and asset management efficiency were greater than the 0.05 level of significance. This indicates that the operational practices of logistics hubs remained generally consistent regardless of the platforms served, type of business organization, years of operation, number of employees, average daily parcel volume, and type of vehicle used. Hence, the null hypothesis was failed to be rejected. The findings further suggest that logistics operational efficiency may depend more on standardized procedures, process coordination, system integration, route planning, capacity management, and continuous improvement than on the specific

characteristics of the business. Logistics hubs, whether small or large, newly established or long-operating, and handling different parcel volumes or vehicle types, demonstrated comparable levels of reliability, responsiveness, agility, cost efficiency, and asset management. Although responsiveness according to vehicle type approached the significance threshold with a p-value of 0.061, it remained statistically nonsignificant. Overall, the findings demonstrate that business profile characteristics did not substantially influence the sorting and last-mile distribution practices of logistics hubs.

3.7 Challenges Encountered By Employees In Sorting Operations And Last-Mile Distribution

The findings revealed that employees encountered distinct challenges in both sorting operations and last-mile distribution, with concerns reflecting cost, responsiveness, and agility. In sorting operations, the most prominent concern was parcel information and routing issues, particularly incorrect address information and parcels being mistakenly mixed or routed to other hubs. These problems affected the accuracy and timeliness of sorting activities. Another major concern was sorting workflow disruption, including parcel backlogs, delayed preparation, and longer processing times during peak volumes, which consequently affected dispatch schedules and increased operational workload. For last-mile distribution, the most prominent challenge was return-to-hub delivery issues, particularly parcel refusals and changes in customer acceptance, resulting in repeated delivery and return processes and additional operational costs. This was followed by delivery attempt challenges, such as customer unavailability, unanswered calls or messages, and difficult or inaccessible delivery locations, which required repeated attempts and caused delays. Delivery schedule and route adjustments also emerged as a concern, as changes in delivery time or location disrupted route planning and affected operational flexibility. Overall, the findings indicate that sorting challenges are primarily internal and process-related, whereas last-mile challenges are more customer-driven and cost-sensitive. These results highlight the need to improve parcel information accuracy, sorting workflows, delivery coordination, customer communication, and route planning to strengthen overall logistics efficiency.

4. Conclusion & Recommendations

The findings led to the conclusion that logistics hubs in the Second District of Rizal generally maintained consistent sorting and last-mile distribution practices regardless of their business profile, including platforms served, type of business organization, years of operation, number of employees, parcel volume, and vehicle type. However, employees continued to experience operational challenges, particularly inaccurate parcel information, misrouting, sorting backlogs, delayed parcel preparation, delivery refusals, unsuccessful delivery attempts, and frequent schedule or route adjustments. These challenges indicate that while established operational practices are generally consistent, disruptions within sorting and delivery processes can still affect responsiveness, cost efficiency, agility, and overall service performance.

Based on these findings, logistics hubs should strengthen parcel information validation and routing procedures, improve sorting workflow and backlog management, and adopt more effective capacity planning during peak periods. Last-mile operations should likewise enhance customer communication and delivery confirmation, establish clearer procedures for handling refusals and return-to-hub parcels, and improve route planning and rescheduling mechanisms. Regular employee training, monitoring of delivery performance, and the use of appropriate digital tracking and coordination systems are also recommended to minimize operational disruptions. These measures can help logistics hubs improve reliability, responsiveness, agility, cost management, and asset utilization while sustaining efficient sorting and last-mile distribution operations.

5. Compliance with ethical standards

The author affirms that no conflicts of interest exist in relation to this study. The research was conducted in accordance with accepted ethical principles for human-participant research, including obtaining informed consent, ensuring voluntary participation, allowing participants to withdraw at any stage without consequence, and protecting participant confidentiality through anonymous, secure, and aggregated data management. Because the study examined psychological well-being, all research procedures were non-invasive and implemented with appropriate measures to reduce the risk of discomfort. Participants were informed of available support services should the need arise. Furthermore, the necessary institutional approvals were obtained for the administration of the research instruments and access to relevant academic records.

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