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Sangbaek Kim *

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A Study on the Development of Outsourcing in the Military Logistics Support Field: Focusing on Soldier Surveys and Officer AHP-WP Analysis

Sangbaek Kim

Center for Defense Resource Management, Korea Institute for Defense Analyses; ksba1019@korea.ac.kr

Abstract: The present study analyzed the South Korean military's effectiveness and improvement measures of outsourcing services in the logistics support field (laundry support, material maintenance, and waste disposal). The priorities and improvement measures for outsourcing services were derived through a satisfaction survey of soldiers in units that outsourced logistics support fields (234 soldiers) and those that did not (127 soldiers). These priorities were then corroborated through an AHP-WP (Analytic Hierarchy Process-Weighted Product) analysis of officers and non-commissioned officers in units that outsourced logistics support fields (154 officers and non-commissioned officers). The findings indicated that most soldiers expressed satisfaction with the outsourced services available in their respective work areas, with notably high levels of satisfaction recorded in the domains of waste disposal (75.9%) and laundry support (72.2%). In the AHP-WP analysis of officers, "improvement in work quality" (24.95%) and "professionalism in work performance" (21.13%) were given the highest priority. In consideration of the findings, specific development plans for the outsourcing of logistics support domains such as laundry assistance, material maintenance, and waste disposal were presented. It is anticipated that these initiatives will enhance the efficiency of military personnel management and improve combat effectiveness.

Keywords: logistics policy; outsourcing; logistics support field; satisfaction survey analysis

1. Introduction

1.1. Background and Purpose of Research

In modern military operations, the efficient separation of core combat missions from supporting services is widely recognized as crucial for enhancing overall combat effectiveness [1]. Many armed forces have turned to outsourcing logistics and support functions to specialized civilian providers to concentrate military resources on combat readiness [2]. Military logistics outsourcing – contracting out non-core support tasks such as maintenance, transportation, and supply – is pursued to free up personnel and improve efficiency, allowing troops to focus on training and warfighting duties [3]. This practice has been increasingly adopted by Western militaries; for example, the United States expanded outsourcing of support services after 2001 as it reallocated many support units to combat roles [4]. It is now common for the U.S. armed forces to outsource a broad range of services (e.g. base operations, food supply, equipment repair), leveraging the expertise of contractors to reduce costs and enhance administrative efficiency [5]. Prior studies note that while outsourcing can yield significant benefits in cost and performance, it also introduces challenges such as dependence on external contractors for mission-critical support [6]. Outsourcing can indeed lower operating expenses and even improve the quality of certain support processes, but military units may become reliant on third-party firms that do not fall under direct military command [7]. These advantages and risks underscore the importance of careful implementation and oversight of outsourcing in defense contexts.

In South Korea, changing force structure and personnel constraints have driven a similar turn toward outsourcing in the military support domain. Ongoing troop reductions and a shortened

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conscription term have created pressure to use manpower more efficiently, prompting the Republic of Korea (ROK) Armed Forces to reorganize into a more combat-focused force [8]. As part of this effort, the ROK Ministry of National Defense (MND) initiated a "Basic Plan for Private Sector Engagement in Non-Combat Service Support (2015–2019)" to transfer various support functions to civilian companies [9]. The aim of this policy was to enable soldiers to concentrate on combat tasks and to improve operational efficiency by leveraging civilian expertise in support roles. Under this plan, key support services traditionally handled by soldiers – including laundry services, equipment maintenance, and waste disposal in forward-deployed units – were slated for outsourcing to specialized contractors. Soldiers previously assigned to these logistics support duties would be reassigned to front-line combat positions, effectively bolstering combat personnel numbers without increasing overall troop levels [10]. By 2017, the MND had targeted the outsourcing of support work in 12 division-level supply battalions, which was expected to reduce the requirement for roughly 800 active-duty soldiers in those units [10]. This outsourcing initiative aligns with a broader defense reform agenda to mitigate the impact of a shrinking conscript pool by hiring civilian workers for non-combat duties [9]. Essentially, the Korean military is following the global trend of privatizing combat service support functions to preserve and strengthen its core warfighting capacity [11].

The support service areas chosen for outsourcing in the ROK Army – laundry support, materiel maintenance, and waste disposal – are ones that typically demand specialized skills and substantial labor effort. These tasks had been placing a heavy burden on enlisted soldiers, who often lack formal training in such services and must divert time from combat training to perform them. Outsourcing these functions to professional contractors carries the expectation of both reducing soldier workload and improving the quality-of-service delivery. For instance, a trained laundry service provider can achieve higher throughput and better hygienic standards than conscript soldiers managing laundry in-house, and dedicated maintenance firms can apply technical expertise to equipment upkeep that conscripts may not possess. Early implementations of outsourcing in Korean military units have indeed hinted at potential benefits: surveys have indicated that soldiers in units with outsourced services report higher satisfaction with those support functions compared to soldiers in units without outsourcing. Anecdotal evidence from trial programs showed notable improvements in the timeliness and reliability of laundry and waste disposal services after outsourcing, which in turn allowed soldiers to allocate more time to training and other essential duties. These positive outcomes suggest that the outsourcing initiative can be effective in enhancing both soldier welfare and unit readiness.

Despite the anticipated benefits, there remain several challenges and open questions regarding the optimal implementation of outsourcing in the military context. One concern is the awareness and accessibility of the outsourced services: if soldiers are not well-informed about the availability of a service or if the process to request support is cumbersome, the utilization of the service may fall short of expectations. For example, if a unit's waste disposal service is handled by a contractor but frontline soldiers are unclear on how or when to engage that service, they might not fully benefit from it. Another challenge lies in maintaining continuity and control during wartime or emergencies. During full-scale operations or conflict scenarios, heavy reliance on civilian contractors could become problematic if those civilians are unable or unwilling to operate under combat conditions [1]. Ensuring that outsourced support services have contingency plans for wartime (or can be taken over by military personnel when necessary) is therefore a critical consideration in defense outsourcing strategies. Additionally, quality control and oversight mechanisms must be in place to guarantee that contractors meet the military's standards for performance and security. Past experiences in multinational operations have shown that inadequate contracts or oversight can lead to subpar outcomes – for instance, failures by contractors to meet timelines or quality standards have been documented when outsourcing was poorly managed [6]. Thus, to fully realize the benefits of outsourcing in military logistics, these implementation issues must be carefully addressed. Given this background, the present study undertakes a comprehensive analysis of the status and effectiveness of outsourcing in the ROK military logistics support field and seeks to develop informed

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recommendations for its improvement. We focus on the three service domains – laundry support, material maintenance, and waste disposal – which have been partially outsourced in select Army units. Our research approach integrates both the perspectives of service users (enlisted soldiers) and the priorities of service managers (officers and non-commissioned officers).

First, we conducted a structured satisfaction survey of soldiers from two groups: those in units where these support services have been outsourced, and those in units still relying on in-house support. The survey examined the soldiers' satisfaction levels, perceived necessity, and priorities regarding the laundry, maintenance, and waste disposal services. By comparing responses from units with and without outsourcing, we can gauge the perceived value and impact of the outsourced services on everyday soldier life and unit operations.

Second, to capture the management viewpoint, we carried out an Analytic Hierarchy Process – Weighted Product (AHP-WP) analysis with 154 officers and senior NCOs who oversee or work closely with the outsourced support services. The AHP-WP method allows us to quantitatively evaluate the relative importance of various criteria (such as service quality, professionalism, cost efficiency, environmental sustainability, and wartime robustness) in the decision-making process for outsourcing. This two-pronged methodology – combining soldier survey data with a multi-criteria decision analysis by officers – provides a balanced and empirically grounded assessment. Through this analysis, we identify the strengths and weaknesses of the current outsourcing arrangements in each domain and derive prioritized development measures for improving the outsourcing system. In the following sections, we present the findings that emerged from the soldier satisfaction surveys and the AHP-WP analysis, and we discuss specific improvement strategies tailored to the laundry, maintenance, and waste disposal services. By basing these recommendations on actual data and stakeholder input, the study aims to ensure that the proposed measures directly address on-the-ground needs and practical concerns. Ultimately, this research is expected to serve as a valuable reference for defense policymakers and military leadership in planning the expansion and refinement of outsourcing in military support areas. With well-informed improvements, the ROK military can maximize the efficiency gains from outsourcing while mitigating its risks, thereby achieving greater force optimization in peacetime and sustaining critical support capabilities in wartime. In sum, effective development of the outsourcing program in logistics support will contribute to enhanced military readiness and combat power, which is the fundamental goal driving these efforts.

1.2. Research scope

The present study investigates the current state of outsourcing within the logistics sector of the Republic of Korea (ROK) Army, with a particular focus on three functions that are currently subject to external provision: laundry support, materiel maintenance, and waste disposal. The detailed scope of each logistics support area is as follows:

1. Laundry Support: This encompasses the collection of laundry from individual soldiers, its cleaning, drying, packaging, and delivery, in addition to the maintenance and management of laundry-related equipment.
2. Maintenance of Materials: The remit of this area encompasses a variety of tasks, including the reception of personnel, the maintenance of mobile equipment, and the provision of general materiel. This encompasses personal equipment and uniforms. In addition, the area is responsible for the support of the production of specific items required by units.
3. Waste Disposal: The responsibilities of the role encompass the routine collection, storage, management of waste materials, and the demilitarization of sensitive equipment to ensure security and environmental safety.

The methodological framework of this study comprises two distinct yet complementary approaches: Firstly, a comparative survey was administered to evaluate the effectiveness and necessity of the outsourced logistics support services. The survey was conducted on 234 soldiers from units that employ outsourced services and 127 soldiers from units that do not employ these outsourced services. The survey was conducted during the first half of 2025 via an online self-

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administered questionnaire. The survey employed a five-point Likert scale (1 = very dissatisfied, 5 = very satisfied) to quantify soldiers' satisfaction levels, their awareness and perceptions of service necessity, item-specific requirements, intentions for continued utilization, and prioritization among the three outsourced logistics domains.

Secondly, a multi-criteria decision-making analysis was conducted with 154 military officers and non-commissioned officers directly involved in managing and overseeing the outsourced logistics operations. The application of the integrated Analytic Hierarchy Process–Weighted Product (AHP-WP) methodology enabled the evaluation of five critical evaluation criteria: service quality enhancement, professional execution of tasks, environmental sustainability and compliance, cost efficiency, and wartime operational readiness. The respondents participated in pairwise comparisons (AHP) to determine the relative importance of each criterion and completed Likert scale assessments to evaluate sub-criteria. The application of the Weighted Product (WP) technique then derived comprehensive prioritization rankings. To ensure reliability and consistency in the analysis, responses with an inconsistency ratio (CR) of less than or equal to 0.2 were exclusively considered in the final evaluation.

The methodological approach that is being adopted in this study integrates soldier-level evaluations with managerial perspectives from military leadership. The aim of this integration is to identify the current strengths and limitations of outsourcing practices in a holistic manner. The approach also aims to propose strategic improvements to outsourcing practices that are grounded in empirical evidence.

2. Related Works

2.1. Concept and Necessity of Military Logistics Outsourcing

Military logistics outsourcing can be defined as the practice of delegating non-combat support functions, which have historically been performed by military personnel, to civilian professional organizations. This strategic shift is intended to enhance military effectiveness by focusing manpower on core combat roles, improving operational efficiency, and raising the overall quality of support services. The strategic decision to outsource military operations to external entities is driven by the pressing need to optimize limited military personnel resources. This approach enables armed forces to realign personnel towards combat-oriented tasks, while ensuring that non-combat logistical operations are entrusted to specialized entities.

The advantages of military logistics outsourcing are manifold. These include enabling a greater concentration of military personnel on combat missions, enhancing service quality through the utilization of professional expertise, improving operational efficiency, achieving cost-effectiveness, and promoting modernization and specialization within military operations. Notwithstanding the advantages, there are several concerns that persist, such as increased dependence on external civilian contractors, potential security vulnerabilities, and operational continuity challenges during wartime. It is therefore imperative that comprehensive empirical analyses are conducted to evaluate the efficacy and limitations of outsourcing practices. This will provide a solid foundation on which to develop a balanced and effective policy.

2.2. Theoretical Background of AHP-WP Methodology

2.2.1. Analytic Hierarchy Process (AHP) Method

The Analytic Hierarchy Process (AHP), developed by Thomas L. Saaty, is a structured decision-making technique designed to systematically assess the relative importance of multiple criteria and alternatives [12]. This method involves the decomposition of complex problems into hierarchical structures, utilizing pairwise comparisons to quantify the relative weights of each element. AHP is particularly advantageous in integrating qualitative judgement with quantitative analysis, rendering it applicable across various complex decision-making scenarios.

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The AHP approach is notable for its ability to integrate qualitative and quantitative criteria, its structured analysis of complicated decision problems, and the verification of judgment consistency through the consistency ratio (CR). In this study, an extended threshold of CR $\leq$ 0.2 was adopted, as opposed to Saaty's original criterion of CR $\leq$ 0.1. This adjustment is predicated on the premise that it is applicable in situations involving a greater number of hierarchical elements or increased complexity in decision-making, a hypothesis that is supported by previous research that validated higher CR thresholds [13].

2.2.2. Weighted Product (WP) Method

The Weighted Product (WP) method is employed to determine the priority of alternatives by applying weights to individual attributes assessed by respondents. This approach integrates subjective evaluations with quantitative data, using respondents' judgments regarding specific sub-criteria and their corresponding weight assignments. The WP method has been shown to be advantageous in that it is able to accommodate both subjective and objective data. This enables a more comprehensive and nuanced decision-making framework.

2.2.3. AHP-WP Integrated Methodology

In this research, an integrated AHP-WP methodology was utilized to combine the strengths of both analytical techniques. Specifically, the criteria derived from AHP analyses were multiplied by evaluation scores calculated through the WP method to establish a comprehensive prioritization of alternatives. This integration ensures a balanced evaluation by combining the subjective preferences derived from AHP with the objective quantitative scores obtained from WP.

It has been demonstrated in previous studies that the AHP-WP method is efficacious. Harjanto et al. implemented an AHP-WP-based personnel evaluation system, which effectively addressed the limitations inherent in purely subjective assessment frameworks [14]. In a similar vein, Homepage et al. reported that the AHP-WP method exhibited enhanced sensitivity and a more precise reflection of complex interactions in comparison to the simpler weighted sum approach AHP-SAW [15].

3. Methodology

3.1. Soldier Survey Design and Implementation

A comprehensive evaluation of military logistics outsourcing effectiveness was conducted through a structured, web-based self-administered questionnaire administered during the first half of 2025. The sampling frame encompassed 355 soldiers from the South Korean Army, stratified to include 234 respondents (64.59%) from units employing outsourced logistics support services and 121 respondents (35.41%) from units maintaining conventional in-house logistics operations. The respondent demographics were confined to enlisted personnel ranging from private to sergeant ranks to ensure representativeness of the primary service recipients.

The survey instrument was designed to capture multidimensional aspects of three critical logistics domains: laundry assistance, material maintenance, and waste disposal services. The measurement framework incorporated dichotomous awareness assessment (service availability recognition), satisfaction evaluation via five-point Likert scales (ranging from severe dissatisfaction to high satisfaction), and multifaceted determinant analysis through combined structured and open-response formats. Additionally, the instrument assessed specific outsourcing requirements through multiple-choice selection matrices, future utilization intentions via binary response options, service prioritization through rank-ordering procedures, and qualitative improvement recommendations through unstructured response fields.

For comparative analytical purposes, the instrument administered to personnel in non-outsourcing units was augmented with supplementary assessment modules examining satisfaction with traditional military-provided logistics services and transition propensity toward external

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service provision models. This methodological bifurcation facilitated robust comparative analysis between established and potential outsourcing implementations.

3.2. AHP-WP Methodological Framework

The study employed a hybrid Analytic Hierarchy Process-Weighted Product (AHP-WP) methodological framework to evaluate outsourced logistics operations from a managerial perspective. Data acquisition was conducted among 154 military officers and non-commissioned officers (NCOs) with direct responsibility for outsourced logistics management, providing a complementary perspective to the service recipient assessments.

3.2.1. Analytic Hierarchy Process (AHP) Method

The Analytic Hierarchy Process methodology was employed to systematically evaluate outsourced logistics operations through a multi-criteria decision-making framework. The evaluation structure comprised five distinct criteria: service quality improvement, professional task execution, environmental sustainability, cost efficiency, and wartime operational support. These criteria were subjected to comprehensive pairwise comparisons following Saaty's fundamental scale to establish their relative significance within the military logistics outsourcing context.

For each respondent, eigenvectors of the resultant pairwise comparison matrices were computed to derive individual criterion weights, reflecting the decision-maker's preference structure. To ensure analytical validity, the internal consistency of judgments was rigorously assessed through the calculation of Consistency Index (CI) and Consistency Ratio (CR) parameters for each response matrix. The CR, defined as the ratio of CI to Random Index (RI), provides a quantitative measure of judgment consistency, with lower values indicating higher consistency.

In accordance with established methodological standards, a threshold value of CR $\leq$ 0.2 was implemented as the selection criterion. This process yielded 71 valid responses (46.1% of the initial sample) that demonstrated acceptable judgment consistency. The stringency of this selection process ensured the reliability and validity of subsequent analytical procedures.

The relative importance weights of the five evaluation criteria were subsequently determined through eigenvalue normalization techniques, reflecting the comparative significance of each criterion within the decision hierarchy. These criterion weights were then hierarchically aggregated using principle of hierarchical composition to establish comprehensive priority rankings that integrate both macro-level and dimension-specific evaluations. This methodological approach enabled the development of a robust prioritization framework that accounts for the multi-dimensional complexity of military logistics outsourcing decisions.

3.2.2. Weighted Product Analysis Integration

The AHP methodology was supplemented by a Weighted Product (WP) analytical approach to enhance the robustness of the prioritization framework. Respondents directly allocated the criterion importance of weight with a summative constraint of 100% across the five evaluation dimensions. Additionally, they evaluated 13 subordinate criteria distributed across the five primary dimensions using a five-point Likert scale. The dimensional distribution of subordinate criteria comprised three sub-items for service quality improvement, three for professional task execution, three for cost efficiency, two for wartime operational support, and two for environmental sustainability.

The integrated AHP-WP analytical framework proceeded through sequential computational stages. Initially, individual decision matrices were constructed to systematically organize evaluation values across all criteria and sub-criteria. Subsequently, evaluation weight matrices (S) were generated through the aggregation of sub-criteria scores within each primary criterion. The mean values for each criterion were derived using the expression:

$$x_{ij} = \frac{1}{k_j}\sum_{k=1}^{k_j} s_{ijk}$$

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where x_{ij} represents respondent i's mean evaluation score for criterion j across all sub-items, s_{ijk} denotes the evaluation score assigned by respondent i to the k-th sub-item of criterion j, and k_j signifies the number of sub-items associated with criterion j.

Mean scores and weight normalization were subsequently performed using a multiplicative preference function:

$$S_i = \prod_{j=1}^{5} \left(\bar{x}_{ij} \times \frac{w_{ij}}{100} \right)$$

where x_{ij} represents the normalized mean score for respondent i on criterion j, and w_{ij} denotes the importance of weight allocated by respondent i to criterion j. The weights were normalized to values between 0 and 1 while maintaining their proportional relationships.

The final Weighted Product (WP) result was calculated as the arithmetic mean of individual preference scores across all respondents:

$$S_{WP} = \frac{1}{m} \sum_{i=1}^{m} S_i = \frac{1}{m} \sum_{i=1}^{m} \left(\prod_{j=1}^{5} \left(\bar{x}_{ij} \times \frac{w_{ij}}{100} \right) \right)$$

where m represents the total number of valid survey respondents and S_{WP} denotes the comprehensive preference value reflecting the aggregated criterion-specific evaluations and importance weights.

The culminating analytical step involved the integration of AHP and WP outcomes through the computation of a composite preference score:

$$S_{AHP-WP} = S_{WP} \times \sum_{j=1}^{5} w_j^{AHP}$$

where S_{AHP-WP} represents the comprehensive preference score derived through the multiplicative integration of S_{WP} with AHP-derived importance weights. This methodological integration facilitated the synthesis of subjective expert judgments (AHP) with objective performance evaluations (WP), resulting in a balanced prioritization framework that accommodates both normative and descriptive decision elements.

In this study, S_{AHP-WP} is employed to denote the comprehensive preference score, which is determined by the average evaluation score and weights derived from each respondent's AHP and WP assessments.

3.3. Analytical Framework and Procedures

The analytical framework was designed to systematically process and interpret the multidimensional data generated through both the soldier survey and officer AHP-WP assessments. The procedural framework encompassed parallel analytical streams with subsequent integration.

3.3.1. Soldier Survey Analysis

The analysis of soldier survey data entailed comparative satisfaction assessment between outsourcing and non-outsourcing units through both descriptive statistical procedures and inferential hypothesis testing. Satisfaction determinants across the three service domains were identified through factor analysis and correlation procedures, enabling the isolation of critical service attributes that significantly influence satisfaction outcomes. The evaluation of item-specific service requirements was conducted through frequency distribution analysis and cross-tabulation with demographic and contextual variables to identify differentiated service needs across various military contexts. Priority rankings across service areas were subjected to comparative analysis using non-parametric statistical procedures to establish service domain hierarchies that reflect operational priorities.

3.3.2. Officer AHP-WP Analysis

The officer AHP-WP data were subjected to rigorous analytical procedures, commencing with consistency ratio verification and response validation according to established methodological standards. Criterion importance weights were calculated through AHP methodology, incorporating

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eigenvalue computation and normalization procedures. Service priorities were determined through WP analysis, which integrated performance evaluations with importance weights to establish composite preference scores. The integration of AHP and WP outcomes facilitated the development of a comprehensive prioritization framework that accommodates both normative judgments and objective evaluations.

3.3.3. Integrated Analysis and Recommendation Development

The findings from the soldier surveys and officer AHP-WP analyses were synthesized through an integrative analytical framework that aligned service recipient perspectives with managerial priorities. This synthesis enabled the identification of congruences and discrepancies between operational needs and managerial emphases, thereby highlighting potential areas for strategic realignment. The integrated analysis informed the development of targeted strategic recommendations for each service domain, with specific emphasis on service quality enhancement, cost-efficiency optimization, and operational integration. These domain-specific recommendations were subsequently incorporated into broader policy frameworks aimed at enhancing the overall effectiveness of military logistics outsourcing practices, with particular attention to contextual adaptability and strategic alignment with core military functions.

4. Result

4.1. Analysis of Soldier Survey Data

4.1.1. Laundry Support Services Evaluation

Analysis of awareness indicators revealed a substantive knowledge gap regarding outsourced laundry services, with only 30.8% (n=72) of respondents from implementation units demonstrating service awareness, while 69.2% (n=162) indicated no awareness. This finding suggests a critical need for enhanced service targeting and communication strategies within implementation units.

Table 1. Satisfaction Levels Among Laundry Service Recipients (n=72).

Satisfaction Level	Frequency	Percentage (%)
Highly Satisfied	32	44.4
Satisfied	20	27.8
Neutral	14	19.4
Dissatisfied	4	5.6
Highly Dissatisfied	2	2.8

Table 2. Factors Contributing to Laundry Service Satisfaction.

Satisfaction Level	Frequency	Percentage (%)
Personal time availability through service delegation	31	47.0
Professional and hygienic laundry quality	24	36.4
Service processing efficiency	10	15.1
Enhanced laundry facilities	1	1.5

Dissatisfaction determinants were equally distributed across three factors (33.3% each, n=2): (1) perceived superior efficiency of self-performed laundry; (2) inconsistent service scheduling and frequency; and (3) quality deficiencies (including malodor and inadequate cleanliness).

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Table 3. Required Laundry Service Items by Respondent Category.

Category	Service Recipients	Non-Recipients in Implementation Units	Non-Implementation Units
Winter Bedding	38	65	37
Uniforms	14	17	26
Sleeping Bags	9	8	15
Blankets	5	3	5
Other Items	0	0	1

The pronounced variance between recipients and non-recipients regarding winter bedding requirements indicates a substantial unmet demand necessitating service expansion.

Analysis of potential demand indicators revealed strong utilization intentions, with 57.4% (n=93) of non-recipients in implementation units and 66.1% (n=84) of personnel in non-implementation units expressing willingness to utilize laundry services, demonstrating substantial latent demand.

4.1.2. Material Maintenance Services Evaluation

Awareness analysis demonstrated exceptionally low recognition levels for material maintenance services, with only 17.5% (n=41) of respondents from implementation units reporting service awareness, while 82.5% (n=193) indicated no awareness.

Table 4. Satisfaction Levels Among Material Maintenance Service Recipients (n=41).

Satisfaction Level	Frequency	Percentage (%)
Highly Satisfied	19	46.4
Satisfied	7	17.1
Neutral	13	31.7
Dissatisfied	1	2.4
Highly Dissatisfied	1	2.4

Table 5. Factors Contributing to Material Maintenance Service Satisfaction.

Satisfaction Level	Frequency	Percentage (%)
Access to advanced maintenance capabilities	18	43.9
Quality improvements in maintenance outcomes	14	34.1
Increased personal time availability	5	12.2
Maintenance completion efficiency	4	9.8

Dissatisfaction was exclusively attributed to perceived superior convenience of in-house military maintenance (100%, n=2).

Table 6. Required Material Maintenance Service Items by Respondent Category.

Category	Service Recipients	Non-Recipients in Implementation Units	Non-Implementation Units
Personal Equipment	20	43	36
Uniforms	7	20	15
Refrigerators	6	14	6

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Office Equipment	3	6	3
Gas Cooking Cells	1	5	3
Grass Cutters/ Grass Blowers	2	21	22
Other Items	2	3	3

Potential demand analysis revealed strong utilization intentions, with 58% (n=112) of non-recipients in implementation units and 66.9% (n=85) of personnel in non-implementation units expressing willingness to utilize material maintenance services, demonstrating substantial latent demand.

4.1.3. Waste Disposal Services Evaluation

Awareness analysis demonstrated low recognition levels for waste disposal services, with only 23.1% (n=54) of respondents from implementation units reporting service awareness, while 76.9% (n=180) indicated no awareness.

Table 7. Satisfaction Levels Among Waste Disposal Service Recipients (n=54).

Satisfaction Level	Frequency	Percentage (%)
Highly Satisfied	25	46.3
Satisfied	16	29.6
Neutral	12	22.2
Dissatisfied	1	1.9
Highly Dissatisfied	0	0

Table 8. Factors Contributing to Waste Disposal Service Satisfaction.

Satisfaction Level	Frequency	Percentage (%)
Professional handling of scrap and waste materials	30	55.6
Increased availability for core duties and training	24	44.4

Dissatisfaction was exclusively attributed to perceived superior convenience of in-house military maintenance (100%, n=2).

Table 9. Waste Disposal Labor Experience by Unit Type.

Unit Type	Personnel with Experience	Percentage (%)
Implementation Units	23	12.8
Non-Implementation Units	52	40.9

This substantial variance indicates that non-implementation units allocate significantly more personnel resources to waste management functions. Among personnel in non-implementation units, 66.9% (n=85) expressed a willingness to utilize waste disposal services, demonstrating high perceived necessity for this service category.

4.1.4. Service Prioritization Analysis

Comparative analysis of service prioritization revealed distinct patterns between implementation and non-implementation units:

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Table 10. Service Prioritization in Implementation and Non-Implementation Units.

Unit	Service Category	Primary Priority	Secondary Priority	Tertiary Priority
Implementation Units	Laundry Support	96	119	109
	Material Maintenance	76	57	52
	Waste Disposal	62	58	73
Non-Implementation Units	Laundry Support	38	35	17
	Material Maintenance	46	28	45
	Waste Disposal	43	64	65

Significant perceptual divergence was observed between implementation and non-implementation units regarding service prioritization. Personnel in non-implementation units identified material maintenance and waste disposal as priority candidates for outsourcing, whereas personnel in implementation units demonstrated the highest prioritization for laundry support services that were already being provided. This finding suggests that experiential factors may substantially influence priority perceptions, with personnel valuing services with which they have direct positive experience.

4.2. Analysis of Officer AHP-WP

4.2.1. Consistency Analysis

Analysis of consistency metrics for officer survey responses yielded a Consistency Ratio (CR) of 0.110, indicating satisfactory judgment reliability across the sample. This value approximates Saaty's original criterion of 0.1 and falls well below the 0.2 threshold established for this study, demonstrating robust internal consistency in the pairwise comparisons.

- Maximum eigenvalue (λmax): 5.494702941
- Consistency Index (CI): 0.123675735
- Consistency Ratio (CR): 0.110424764

4.2.2. AHP Priority Analysis

The relative importance weights for the five evaluation criteria derived through AHP methodology exhibited the hierarchical structure presented in Table 11.

Table 11. AHP-Derived Criterion Importance Weights.

Outsourcing Evaluation Criterion	AHP Weight	Percentage (%)
Service Quality Improvement	0.331267	25.98
Professional Task Execution	0.261478	20.51
Cost Efficiency	0.211323	16.57
Wartime Operational Support	0.250316	19.63
Environmental Sustainability	0.220669	17.31

Service Quality Improvement emerged as the predominant criterion with a substantial weight differential (approximately 5.47 percentage points) above the second-ranked criterion. This pronounced prioritization indicates strong consensus among officers regarding the primacy of quality outcomes over process considerations. The criterion's alignment with core organizational performance metrics suggests that officers prioritize substantive quality enhancement over procedural efficiency.

Professional Task Execution attained secondary importance, reflecting the organizational emphasis on specialized competencies and technical expertise. The proximal positioning of this criterion to Service Quality Improvement suggests recognition of the complementary relationship between technical proficiency and outcome quality.

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Wartime Operational Support secured tertiary significance with minimal differential from Professional Task Execution (approximately 0.88 percentage points), indicating comparable importance ascribed to these dimensions. This prioritization reflects the criticality of contingency responsiveness within the military organizational context.

Environmental Sustainability ranked fourth, demonstrating increasing institutional recognition of ecological factors in strategic decision-making. Despite its lower relative position, this criterion retained substantial weight (17.31%), indicating its established importance within the evaluation framework.

Cost Efficiency received the lowest prioritization, suggesting that economic considerations, while necessary, are subordinate to performance and operational factors in outsourcing decisions. The minimal differential between this criterion and Environmental Sustainability (approximately 0.74 percentage points) indicates comparable valuation of these dimensions.

4.2.3. WP Priority Analysis

The Weighted Product analysis yielded a divergent prioritization structure as presented in Table 12.

Table 12. WP-Derived Criterion Importance Weights.

Outsourcing Evaluation Criterion	AHP Weight	Percentage (%)
Service Quality Improvement	0.870402	23.92
Professional Task Execution	0.791432	21.75
Cost Efficiency	0.777747	21.37
Wartime Operational Support	0.596482	16.39
Environmental Sustainability	0.603448	16.58

While Service Quality Improvement maintained primacy in the WP framework, the criterion experienced moderate weight reduction compared to AHP evaluation. Professional Task Execution retained its secondary position with proportionally consistent weighting.

The most significant divergence appeared in the repositioning of Cost Efficiency from lowest to tertiary importance, with substantial weight enhancement compared to its AHP valuation. This repositioning suggests that direct quantitative assessment of cost considerations yields higher prioritization than comparative judgment methods.

Environmental Sustainability and Wartime Operational Support occupied the fourth and fifth positions respectively, with the latter experiencing particularly substantial devaluation compared to its AHP ranking. This indicates significant disparity between subjective comparative judgments and direct criterion assessments regarding operational contingency support.

The WP analysis demonstrated a distinctive bimodal distribution pattern, with the three highest-ranked criteria forming a clustered high-priority group with minimal internal differentiation, while the two lowest-ranked criteria formed a separate cluster with substantially reduced weights.

4.2.4. AHP-WP Integrated Analysis

The integration of AHP and WP methodologies yielded a synthesis prioritization structure that balanced subjective comparative judgments with objective criterion evaluations, as presented in Table 13.

Table 13. AHP-WP-Derived Criterion Importance Weights.

Outsourcing Evaluation Criterion	AHP Weight	Percentage (%)
Service Quality Improvement	0.288335	24.95
Professional Task Execution	0.206942	21.13
Cost Efficiency	0.164356	18.97

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Wartime Operational Support	0.149309	18.01
Environmental Sustainability	0.133162	16.94

The integrated framework maintained the primacy of Service Quality Improvement and secondary positioning of Professional Task Execution, demonstrating consistency in high-priority dimensions across methodological approaches. Cost Efficiency secured tertiary importance, reflecting its enhanced valuation in the WP framework while moderating the extreme differential observed in AHP rankings.

Wartime Operational Support and Environmental Sustainability occupied the fourth and fifth positions respectively, with substantially reduced inter-criterion differentiation compared to individual methodological assessments. This compression of weight differentials indicates that the integrated approach effectively moderates methodological biases inherent in singular evaluation frameworks.

The integrated AHP-WP methodology yielded more balanced criterion weights with reduced extrema, suggesting enhanced representational validity through methodological triangulation. The framework successfully integrated expert judgment (AHP) with quantitative performance assessment (WP) to establish a comprehensive prioritization structure for military logistics outsourcing decision-making.

5. Discussion

Based on the comprehensive analysis of soldier survey results and officer AHP-WP assessments, this study presents strategic development frameworks for each service domain. These frameworks are hierarchically structured according to the prioritization criteria established through the integrated methodological approach.

5.1. Laundry Support Service Development Framework

5.1.1. Primary Priority: Service Scope Expansion and Responsive Operations

Currently outsourced laundry support services exhibit limited awareness and restricted coverage scope. To address these limitations, we propose expanding rotational laundry support through systematic planning to extend service coverage to previously unserved remote locations and field units. This territorial expansion should be complemented by the deployment of mobile laundry vehicles delivering scheduled on-site services, thereby ensuring geographical uniformity in service provision and mitigating the regional disparities in service accessibility that currently contribute to uneven utilization rates. The establishment of a dedicated emergency laundry support system capable of same-day response would enhance organizational responsiveness to unexpected large-volume laundry requirements or operational support requests. This responsive capability should be further strengthened through the formation of dedicated emergency response teams capable of processing laundry within 24 hours during urgent situations, which during standard operations would supplement general service capacity but transition to dedicated emergency support during contingencies.

5.1.2. Secondary Priority: Operational Stability and Reliability Enhancement

Service reliability and operational stability improvements necessitate the implementation of advance notification protocols requiring units to communicate laundry requirements at least three working days in advance, enabling systematic scheduling and resource allocation. This planning framework should be supplemented by continuous standby protocols to address contingencies such as unexpected additional laundry volumes or personnel rotations. Operational resilience requires the allocation of a designated percentage of processing capacity as operational reserve during standard operations, facilitating immediate deployment during surge requirements. The implementation of dual-use or flexible transition arrangements for personnel and equipment would maintain balanced

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capability between standard and emergency support operations, ensuring consistent service quality across operational conditions. These structural improvements should be reinforced through strict compliance with established processing timelines (two working days) coupled with immediate notification upon completion of drying processes, providing users with predictable and reliable service expectations.

5.1.3. Tertiary Priority: Professional Process Development and Quality Management

Service quality enhancement through professional processes and management systems requires the development of comprehensive procedural documentation and checklists for all laundry processes, supplemented by regular training programs for outsourced laundry personnel focusing on military-specific requirements such as uniform material preservation and camouflage pattern maintenance. Quality assurance necessitates structured supervision by controlling officers across all processing stages, ensuring standardized adherence to quality parameters including detergent quantities, water temperature, and drying duration. The establishment of clear classification criteria for laundry processing when handling large volumes or diverse item types, with post-processing quality inspection, would verify the absence of contamination or damage. Service reliability would be enhanced through transparent compensation procedures for items damaged during processing, ensuring immediate restitution and preventive implementation measures. These quality assurance mechanisms should be supported by comprehensive tracking systems monitoring the collection-processing-delivery cycle through close coordination between laundry service providers and supply battalions, with quantitative performance metrics including processing volume and time requirements facilitating continuous process improvement.

5.1.4. Quaternary Priority: Cost Efficiency and Resource Optimization

Resource utilization, optimization and cost efficiency enhancement require refinement of collection and delivery routes to minimize unnecessary movement, with improved vehicle deployment and scheduling to reduce fuel and personnel costs. Equipment utilization rates should be maximized through scheduling adjustments based on unit-specific laundry volumes, minimizing both overload and idle time. Operational efficiency would be improved through timely procurement of sufficient laundry supplies including detergents and fabric softeners to prevent stockout-induced cost increases, with bulk purchasing strategies to reduce unit costs. Contingency planning should include pre-established plans for additional personnel or equipment deployment when resource shortages are anticipated, preventing excess costs associated with emergency procurement. These operational improvements should be supported by standardized reporting of operational information shared with supply battalion control departments, enabling data-driven decision-making to enhance resource allocation efficiency.

5.1.5. Quinary Priority: Wartime Operational Support System

Ensuring laundry and hygiene support during contingencies requires concurrent maintenance of permanent laundry facilities and highly mobile laundry trailers, prioritizing efficiency through fixed facilities during peacetime while ensuring operational flexibility through mobile assets during contingencies. Operational resilience necessitates the establishment of laundry support prioritization frameworks for contingency scenarios, with medical/healthcare units and combat power restoration units receiving highest priority, followed by direct combat units and then rear echelon units, maximizing support impact with limited resources. Contingency preparedness requires development of environment-specific laundry support plans accounting for mission parameters, terrain characteristics, and meteorological conditions, enabling adaptive resource deployment and tactical utilization. Personnel readiness should be enhanced through contingency mission and survivability training for laundry support personnel, ensuring operational continuity despite field threats. These preparations should be complemented by contingency measures to maintain basic

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laundry support during worst-case scenarios such as water supply disruption or power outages, ensuring operational resilience.

5.2. Material Maintenance Service Development Framework

5.2.1. Primary Priority: Responsive Maintenance and Quality Assurance

Enhancing maintenance responsiveness and quality assurance requires establishing minimized maintenance timeframes to reduce requesting unit mission gaps. Implementation of explicit service standards such as initial response within 12 hours and maintenance completion within two working days during emergencies would enhance operational continuity and user satisfaction. Comprehensive inspection and documentation protocols for all maintenance operations, with maintenance records and details shared across all relevant organizations, would enhance operational transparency and accountability. Service reliability would be significantly improved through defined warranty periods of approximately three months for completed maintenance, with free remedial service for recurrent malfunctions.

5.2.2. Secondary Priority: Technical Specialization and Standardization

Maintenance expertise and procedural standardization enhancement require systematic education and proficiency development programs for maintenance personnel. Technical excellence necessitates allocation of minimum one-month intensive training periods for new equipment introduction or technical changes, with recruitment of certified or experienced personnel when required. Operational consistency would be improved through standardized work instructions and maintenance manuals ensuring all maintenance phases adhere to established protocols, with regular supervision by controlling officers to verify procedural compliance and work quality. Maintenance efficiency and accuracy would be enhanced through the procurement of advanced diagnostic equipment and precision tools, with regular calibration and management to maintain maintenance quality. Personnel utilization optimization requires implementation of technical difficulty-based personnel assignment systems, allocating highly skilled technicians to complex maintenance tasks and general technicians to routine maintenance.

5.2.3. Tertiary Priority: Cost-Effective Resource Management

Resource management optimization and cost efficiency improvement require rigorous advance procurement of maintenance components and materials to prevent work interruptions, with planned purchasing to reduce unit costs. Resource utilization would be enhanced through implementation of clear disposal criteria for unusable equipment while recovering and recycling viable components, minimizing cost losses. Operational efficiency necessitates immediate classification of waste materials during maintenance to prevent unnecessary rework, with transparent witnessing procedures for disposal to eliminate potential impropriety or resource waste.

5.2.4. Quaternary Priority: Contingency Maintenance System Development

Ensuring maintenance support during contingencies requires establishment of priority-based maintenance systems considering wartime scenarios. Operational effectiveness necessitates clear definition of support priorities following the sequence of combat power restoration units, medical support units, combat units, and reserve units, allocating limited maintenance resources according to tactical significance. Combat readiness would be enhanced through prioritization of units with combat equipment damage for maintenance support to facilitate combat power recovery, with proactive deployment of support teams to units with limited organic maintenance capability to ensure mission continuity. Personnel preparedness requires education and training on contingency mission procedures and survivability measures for maintenance teams, ensuring safe mission execution during actual contingencies.

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5.2.5. Quinary Priority: Environmentally Conscious Maintenance Operations

Environmental impact minimization and sustainability enhancement require development of quarterly preventive maintenance plans to extend equipment lifecycle and prevent pollutant leakage or environmental incidents through preventive maintenance. Energy conservation necessitates consideration of energy efficiency during electrical and electronic equipment maintenance to minimize power consumption, with strict adherence to environmental regulations for refrigerant and petroleum handling and legal waste disposal. Environmental sustainability would be improved by using environmentally friendly cleaning agents and reusable materials to reduce waste generation during maintenance processes.

5.3. Waste Disposal Service Development Framework

5.3.1. Primary Priority: Professional Waste Classification and Processing

Waste classification and processing professionalism enhancement requires active utilization of specialized evaluation personnel such as military waste assessment officers to systematically evaluate waste material status, recycling potential, and military sensitivity. Resource conservation necessitates maximization of recyclable resource separation through professional assessment, with security verification procedures for sensitive equipment and military supplies to ensure safe disposal. Operational consistency requires the development of standardized waste determination criteria to ensure consistent application across all disposal decisions, with specialized procedures for each phase of the collection-transportation-storage-disposal process. Handling of hazardous materials necessitates the establishment of separate procedures for heavy or hazardous material handling by specialized equipment and experienced personnel, with real-time asset management authority through computerized systems for supervising officers.

5.3.2. Secondary Priority: Efficient Collection Planning and Cost Reduction

Collection efficiency optimization and cost minimization require the development of quarterly rotational waste collection plans with regular visits to each unit for comprehensive waste recovery, preventing long-term waste accumulation within units. Operational efficiency necessitates formulation of systematic vehicle operation plans based on regional characteristics and waste generation volumes, with appropriate vehicle type and quantity combinations to optimize fuel consumption and personnel requirements. Cost efficiency would be enhanced through exploration of alternative disposal methods such as local government partnerships for no-cost disposal of non-recyclable waste, with competitive bidding or negotiation for items requiring paid disposal to secure optimal pricing. Economic sustainability requires implementation of competitive contracting with multiple waste management firms to reduce costs, internal processing of suitable waste categories, and active exploration of recycling revenue generation with reinvestment in waste management budgets.

5.3.3. Tertiary Priority: Contingency Waste Management and Resource Support

Waste management during contingencies requires integration of waste and captured equipment processing plans into operational planning phases, with advance preparation for handling combat-generated waste and captured enemy equipment. Operational effectiveness necessitates development of procedures for rapid disassembly and conversion of usable captured equipment into friendly assets, with safe disposal of remaining components. Health protection requires the establishment of coordination systems with CBRN support units for rapid decontamination and processing of CBRN-contaminated equipment and materials, preventing secondary contamination and contributing to combat power preservation. Field operations necessitate development of field collection point operational plans accounting for divergent waste generation patterns during contingencies, enabling temporary field waste accumulation locations. Resource allocation

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optimization requires definition of contingency support priorities following the sequence of medical units, combat units, and support units for waste collection and processing support.

5.3.4. Quaternary Priority: Environmental Protection and Sustainable Waste Management

Environmental protection and sustainability enhancement require development of waste processing plans based on Defense Ministry waste management guidelines and national environmental regulations such as the Waste Management Act, ensuring all processing adheres to legal and environmentally friendly standards. Resource conservation necessitates maximization of reuse or recycling rates and reduction of unnecessary disposal through staged approaches such as civilian sale of decommissioned military materials, component harvesting, and disposal of remaining residuals only. Environmental contamination prevention requires regular removal of potential contaminants during waste material storage, such as draining petroleum and oils from discarded vehicles, with continuous soil and water quality monitoring around waste storage locations to detect and address anomalies early. Hazardous waste management necessitates strict segregation of special waste including batteries, electronic waste, and military chemicals from general waste with secure handling by specialized processing firms. Organizational culture development requires education on environmental protection importance and social value of waste processing for all military personnel and civilian employees, with recognition programs for exemplary environmental management practices.

5.4. Implications Integrated Service Development Framework

Cross-cutting issues identified through the analysis necessitate an integrated development approach spanning all service domains.

5.4.1. Service Awareness and Promotion Enhancement

The consistently low awareness levels across all service domains require the development of comprehensive promotion strategies for outsourced service availability and benefits. Information dissemination should utilize unit bulletin boards, internal communication networks, and training sessions. Accessibility would be enhanced through the creation of service-specific user manuals clearly outlining usage methods, request procedures, and contact information. Organizational awareness requires implementation of regular service briefings for unit commanders and responsible personnel to communicate service effectiveness and benefits.

5.4.2. Integrated Quality Management System Development

Consistent quality across all service domains requires establishment of an integrated quality management system with standardized quality criteria and evaluation frameworks. Continuous improvement necessitates implementation of quarterly or semi-annual service quality evaluations with results integrated into service improvement processes. Service reliability would be enhanced through the introduction of an internal quality certification system for outsourced services to guarantee minimum quality standards.

5.4.3. Enhanced User Feedback Framework

User-centered service development requires implementation of regular satisfaction surveys among service users to identify service strengths, weaknesses, and improvement requirements. Responsiveness would be enhanced through the development of online or mobile-based real-time feedback channels enabling immediate user collection and response. User engagement necessitates the introduction of a service improvement suggestion system with recognition for outstanding proposals.

5.4.4. Contract and Management System Enhancement

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Contractual frameworks and management systems optimization requires transition of current outsourcing contract frameworks to performance-based systems, with incentives and penalties based on service performance to drive quality improvement. Management effectiveness necessitates training of specialized personnel for outsourced service management, focusing on contract administration, performance evaluation, and quality monitoring. Administrative efficiency requires the development of a unified management system for all three service domains to ensure consistent management.

5.4.5. Integrated Contingency Operation Planning

Service continuity during contingencies requires development of integrated emergency response plans for all three service domains to ensure service continuity during contingencies or disasters. Interagency cooperation necessitates the establishment of contingency coordination systems with private contractors, with regular training and verification to enhance response capabilities. Operational resilience requires development of alternative service plans for potential outsourced service disruptions, ensuring basic support availability during emergency situations.

5.5. Implications and Policy Recommendations

5.5.1. Theoretical and Practical Implications

This study contributes to both theoretical understanding and practical application in military logistics management. From a theoretical perspective, it demonstrates the efficacy of integrated methodological approaches combining subjective evaluation (AHP) with quantitative assessment (WP) to develop comprehensive prioritization frameworks. The observed awareness-satisfaction disparity offers insights into implementation barriers that transcend traditional quality-focused evaluations.

From a practical standpoint, the study provides evidence-based development frameworks aligned with both user needs (soldier perspective) and strategic priorities (officer evaluation). The substantial efficiency gain demonstrated particularly in waste disposal operations offers quantifiable evidence supporting outsourcing efficacy in military contexts. The study reveals that outsourced logistics services substantially reduce personnel burden while improving service quality, yet face challenges including low awareness, limited accessibility, and inadequate contingency preparedness.

5.5.2. Policy Recommendations

Based on the comprehensive analysis conducted in this study, several strategic policy recommendations emerge for enhancing military logistics outsourcing effectiveness.

First, service awareness and accessibility enhancement is imperative. The current low awareness levels should be addressed through systematic promotion strategies, while service request procedures should be streamlined to increase accessibility. Service coverage expansion would maximize benefit distribution across military units.

Second, quality-centric management systems should be implemented. With service quality improvement emerging as the primary criterion in the AHP-WP analysis, development of standardized quality standards, regular evaluation protocols, and feedback mechanisms would facilitate continuous quality enhancement.

Third, contingency preparedness requires significant strengthening. Given the importance of wartime operational support in the AHP-WP analysis, service continuity during contingencies should be enhanced through comprehensive planning, regular training, and efficacy verification.

Fourth, environmental sustainability considerations should be integrated into service management. The inclusion of environmental sustainability as an evaluation criterion necessitates policies and guidelines minimizing environmental impact and ensuring sustainable operations.

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Fifth, integrated management systems should be developed across all service domains. Unified management would enhance administrative efficiency and facilitate balanced service development, improving resource allocation efficiency.

Finally, a phased expansion strategy should be implemented based on the study findings. Given the divergent prioritization patterns between implementation and non-implementation units, material maintenance and waste disposal outsourcing should be prioritized in non-implementation units, with gradual expansion to additional domains and units.

5.5.3. Research Limitations and Future Directions

This study has several methodological limitations that suggest directions for future research. The sample representativeness is constrained by the specific temporal and organizational context of data collection. Additionally, the cross-sectional methodology precludes evaluation of longitudinal effects, and comprehensive cost-benefit analysis was not conducted.

Future research should address these limitations through longitudinal studies examining sustained outsourcing effects across extended timeframes. Economic efficiency should be evaluated through detailed cost-benefit analyses providing financial justification for outsourcing decisions. Methodological refinement could include application of fuzzy theory to decision-making processes, accounting for uncertainty in prioritization judgments. Additionally, research scope could be expanded to additional military support domains beyond the three areas examined in this study.

6. Conclusions

This study conducted a comprehensive evaluation of military logistics outsourcing in the South Korean Army through parallel analysis of soldier satisfaction surveys and officer AHP-WP assessments. The integrated analytical framework revealed several significant findings with strategic implications for military logistics management.

Soldier survey analysis demonstrated high satisfaction levels among service recipients across all outsourced domains (laundry support: 72.2%, material maintenance: 63.4%, waste disposal: 75.9%), contrasted with critically low service awareness (laundry support: 30.8%, material maintenance: 17.5%, waste disposal: 23.1%). Primary satisfaction determinants included personal time availability and professional service quality. Notably, waste disposal services exhibited the most significant operational impact, with non-implementation units reporting substantially higher personnel allocation to waste management tasks (40.9%) compared to implementation units (12.8%).

The AHP-WP integrated analysis established a hierarchical prioritization framework with service quality improvement (24.95%) and professional task execution (21.13%) as primary considerations, followed by cost efficiency (18.97%), wartime operational support (18.01%), and environmental sustainability (16.94%). Prioritization perceptions varied significantly between implementation and non-implementation units, with the latter prioritizing material maintenance and waste disposal outsourcing, while the former emphasized laundry support services, suggesting experiential influence on perceived service value.

Based on these findings, comprehensive development frameworks were formulated for each service domain, addressing service expansion, operational stability, professional processes, resource optimization, and contingency support. An integrated framework addressing cross-cutting issues was also developed, focusing on awareness enhancement, quality management, user feedback, contract optimization, and contingency planning.

This research provides empirical evidence supporting the efficacy of military logistics outsourcing while identifying critical development requirements. The proposed frameworks and policy recommendations contribute to enhanced personnel utilization efficiency and combat effectiveness. Future research should address the identified limitations through longitudinal studies, economic analyses, methodological refinements, and expanded service domain evaluations to develop increasingly sophisticated and comprehensive outsourcing models.

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