

## LOGISTICS MANAGEMENT MODEL FOR SPORTS INDUSTRY IN THAILAND

THANARIT THANAIUDOMPAT<sup>1\*</sup> and PATANTIYA SINGCRAM<sup>2</sup>

### ABSTRACT

This research addresses green reverse logistics model for Thailand's economically vital sports industry by developing a framework that integrates social, environmental, and economic pillars to enhance operational efficiency and overcome international trade barriers and aimed to develop a green reverse logistics management model for the sports industry in Thailand. The study employed mixed-methods research design, integrating both quantitative and qualitative approaches. The quantitative component was utilized to examine the causal relationships and outcomes among logistics management innovation factors, green reverse logistics management and information technology, in relation to the logistics operational performance of the sports industry. Data was collected from 295 businesses across three sectors: sporting goods retailers and wholesalers, sporting equipment manufacturers, and sports import and export operators. The qualitative component adopted a phenomenological approach, conducted through in-depth interviews, the findings of which were subsequently validated by means of focus group discussions. Participants comprised five individuals, including executive- and operational-level professionals from the sports industry sector as well as academics specializing in sports management. Data analysis was carried out using confirmatory factor analysis and structural equation modelling.

The hypothesis testing results revealed that: 1) logistics management innovation exerts a direct influence on green reverse logistics management within Thailand's sports industry; 2) information technology has a significant effect on green reverse logistics management in Thailand's sports industry; and 3) green reverse logistics management has a significant effect on the logistics operational performance of the sports industry. The analysis indicated that the hypothesized model demonstrated a satisfactory level of fit with the empirical data, meeting all prescribed criteria, as evidenced by the following fit indices:  $\chi^2 = 13.78$ ,  $p\text{-value} = 0.79$ ,  $\chi^2/df = 0.72$ , GFI = 0.98, AGFI = 0.95, and RMSEA = 0.00.

The contributions of this research lie in its capacity to elucidate the causal relationships among logistics management innovation, green reverse logistics management, and information technology in relation to the logistics operational performance of the sports industry. The findings may be further applied to inform and enhance business management practices within the sports industry.

**Keywords:** Logistic Innovation Management ; Information Technology ; Green Reverse Logistics ; Logistics Operational Efficiency

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<sup>1-2</sup> Faculty of Liberal Arts, Thailand National Sports University Chon Buri Campus.

\* Corresponding Author, Email: tofkpru@gmail.com

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## INTRODUCTION

Green Reverse Logistics Management marks a modern evolution from traditional logistics by shifting the focus from the forward flow of physical, financial, and informational assets toward the backward flow of goods for recycling, remanufacturing, or disposal, thereby encouraging socially and environmentally responsible operations. While the efficiency of this reverse chain depends on rigorous attention to foundational upstream processes, the Thai sports industry currently faces a critical research gap: the absence of a tailored Green Reverse Logistics Management model that holistically integrates and balances social impact, environmental stewardship, and economic viability. Existing research remains fragmented, leaving domestic enterprises without a practical framework to enhance operational efficiency and overcome international environmental trade barriers, which are essential for securing long-term sustainable competitiveness in the global market.

Research by Gazi (2024) indicates that the sports industry in Thailand involves five key logistics activities that impact Green Reverse Logistics. The study suggests that operators must monitor and prioritize these specific areas of product design and material selection that are environmentally friendly, fully recyclable, or capable of being re-entered into the production cycle. Transportation and movement to minimize losses during transit to prevent the generation of sports-related waste caused by breakage or damage.

Furthermore, research by Garg and Vemaraju (2025) indicates that the primary focus of green reverse logistics management has traditionally been on enhancing efficiency, cost-competitiveness, and quality for manufacturing firms. While this also elevates competitive capability within environmentally conscious supply chains, it remains insufficient for

overcoming trade barriers related to environmental policy.

For a business to operate effectively and foster efficient green reverse logistics, it must adhere to the three pillars of sustainability: social or community responsibility, environmental stewardship, and economic viability. This holistic approach supports operators in effectively applying these practices, maximizing benefits to society, and creating sustainable competitive advantages for business.

By distinguishing an organization through its commitment to environmental standards, it becomes imperative to integrate sustainable green reverse logistics into corporate strategic and operational plans. This integration facilitates an optimal balance between environmental and economic goals, thereby increasing opportunities for market entry, particularly in developed countries with high purchasing power that serve as key economic drivers (Gazi, 2024).

Furthermore, current research often suffers from a fragmented perspective. For instance, studies such as those by Nikolaidis (2013) prioritize operational quality, while research by Gazi (2024) focuses primarily on organizational value creation. Critically, there is a notable absence of a green reverse logistics model tailored to the Thai sports industry that effectively integrates and balances social or community impact, environmental stewardship, and economic viability. Therefore, this study seeks to develop a sustainable logistics management model. By doing so, it will provide entrepreneurs with a practical framework to enhance both operational efficiency and environmental consciousness, thereby enabling them to overcome trade barriers and establish long-term sustainable competitiveness.

## Objectives

1. To examine the causal factors influencing green reverse logistics management within the sports industry in Thailand.

2 To develop a causal model of logistics management innovation factors, green reverse logistics management and information technology in relation to the logistics operational performance of the sports industry.

## METHODOLOGY

The research methodology employed to develop the model for green reverse logistics management within the Thai sports industry utilizes a Mixed Methods Research design. This approach integrates both quantitative and qualitative methodologies, with quantitative research serving as the primary method, while qualitative research is utilized to elaborate upon and validate the quantitative findings, thereby enhancing the clarity and robustness of the results (Creswell, 2013). The study is descriptive in nature, with business organizations in the Thai sports industry serving as the unit of analysis.

### Test of Tool Quality

This mixed-methods study develops a green reverse logistics management model for the Thai sports industry by integrating quantitative structural equation model in. The findings confirm that logistics management innovation and information technology exert significant direct influences on green reverse logistics, which subsequently drives the operational performance of the industry. The hypothesized model demonstrated an excellent fit with empirical data, evidenced by fit indices such as a GFI of 0.98 and an RMSEA of 0.00. By aligning with the national Bio-Circular-Green (BCG) model, this research offers a practical

framework for Thai enterprises to optimize their supply chains, reduce carbon emissions, and secure long-term sustainable competitiveness in the global market.

### Population and Sample Selection

The population for the quantitative phase consists of business owners, executives, and managers representing retail and wholesale sports equipment companies, sports equipment manufacturers, and sports import/export firms. Data was obtained from the Department of Business Development database (2025), which identified 295 relevant entities. The sample size determination adhered to the criterion that the ratio of observations to variables should be no less than 15:1 (Hair, Black, Babin and Anderson, 2010). Given that the study includes 12 observed variables, a minimum sample size of 180 respondents was required for the quantitative analysis.

For the qualitative phase, Key Informants were selected using theoretical and purposive sampling. Data collection involved in-depth interviews, non-participant observation, and focus group discussions. The participants included three experts from the sports industry, selected based on their extensive business and operational experience, and two academics specializing in sports management, chosen for their subject matter expertise. This methodological approach ensures that the data obtained are both diverse and valid (Khare Munoz-Carpena, Rooney and Martinez, 2015).

### Research Results: Analysis of Variables and Multicollinearity

The analysis of the correlations between the 14 observed variables revealed significant relationships across all 91 pairs. All pairs demonstrated a positive correlation, statistically significant at the 0.01 level, with correlation coefficients ranging from 0.310 to 0.589.

Upon examining the coefficients, no pairs exhibited high correlation ( $0.6 < r < 0.8$ ). Moderate correlations ( $0.4 < r < 0.6$ ) were observed in 53 pairs, while 38 pairs showed low correlations ( $r < 0.4$ ). The strongest correlation was found between Information System Capability (COM) and Waste Disposal Process (WAST) ( $r = 0.589$ ), while the weakest correlation was observed between Return Policy and Procedures (POL) and the Remanufacturing Process (REP) ( $r = 0.310$ ).

Critically, the correlation coefficients for all pairs remained below the 0.80 threshold. This indicates that the variables do not pose a multicollinearity problem and share sufficient commonality to be analyzed as a unified model, confirming their appropriateness for subsequent structural equation modeling.

### Analysis of the quantitative data

Goodness-of-Fit Indices for the Green Reverse Logistics Model. The goodness-of-fit indices for the structural model of green reverse logistics management in the Thai sports industry are as follows: The Chi-square ( $\chi^2$ ) value is 13.78, which is not statistically significant at the 0.05 level ( $p$ -value = 0.79). The relative Chi-square ( $\chi^2/df$ ) is 0.78. Furthermore, the Comparative Fit Index (CFI) is 1.00, the Goodness-of-Fit Index (GFI) is 0.98, the Adjusted Goodness-of-Fit Index (AGFI) is 0.90, and the Root Mean Square Error of Approximation (RMSEA) is 0.00. Since all indices meet the established academic criteria, it can be concluded that the proposed model demonstrates a good fit with the empirical data. The analysis of the causal relationships between logistics management, information technology, green reverse logistics, and logistics operational performance within the Thai sports industry is illustrated in the figure 1 below.

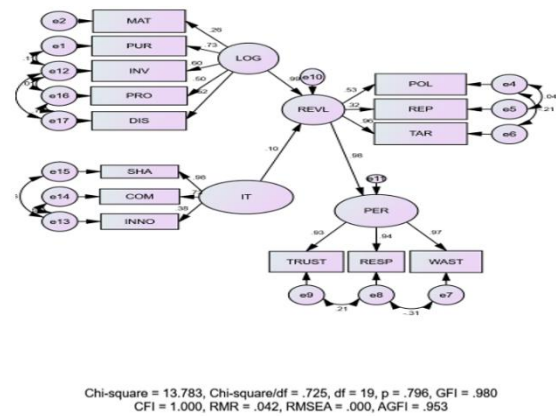


**Figure 1:** Analysis of goodness of fit index of the model

The researcher tested the influence of causal and outcome variables within the developed Green Reverse Logistics Management model for the Thai sports industry to evaluate the research hypotheses.

**Figure 1:** Influence of Variables According to Research Hypotheses

Based on Figure 1, the variables comprising the causal and outcome factors of the developed Green Reverse Logistics Management model for the Thai sports industry exhibit direct, indirect, and total effects, as detailed by the research hypotheses below:

#### Hypothesis 1: Logistics management—comprising

1) Raw material management, 2) Procurement, 3) Warehousing, 4) Production processes, and 5) Distribution—positively influences green reverse logistics management. The analysis reveals that Logistics Management (LOG) has a direct positive influence on Green Reverse Logistics Management (REVL) in the Thai sports industry, with a direct effect coefficient of 0.99, statistically significant at the 0.05 level. Therefore, Hypothesis 1 is supported.

#### Hypothesis 2: Information Technology—comprising

1) Data exchange, 2) Information system capability, and 3) Technological innovation—positively influences green reverse logistics management. The analysis indicates that Information Technology (IT) has

a direct positive influence on Green Reverse Logistics Management (REVL), with a direct effect coefficient of 0.10 and a total effect of 0.10, statistically significant at the 0.05 level. Therefore, Hypothesis 2 is supported.

**Hypothesis 3:** Green reverse logistics management—comprising 1) Return policy and procedures, 2) Remanufacturing processes, and 3) Waste disposal processes—positively influence logistics operational performance. The analysis confirms that Green Reverse Logistics Management (REVL) has a direct positive influence on the logistics operational performance (PER) of the Thai sports industry, with a direct effect coefficient of 0.98 and a total effect of 0.98, statistically significant at the 0.05 level. Therefore, Hypothesis 3 is supported.

### Qualitative analysis results

The researcher utilized phenomenology methodology to analyze qualitative data. A total of five key informants were selected, comprising three experts in executive and operational roles within the sports industry—chosen based on their extensive business achievements and relevant experience, and two scholars in sports management, selected for their academic contributions and expertise in the field. This purposive sampling ensured a diverse and robust data set. Selecting informants directly involved in the research context enhances the credibility of the data sources (Phothisita, 2013).

Data collection was multi-faceted, primarily involving in-depth, face-to-face interviews. This method provided the opportunity to pose follow-up questions, thereby eliciting greater clarity and depth in the responses. Furthermore, non-participating observation was conducted to ensure a comprehensive understanding. To verify the accuracy and validity of the findings, the researcher conducted follow-up inquiries

with the key informants to confirm that the synthesized conclusions aligned with their original perspectives.

The semi-structured interview protocol covered the current context and status of logistics operational performance within the Thai sports industry, as well as specific factors such as logistics management, information technology, and green reverse logistics, all aimed at enhancing operational efficiency. The researcher integrated these qualitative findings to validate and expand upon the results derived from the quantitative analysis, ensuring the research conclusions are both comprehensive and substantiated. The findings are presented hereafter.

### The Status of the Sports Industry in Thailand

The logistics operational performance of Thailand's sports industry serves as a fundamental driver for the transport and exchange of sporting goods and services. This sector holds significant economic importance for Thailand, directly influencing both national export and import valuations. Furthermore, Thailand's current account balance has shown robust growth, catalyzed by the rise of sports tourism. This trend is driven by an influx of athletes and spectators traveling to Thailand for various international and national competitions. Consequently, the value generated by hosting these sporting events creates a multiplier effect, providing associated businesses with expanded commercial opportunities and enhancing the overall value of the industry.

Moreover, sports tourism is heavily bolstered by government support, which promotes diverse tourism models. Strategic public relations and incentives designed for entrepreneurs further stimulate the growth of Thai tourism. This creates a positive feedback loop that enables the hosting of world-class sporting events, allowing the industry to flourish and increase its

economic value in alignment with the nation's tourism trajectory.

### **Logistics Management in the Sports Industry**

To remain competitive and modern, the Thai sports industry must rely on sophisticated logistics management. Success requires proficiency in several key domains: raw material management, warehousing, production processes, procurement, and distribution. Businesses must cultivate these specific capabilities to streamline their logistics and transportation systems to achieve their strategic goals.

This demonstrates that logistics management is the primary mechanism driving the supply chain within the sports industry. It ensures the rapid and efficient flow of raw materials and finished products, enabling the industry to respond swiftly to market demands. In contemporary business management, logistics is recognized as a vital competitive advantage at both the macro and micro levels. Ultimately, if the national logistics cost is lower than that of international competitors, it provides a distinct advantage, enabling significant cost reductions for sporting goods—both domestically and in the global export market.

### **Information Technology in the Thai Sports Industry**

Today, every industry must continuously modernize its IT infrastructure to keep pace with dynamic competitive landscapes. This is especially true for the sports industry, where competition is intense and product lifecycles are accelerated by rapidly shifting consumer trends. Consequently, IT management has become an indispensable tool for managing business data across various domains.

In this context, IT management in the sports industry involves organizing information into comprehensive databases, utilizing technology to facilitate seamless information exchange, and ensuring

effective communication with relevant stakeholders. Success in this area requires the continuous development of information system capabilities and the strategic application of technological innovations to achieve maximum operational efficiency.

### **Green Reverse Logistics Management in Thailand**

Green reverse logistics management in Thailand is currently transitioning from basic Returns Management to a fully realized Circular Economy. The primary catalyst for this shift is the e-commerce boom, which has led to a dramatic surge in product returns. Thai businesses are now integrating advanced technology to facilitate sorting and condition inspection at return points, thereby mitigating redundant transport costs.

Furthermore, remanufacturing and waste disposal processes are being bolstered by the government's Bio-Circular-Green (BCG) model. This policy has established more efficient networks for collecting and segregating materials, transforming them into high-quality raw materials.

A significant challenge remains in operational costs, which are typically higher than in forward logistics due to the dispersed nature of small-scale consumer returns and the lack of standardized, reusable packaging. To address this, Thai enterprises are forming collaborative networks, utilizing convenience stores and service stations as "Centralized Return Centers." This consolidation not only saves on fuel and time but also reduces carbon emissions in the transportation sector, aligning with global sustainability goals.

### **Outcomes of Logistics, IT, and Green Reverse Logistics on Operational Performance**

The integration of efficient logistics management and information technology into reverse logistics systems directly enhances asset turnover and sunk cost

management within the sports industry. Because sports equipment often follows seasonal lifecycles, the implementation of IoT and RFID systems enables real-time tracking of returned products and end-of-life equipment. This accelerates the sorting, refurbishment, and resale processes, thereby preventing commercial loss and minimizing excess inventory. Consequently, this boosts inventory turnover and strengthens business liquidity.

Beyond numerical efficiency, a crucial outcome is the development of a sustainable competitive advantage (Green Logistics). IT facilitates route optimization for return logistics, eliminating "empty miles" and curbing carbon emissions. In an industry where consumers increasingly prioritize environmental stewardship, having a structured system for sports equipment waste management and remanufacturing cultivates brand trust. Ultimately, this fosters long-term operational stability by both reducing environmental costs and solidifying brand loyalty.

#### **Confirmation of findings from focus group discussions.**

The results of the focus group discussion with the five key informants served to validate the developed model for Green Reverse Logistics Management in the Thai sports industry. The findings indicate that the model—developed through the synthesis of both quantitative and qualitative data—is consistent with the research hypotheses. Furthermore, the focus group offered additional insights, particularly regarding the exchange and shared use of resources, or the establishment of a centralized Cloud-based database among business units. Such integration is essential for ensuring efficiency and agility in responding to the evolving landscape of green reverse logistics.

## **CONCLUSION AND DISCUSSION**

Regarding Omni-channel distribution, efficient transport networks are essential for effective collection processes. The broader the distribution channel, the more vital the design of designated drop-off points becomes. If distribution systems are optimized to utilize "empty miles" (return trips) for collection, the sports industry can transport defective or end-of-life equipment back to distribution centers with significantly higher fuel and cost efficiency.

Reverse logistics in the Thai sports industry transcends the simple handling of damaged goods; it encompasses value creation through remanufacturing. The five key activities discussed previously operated as a Closed-Loop Supply Chain. When integrated via robust information systems, this structure allows Thai operators to accurately forecast return flows, thereby ensuring long-term industry sustainability (Bonyasuwon and Thanaiudompat, 2024).

Information exchange acts as the backbone for collaboration among partners within the sports industry supply chain. Speed and Accuracy: Research indicates that the speed and accuracy of data transmission between sports equipment retailers and manufacturers significantly reduce delays in processing product returns. Real-time integration utilized of Electronic Data Interchange (EDI) or Cloud-based platforms enables real-time information exchange. This allows organizations to forecast the volume of incoming returns, thereby preparing the necessary resources for sorting and condition inspection in a timely manner. This, in turn, shortens the management cycle and reduces holding costs for goods awaiting processing (Fani et al., 2025).

The three components of IT (innovation, exchange, and systems) promote one another dynamically. Modern technology alone is insufficient

without effective data exchange; therefore, Thai operators must prioritize System Integration to utilize IT as a tool for reducing operational costs and enhancing environmental responsibility, which are crucial competitive factors in the global sports market (Waditwar, 2024). Operational Efficiency and Resource Circulation In the fast-moving sports industry, effective reverse logistics facilitates rapid product recalls and return management, preventing the accumulation of obsolete inventory. Sorting and Refurbishing: Implementing systematic sorting and refurbishing processes converts returned goods into value-generating assets rather than mere waste. This reduces Total Cost and increases asset turnover.

Return Policies as Brand Commitments: Clear return policies act as a contract between the brand and the consumer. For specialized sports equipment, such as injury prevention gear or technical footwear, minor errors can affect athlete performance. Thus, a transparent and responsive return system bolsters credibility. Furthermore, effective gatekeeping (screening) ensures that data flows back to production teams with high accuracy, reducing redundant errors and enhancing supply chain transparency (Waditwar, 2026). Remanufacturing and waste management, remanufacturing and refurbishment are essential for enhancing market responsiveness without relying solely on virgin materials (Singgram and Thanaiudompat, 2023).

Lead Time Reduction: For high-value equipment or parts with scarce availability, recovering and refurbishing functional components reduces the lead time required to provide replacements to customers. A system capable of reintegrating these resources into the market allows businesses to meet customer expectations faster than competitors reliant on factory-fresh production (Sarkar, Bhattacharya and Sarkar 2025). Strategic Waste Disposal: In the sports industry, waste

disposal is not merely about discarding; it is a strategic function that minimizes the burden of "deadstock." Hygienic and environmentally compliant disposal systems reduce legal risks and hidden costs of holding waste in warehouses. By clearing space for fast-moving goods, the supply chain gains agility, allowing it to focus on maximizing satisfaction for athletes and service users (Seepui, P., Bumroongsang, Rojwattanabun, Yaosiri and Sakhonkaruhatdej. 2022).

### New Contribution and Originality

As a present research, Ferreira, Candeias, Nguyen, Rammal and Pereira (2026) founded that several academic research are lack of tailor and integration of BCGs logistic. The established causal model provides a significant theoretical contribution by demonstrating that both logistics management innovation and information technology serve as foundational determinants that directly catalyze the implementation of green reverse logistics. The research effectively bridges a critical gap in the literature by shifting from fragmented, general logistics frameworks to a holistic, industry-specific model that integrates social, environmental, and economic pillars within the Thai sports sector. Originality is further evidenced by the successful synthesis of a mixed-methods approach, which pairs robust structural validation with qualitative phenomenological depth to confirm that sustainable logistics practices directly enhance operational performance. Ultimately, this work offers a novel strategic roadmap for domestic enterprises to navigate international environmental trade barriers and achieve a sustainable competitive advantage aligned with the national Bio-Circular-Green policy.

## RECOMMENDATIONS

In conclusion, based on the synthesis of the conclusions, discussions, and recommendations presented in this study, it is evident that this research provides significant strategic value to the sports industry, associated business entities, and stakeholders throughout the broader sports supply chain.

Furthermore, these findings are applicable to other industrial sectors and regulatory bodies tasked with overseeing sports policy. By leveraging these insights into integrated logistics management and information technology, organizations can significantly enhance their operational efficiency. Ultimately, the outcomes of this study have the potential to drive sustainable competitive advantages and long-term strategic benefits at both the national and international levels.

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