Systematic Literature Mapping: Integrated System of Logistic Distribution for Island

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Abstract:

Purpose: The study aims to identify and compare various methods used to optimize supply chain distribution, with a focus on uncovering novel approaches. It particularly addresses the gap in logistics distribution models tailored for island environments, proposing the development of an integrated information system using genetic and memetic algorithms to handle uncertainties like weather and vessel availability.

Design/methodology/approach: A Systematic Literature Mapping (SLM) approach was adopted. The K-Chart method was applied to categorize conceptual strategies and identify research gaps. A case study was also included to analyze logistical challenges in island settings, incorporating real data variables like transportation schedules and regional demand.

Findings: The study reveals a lack of research focused on integrated logistics systems for island distribution, especially in Southeast Asia. It identifies gaps in current literature, particularly the absence of models incorporating uncertain variables such as weather. The case study shows that existing logistical disruptions in island regions can be addressed using a Business Intelligence-based system combined with genetic and memetic algorithms. These methods show promise in improving scheduling, reducing distribution inefficiencies, and handling data variability.

Originality/value: This research contributes original value by proposing a novel framework that integrates information system and business intelligence with genetic and memetic algorithms for fuel logistics in island environments, an area largely unexplored in prior studies. The approach not only addresses a geographical research gap but also introduces the handling of uncertain data factors in distribution modelling, offering a significant advancement in supply chain research for complex, variable contexts like archipelagic regions.

Keywords: genetic algorithm, integrated information system, logistic distribution, memetic algorithm

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1. Introduction

Improving intra- and inter-organizational relationships throughout the supply chain is essential for achieving long-term competitive advantage. Companies who manage supply chain expenses more effectively than rivals will have a competitive advantage. They can also set themselves apart from their competition by offering a unique blend of higher quality, customer service, product variety, and market exclusivity to their clients. The systematic mapping of the literature is utilized in several reviews to hunt for unique ideas or differences from earlier studies. This study will employ an information system-integrated methodology.

Previous researches have used the Autoregressive Integrated Moving Average (ARIMA) technique. A stationary series' previous values and prior errors are combined linearly to create the ARIMA model. P, Q, and D, which stand for the parameters of the autoregressive order, the moving average component, and the necessary differentiating order for stationary (Morais & Gomes, 2022; Fanoodi, Malmir & Jahantigh, 2019), respectively, are the three parameters that make up this model. The ARIMA model is essentially built on the creation of cycles-based functions that use the information provided by time series to produce a mathematical forecasting structure (de-Souza, Silva, Rodrigues & Santos, 2022). By examining some time series data, research by Alizadeh, Rahimi and Ma (2022) integrates the ARIMA approach with Weighted Nearest Neighbor (WNN) to model and forecast the behaviour of running automobiles. WNN produces nonlinear predictions, while ARIMA creates linear prediction components.

The proposed hybrid model combines ARIMA and WNN to take use of ARIMA's capacity to identify hidden patterns in unlabelled historical data and WNN's adaptability to analyze time series data with various variances. Unlike the study by Li and Zhang (2023) that employs both the Nonlinear Autoregressive with eXogenous inputs (NARX) and the ARIMA methods. The ARIMA-NARX hybrid model exhibits superior accuracy compared to other models, according to this study based on a comparison of the Root Mean Square Error (RMSE), Mean Absolute Relative Error (MARE), and Maximum Relative Error (MAXRE) of the models evaluated. The linear and nonlinear components of UWC are predicted using ARIMA models for linear forecasting and neural networks for nonlinear forecasting. Each distinct time series' error sizes are computed. The mean and median values for each error metric across all series will then be determined.

A number of studies have applied Genetic Algorithms (GA) and Hybrid Genetic Algorithms (HGA) to address complex optimization problems in logistics and scheduling. GA, inspired by biological evolution, has been widely used to minimize computation time and improve route or schedule quality in transportation systems (Vidal, Caiado, Scavarda, Ivson & Garza-Reyes, 2022; Abdallah, Tanougast, Kacem, Diou & Singer, 2019). Prior research demonstrates its usefulness in solving multi-depot electric vehicle scheduling (Wang, Guo & Zuo, 2021) and reducing delivery mileage through genetic search operators (Nitisiri, Gen & Ohwada, 2019). Building on these advancements, hybrid approaches combining GA with local search techniques, such as Tabu Search (TS), have been shown to further enhance performance in flow shop scheduling and flexible job shop problems (Umam, Mustafid & Suryono, 2022; Xu, Zheng & Gao, 2020). In dynamic and intelligent production environments, HGA has also been integrated with deep reinforcement learning to reduce scheduling delays in parallel machines (Chien & Lan, 2021). These findings highlight that metaheuristic-based scheduling methods are effective in addressing uncertainty, resource constraints, and routing complexity, challenges that are highly relevant to logistics operations in island regions where fleet planning, travel time variability, and multi-stop delivery decisions must be optimized.

The Vehicle Routing Problem (VRP) has been widely studied as a core challenge in optimizing distribution routes. VRP is a combinatorial problem that determines the best set of routes for a fleet of cars to go on in order to complete duties for a specific group of clients (Park, Son, Koo & Jeong, 2021; Jie, Liu & Sun, 2022). With the purpose of satisfying customer needs at the lowest possible cost, VRP involves an ideal route for the fleet starting at the depot and is typically expressed as a function of the total mileage (Bruglieri, Ferone, Festa & Pisacane, 2022). Previous study on VRP using modelling and looking for route optimization was done by Pham, Nguyen and Bui (2022), Rodríguez-Martín & Yaman (2022), Li, Xu and Sun (2022), and Zhang, Li, Sun and Hou (2021). Pham et al. (2022) implemented a mechanism for scheduling vehicles after receiving a lot of requests. This study employs VRP to find the most clients to service, the fewest cars required, and the optimal vehicle route to reduce overall distance.

The novel variation of Periodic VRP, which in addition to requiring driver consistency, also requires that the time spent servicing clients be adjusted to maximize the advantages or utilities acquired from the operator, was explored in research by Rodríguez-Martín and Yaman (2022). This study uses precise methods to propose three mathematical models. In Li, Xu and Sun (2022), a new variation of the two-echelon vehicle routing problem was presented by considering the grouping and simultaneous pick-up and delivery limitations. By choosing the best vehicle routes in both echelons and allocating subscriber groups to satellites, the aim is to reduce overall operating costs. The topic of stochastic VRP with ambiguous deadlines was studied by Zhang et al. (2021). The study additionally makes use of this constraint's dual form and converts the issue into an identical semi-infinite mixed integer program with ambiguous input parameters.

Beyond forecasting, scheduling, and routing, inventory management also plays a critical role in ensuring supply chain reliability in island regions. Replenishment opportunities are often limited due to weather-related disruptions and vessel availability constraints, making inventory levels highly vulnerable to uncertainty. Effective inventory control is therefore essential to minimize stockouts, maintain service levels, and ensure fuel availability across dispersed island locations. For this reason, inventory-related models such as the Multi-Depot Inventory Routing Problem (MDIRP), the Location-Inventory Problem (LIP), and the Location-Inventory Routing Problem (LIRP) have become central in recent logistics research. Incorporating inventory considerations into island distribution models is crucial because inventory decisions directly interact with routing schedules, vessel capacity, and demand variability. Thus, inventory topics form an essential component of the literature reviewed in this study.

These studies have not carried out the development of an integrated information system includes an algorithm for framework of fuel logistic distributions in the island. So that the development of algorithms for logistics distribution on the islands needs to be done by considering uncertain variables such as weather factors and vessel availability. This study is motivated by the unique logistical challenges faced by island regions, particularly disruptions caused by weather uncertainty, inconsistent vessel availability, and limited routing flexibility. These constraints highlight the need for an integrated BI+GA+MA framework capable of supporting real-time decision-making. The development of this system aims to schedule ships to distribute logistics in the island.

2. Methodology

This study utilizes Systematic Literature Mapping (SLM) to examine prior research on the distribution used in Supply Chain Management (SCM). The SLR guidelines from Cahyo (2021) were also employed by researchers to look for pertinent publications from 2019 to 2024. The SLM results will aid in identifying and comprehending potential study areas for SCM-based fuel delivery.

Additionally, the researcher uses the K-Chart to identify the layers shown on the Conceptual K-Chart. After that, the researcher does study using various pieces of literature shown on the new K-Chart, and the last step on the K-Chart is to provide references for each box. The process steps used in this Systematic Literature Mapping (SLM) approach are illustrated in Figure 1, which outlines the sequence from identifying research objectives to reporting the results.
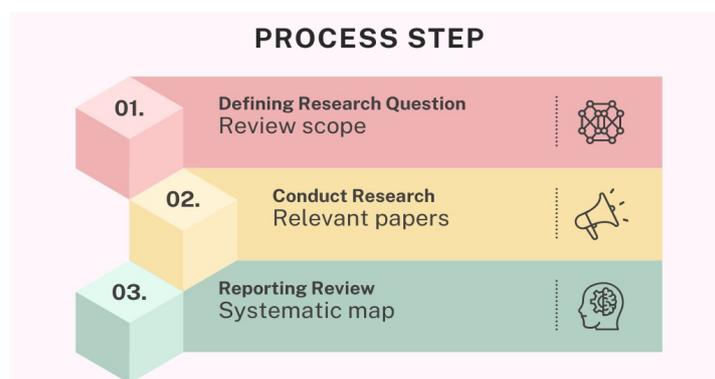

Figure 1. Process Steps

2.1. Setting the Research Objective

Section 2.1 clarifies the research objective, which is (1) to map existing methods related to forecasting, scheduling, routing, and distribution; (2) to identify research gaps specific to island logistics; and (3) to propose an integrated framework combining Business Intelligence (BI), Genetic Algorithm (GA), and Memetic Algoritm (MA) under uncertainty. In addition, another goal is to seek novelty from research. Novelty is carried out to look for elements of novelty or findings from the research that is being carried out. So, the first step is to determine the purpose of the research.

2.2. Applying the Inclusion Criteria

The Inclusion Criteria are divided into search boundaries, search terms, and periods of time. First, search boundaries in this research, namely relevant research is searched in the Scopus database. This is because the Scopus database is reliable and complete. Researchers filter research based on title and exclude studies that are not relevant to the scope of this mapping study. The inclusion was limited to Scopus-indexed Q1–Q2 journals to ensure high-quality references. This selection introduces a potential publication bias, which is acknowledged as a limitation.

Second, search terms that are relevant to this research. The researcher uses the terms "distribution", "supply chain", "forecasting", "ARIMA", "scheduling", "genetic algorithm", "route", and "vehicle routing problem" in searching for keywords.

Third, the period of time for the research sought is 2019-2020. This time is included in the span of 5 years. Of the three inclusion criteria that have been carried out, then filtered in the search for research that is relevant to this mapping.

2.3. Applying the Exclude Criteria

Exclusion was carried out to filter relevant research searches. The exclusion criterion was to eliminate non-English research. Then eliminate non-research articles. From the exclusion criteria, another filter was then carried out to search for research that was relevant to this mapping.

2.4. Reporting

The last step is to make a report of the results that have been found. The output is the result of novelty and comparison of the methods used to improvise supply chain distribution. The report is in the form of a systematic literature mapping in accordance with the case studies and discussions discussed. Figure 2 presents the systematic literature review steps that complement the Systematic Literature Mapping (SLM) process, showing how articles are filtered and categorized.

Figure 2. Systematic Literature Review Step

3. Research Grouping

3.1. Distribution/Grouping of Articles

Previous research has been carried out to examine distribution, supply chain management, forecasting, and scheduling. The research was then mapped into groups of articles based on the year of publication as shown in Figure 3. This analysis was conducted to observe the percentage of publications over the last five years. Based on the figure below, the highest proportion of publications occurred in 2022 with 40.52%. From 2019 to 2021, the trend fluctuated: it started at 15.52% in 2019, decreased to 12.93% in 2020, and then increased to 14.66% in 2021. After reaching its peak in 2022, the percentage declined to 9% in 2023. Meanwhile, the publication share in 2024 was 7.37%. Interest in conducting research related to distribution, supply chain management, forecasting, and scheduling has fluctuated. So that research in 2022 will increase rapidly. This becomes a reference for conducting more relevant research.
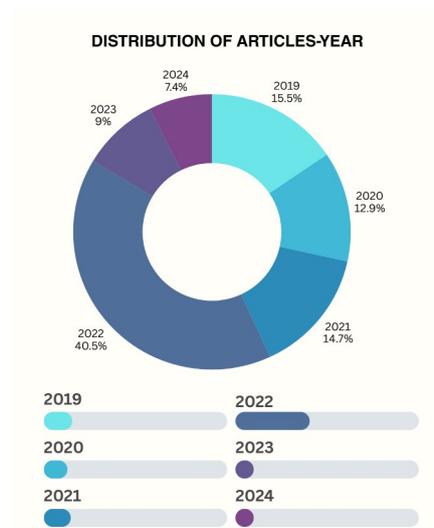

Figure 3. Distribution of Articles by the Year of Publication

Figure 4 shows the distribution of articles by geographical region. It is based on the country where the majority of research on distribution, supply chain management, forecasting, and scheduling is published or where the author lives. Based on geographical distribution, the majority of the author's publications are in the United Kingdom with a percentage of 91.38%. It can also be observed that there is a significant shortage of research contributions in the United States, the Netherlands, China, and Switzerland. So that it can be a challenge to research related to distribution, supply chain management, forecasting, and scheduling.
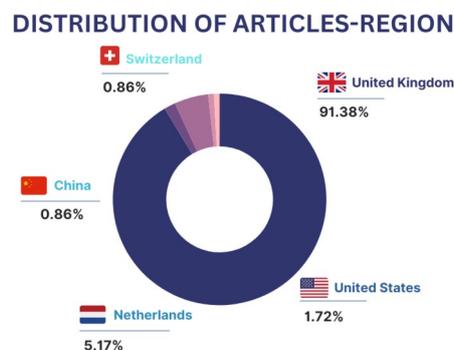

Figure 4. Distribution of Articles by Geographical Origin

The articles used for research grouping are limited to journal quartiles 1 and 2. Figure 5 shows that the majority of research is taken in journal quartile 1 (Q1), which is 98.28%. So it can be concluded that the journal used is the journal with the highest quality based on the Scopus index.
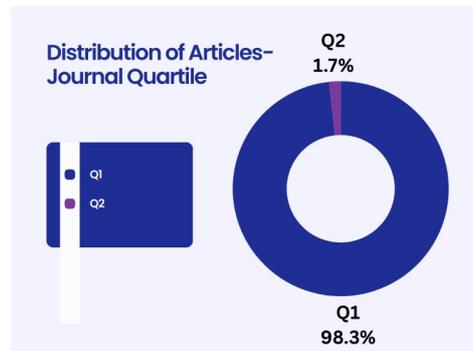

Figure 5. Distribution of Articles by Journal Quartile

3.2. Models/Framework Adopted

Liu, Li and Wang (2022) covered ship handling at the Port dock and route planning with unpredictable arrival time in research they did. This study takes a comprehensive approach to the issue of port planning wharves and routes, integrating wharf allocation, lane selection, delayed ship assignment, and ship sequencing, while taking into account the implications of uncertainty in ship arrival time and handling duration. The assumed uncertainty is contained in a small number of scenarios, or possible outcomes, each with a distinct probability. The study by Mitropoulos, Antypas and Kepaptsoglou (2021) covered island-specific transportation planning. Planning is done for the ferry service's transportation needs. A Continuous Approciation (CA) model was created by the study. Though the majority of maritime transport issues are dealt with as optimization and decision-making issues, the CA model is rarely used to the design of maritime services. Route design on the islands was also done using a genetic algorithm by Friske, Buriol and Camponogara (2022). The idea behind route planning is to shorten the path and save time, but the route must also be safe. The island location has a different route planning process than other areas, and the shallow water will also be taken into consideration as a barrier.

4. Significant Findings from the Literature
4.1. Distributions

Distribution has been covered in a number of publications in the mapping that has been done. 23 researches delve into several distribution-related subjects. Based on various publications, distribution has been extensively discussed in the context of customer engagement in long-distance logistics services. The modified model indicates that safety has a dual impact on consumers' emotional and cognitive attitudes, while their cognitive attitudes toward self-collection are heavily influenced by perceived convenience, functionality, and safety. Convenience was identified as the most significant factor in motivating consumers. Thus, the logistics industry should continue to strive to position itself as a reliable, competent, and committed sector that seeks to enhance customer service, rather than merely being a cargo carrier.

4.2. Forecasting

There are articles on the "forecasting" topic in 2021. Forecasting research done on 7 researches. Research by Lin, Lin and Cao (2021) introduced the EEMD-MKNN-TSPI (Ensemble Empirical Mode Decomposition-Modified K-Nearest Neighbors-Two-Stage Prediction Integration) model for financial time series forecasting, combining data decomposition through (EEMD), neighbor-based prediction with (MKNN), and complexity-based distance with Complexity-Invariant Distance (CID). Tested on 12 stock prices, the model outperformed traditional methods in accuracy using Normalized Mean Squared Error (NMSE), Mean Absolute Scaled Error (MASE), and Mean Absolute Percentage Error (MAPE). Luo and Weng (2019) developed a two-stage method to predict real-time

market prices using historical Real-Time Market (RTM) data and wind farm inputs. Tested over four months, the model showed higher accuracy than direct methods. Key contributions include the use of correlated power data and adaptive training intervals. Future research could explore its application with other renewables like solar energy.

In 2022, forecasting-related research will be conducted by 18 researches. Xian and Che (2022) introduced the MSC (Multi-Space Collaboration) framework to improve electricity load forecasting model selection. Tested through simulations and real cases, MSC proved more stable and accurate than conventional methods and worked well across parameter ranges. While effective with Support Vector Regression (SVR) models for smart grids, it is limited to low-dimensional problems and small datasets due to the constraints of kernel-based SVR. The research on forecasting from 2019 to 2024 has introduced several innovative approaches to improve prediction accuracy in various contexts. Collectively, these studies underscore the continuous advancement in forecasting methodologies. Each study contributes significantly to improving the precision and reliability of predictions. As a result, predictions across various fields have become more accurate and dependable.

4.3. Scheduling

Scheduling was examined in 9 researches and 22 researches examined numerous methods for machine scheduling. Yuan, Li and Wang (2020) studied a two-machine flow shop scheduling problem involving job-related blocking and transport delays. Unlike traditional models, blocking decisions are based on job attributes. The problem, proven NP-hard, was modeled using mixed integer linear programming with makespan constraints. A co-evolution genetic algorithm (CGA) was proposed, using block mining for efficient chromosome creation. Computational tests showed the CGA effectively solved the problem with improved speed and solution quality.

Research on scheduling has explored various methods and algorithms to address challenges in supply chain and machine scheduling. The multi-objective genetic algorithm developed for supply chain scheduling successfully reduced delivery delays and production costs while enhancing product quality, directly impacting customer satisfaction. Additionally, another study introduced a two-machine scheduling problem with job-related blocking and transport delays, highlighting its complexity and proposing a co-evolution genetic algorithm (CGA) to optimize solutions. The test results demonstrated that the CGA approach effectively tackled the issues, accelerating convergence and improving solution quality. Overall, these studies showcase advancements in scheduling approaches that can help industries enhance operational efficiency and competitiveness in the global market.

4.4. Supply Chain

In earlier studies, the supply chain was examined as in Ioannou et al. (2022). Research by Ioannou, Georgali and Fokaides (2022) examined food waste across all stages of the supply chain in Cyprus, using the EU's 2019/1597 methodology. The study found Cyprus generates 404 kg of food waste per person annually (above the EU average) with the most waste occurring at household and processing stages. Data were gathered through surveys, interviews, and balance sheets, also considering imports, exports, and seasonal tourism. The study highlights the need to factor in tourism and seasonal variations when developing future food waste quantification methods.

The 2022 research covers diverse supply chain topics. He, Gong and Hong (2022) explores how acquiring and disclosing demand information affects deteriorating items. Li, Shan et al. (2022) conduct a meta-analysis linking green supply chain management to green innovation through collaboration. Liu, Lee and Zhang (2022) examine pricing strategies in dual-channel supply chains with overconfident consumers. Qu, Zhang, Guo, Cao and Zhu (2022) propose decision strategies for reverse supply chains in electronic waste. Rahman, Paul, Shukla, Agarwal and Taghikhah (2022) review initiatives enhancing supply chain resilience. Wen, Xiao and Dastani (2022) study pricing and collection strategies with environmental responsibility. Zheng and Jin (2022) focus on relicensing in closed-loop supply chains, while Zheng, Shi, Pan and Wu (2022) analyze postponement strategies for standard and customized products. Ruskey and Rosenberg (2022) aim to minimize risks in Bayesian supply networks, and Kaviyani-Charati, Ameli, Souraki and Jabbarzadeh (2022) design sustainable supply networks for non-profit food banks. Collectively, these studies offer valuable insights for improving supply chain performance in various contexts.

39 researches are examples of supply chain research that has topics that are often discussed. Raj, Jauhar, Ramkumar and Pratap (2022) explored the use of blockchain smart contracts to improve procurement, traceability, and

advance cash credit (ACC) payments in supply chains. The proposed system enables decentralized, secure transactions without intermediaries, enhancing transparency and data integrity among suppliers, retailers, and 3PLs. Successfully tested on IDE Remix, the smart contract supports secure interactions, reduces cyber risks, and ensures accountability through features like authenticity, availability, and fault-proof payments.

Recent supply chain research highlights significant advancements in efficiency, sustainability, and security. Ioannou et al. (2022) emphasized the impact of tourism on food waste in island nations, calling for more precise waste quantification. Studies by He et al. (2022) to Kaviyani-Charati et al. (2022) explored topics such as demand information, green innovation, dual-channel pricing, electronic waste, resilience, environmental responsibility, and sustainable networks. Raj et al. (2022) notably introduced blockchain smart contracts to enhance procurement, traceability, and payment security, showing how technology can improve transparency and reduce risks in supply chain transactions. Overall, these significant findings reflect the evolving nature of supply chain research and its crucial role in addressing contemporary global supply chain challenges.

4.5. Inventory

Inventory studies were conducted in 19 research papers. Research on the Multi-Depot Inventory Routing Problem (MDIRP) was done by Bertazzi, Coelho, Maio and Lagana (2019). The study created a novel approach to finish MDIRP more quickly and efficiently. Using a new quantitative measure of a customer's critical inventory level, a new integer program is utilized to create customer groups in the first stage. The idea of intra- and inter-cluster routes is introduced in the second step. To find a workable solution to the issue, a new route-based mixed integer linear programming formulation is solved in the third stage. Using a large number of benchmark examples, the results will be compared to those obtained by applying the branch-and-cut technique without clustering to solve the mixed integer linear programming formulation of the problem within the same time restriction.

Inventory research across 30 studies emphasizes the vital role of integrated location and routing strategies in optimizing supply chain performance. Song and Wu (2022) compared the Location-Inventory Problem (LIP) and Location-Inventory Routing Problem (LIRP), revealing that LIRP is more cost-efficient, cutting transportation costs by 30.7% and reducing cargo loss by 69.4%. While LIP showed high dealer inventory and centralized order inefficiencies, LIRP proved more effective due to its routing decisions. Studies on Multi-Depot Inventory Routing Problems (MDIRP) also demonstrated improved efficiency using mixed integer programming and customer grouping. Overall, these findings highlight how inventory and routing decisions significantly enhance supply chain efficiency.

5. Research Gap

Using information on the volume of clients, demand, geographic locations, vehicle capacities, available vehicle types, and transportation costs, research Bevilaqua, Bevilaqua and Yamanaka (2019) employed a memetic algorithm for vehicle routing in the islands. The conclusions of this research on the routing problem are optimal. Forecasting for ambiguous data, such as the weather and sea waves, has not been done in this study. In studies Agra, Christianse and Wolsey (2022) and Cardenas-Barron and Melo (2021), inventory-based routing issues for delivery and receipt were investigated. In this investigation, a single vehicle that is altered in accordance with the timetable is used. Vehicles can only travel on one route that begins and ends at the same depot during each time period, according to Coelho, Maio and Lagana (2020) analysis of the inventory routing problem with multiple attributes. The routing issue with distribution uncertainty was addressed in Zhang et al. (2021) by the deadline. The study's three main uncertainty parameters are the request's location, transit time, and time of arrival. The issue of vehicle routing with multi-distribution is another issue with Pham et al. (2022). These models, which include parking lots, distribution sites, and customers, have various levels of accessibility.

Based on the previously used literature, there has not been any development of an algorithm for make a framework of fuel logistic distribution model in the islands using memetic algorithms and genetic algorithms that based on uncertain data such as weather data, sea waves, and ship availability. So that the science developed focuses on the distribution of logistics in the islands with the uncertain data.

6. Case Study and Discussion

However, this supply disruption occurs due to weather restrictions, such as high waves that prevent vessels from docking. One example is the inability of ships bringing product to dock due to strong waves. This has caused price fluctuation and instability in the supply of product for the neighborhood. In this case study, concerns about product supply chain dispersion, distribution modelling, and product scarcity and uncertainty in the islands will be discussed. The research variable for this study include:

1. Regional data
   Population data from 2020-2022 for each district (Jemaja, Jemaja Barat, Jemaja Timur, Siantan Selatan, Siantan, Siantan Timur, Siantan Tengah, Palmatak, Siantan Utara, dan Kute Siantan) serve as a proxy for fuel demand potential. For instance, Siantan shows a growing population from 11,668 (2020) to 13,531 (2022), while Palmatak declines significantly, indicating possible reallocation of distribution priority. These demographic patterns directly influence demand forecasting for fuel consumption.

2. Transportation data
   The number of fishing boats and speed boats varies widely across districts; for example, Palmatak has the highest vessel count (831 fishing boats and 97 speed boats), making it one of the most fuel-intensive areas for maritime activities. These variables reflect operational constraints for fuel delivery because vessel-based logistics depend on port access, sailing capacity, and weather exposure.

3. Fuel demand variables
   The available data provide estimated fuel needs for multiple consumer groups, such as motorcycles, fishing boats, heavy equipment, and solar-based individual users. For instance, Siantan Timur shows extremely high maritime fuel demand (4,073,215 units), while Jemaja Timur has substantial heavy-equipment diesel use (25,200 units). These values form the basis for modeling multi-segment fuel distribution needs.

In this case study, distribution knowledge is used for the product distribution system in the island. Distribution in the island is the focus of research so that a system that is orderly and in accordance with the conditions of the islands can be created. In the previous geographical origins research can show that most of the authors publish in the United Kingdom. This proves that there is no great interest in research in Asia, especially Southeast Asia. The result of this integration will be a system based on Business Intelligence. Previous research has not developed a logistics distribution model for the islands using memetic algorithms and genetic algorithms based on business intelligence. So that this case study of algorithm development for framework information system is one of the studies that has an interest in research on distribution, genetic algorithms, and island routes in Asia. Figure 6. illustrates the multi-layer K-Chart used in the case study to map the relationship between weather uncertainty, vessel availability, and fuel distribution processes across the island region. The chart organizes the problem into five analytical layers: issue, system, element, methodology, and result, to clearly identify how disruptions propagate through the logistics system.

The layers on the K-Chart discuss a number of layers, beginning with the issue layer (Cahyo, 2021), which discusses the issues raised in this Systematic Literature Mapping (SLM), namely supply chain management, and moving down to the system layer, which discusses the scientific domains used in each paper that has been gathered. There are three sciences at this layer, namely forecasting, scheduling, and distribution logistics. There are 14 different conceptual strategies that are frequently used to solve supply chain management challenges, and they are pursued in this problem utilizing the K-Chart. The Integrated Information System of Fuel Logistic Distribution was not the subject of any prior research, as can be seen in one of the findings provided by the method utilized. As a result, the result layer has an empty box value, indicating that this research is novel or distinctive from previous studies.

The logistical challenges faced by the island are exacerbated by weather conditions that hinder docking and disrupt the supply chain. To address these issues, the case study examines various aspects of supply chain management, including the dispersion of product supplies, distribution modelling, and the impacts of product scarcity and uncertainty specific to island settings. By integrating regional, transportation, and product data, the study aims to develop a robust distribution system tailored to the unique constraints of island logistics. To empirically demonstrate the proposed BI+GA+MA framework, a preliminary conceptual model was constructed, incorporating:

1. weather uncertainty parameters (wave height, wind speed)
2. vessel availability schedules
3. demand forecasting scenarios
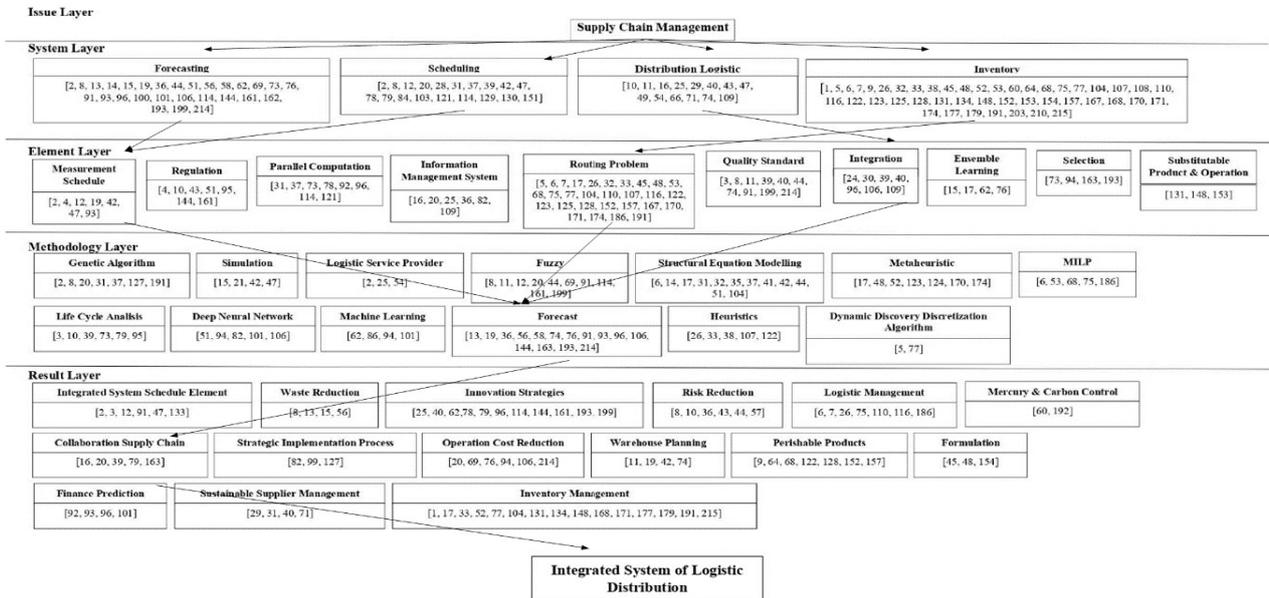4. routing optimization using GA and MA heuristics.

Figure 6. K-Chart Layer

These elements were integrated into a prototype BI dashboard to illustrate potential operational improvements. A simulation-based evaluation was conducted using hypothetical but realistic in. The study's novel approach lies in its application of business intelligence combined with memetic and genetic algorithms; a method not previously explored in the context of island logistics. This innovative framework, highlighted in the K-Chart analysis, bridges a significant gap in existing research, particularly in Southeast Asia. The use of these advanced algorithms for distribution modelling promises to enhance the efficiency and resilience of supply chains in island environments, addressing a previously unexamined niche in logistics research.

7. Conclusion and Recommendation

This study aims to demonstrate the use of Systematic Literature Mapping (SLM) as a research approach to identify emerging topics, research gaps, and methodological opportunities in island logistics. The mapping process revealed significant distinctions between previous studies, particularly regarding the use of optimization algorithms for routing and scheduling in geographically fragmented regions. Through this analysis, the research identified a clear novelty: while prior studies have applied memetic and genetic algorithms to vehicle routing problems, none have incorporated uncertain variables such as weather disruptions, sea wave conditions, and vessel availability, factors that are critical in island environments.

Based on these findings, this study proposes the development of a fuel logistics distribution framework that integrates uncertainty modeling with advanced optimization methods. Insights from the K-Chart analysis highlight how business intelligence tools, combined with memetic and genetic algorithms, can be leveraged to enhance the efficiency and resilience of distribution networks in island regions. This integrated approach addresses a previously unexplored niche in Southeast Asian logistics research and provides a foundation for more robust and adaptive decision-support systems.

Future research should expand this framework by validating it with real-world operational data, integrating dynamic weather forecasting, and testing alternative metaheuristic or hybrid algorithms. Further development of a full-scale

BI, enabled simulation dashboard is also recommended to assess system performance under various disruption scenarios. These extensions will strengthen the applicability of the proposed model and contribute to more resilient and data-driven logistics planning for island environments.

Declaration of Conflicting Interests

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