16th International Logistics and Supply Chain Congress

LMSCM2018

Future Trends in Logistics and Supply Chain Management

Book of Abstracts

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LMSCM 2018

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Surendra M. Gupta, Ph.D., P.E., is a Professor of Mechanical and Industrial Engineering and the Director of the Laboratory for Responsible Manufacturing at Northeastern University in Boston, Massachusetts, USA. He received his BE in Electronics Engineering from Birla Institute of Technology and Science, MBA from Bryant University, and MSIE and Ph.D. in Industrial Engineering from Purdue University. He is a registered professional engineer in the State of Massachusetts, USA. Dr. Gupta's research interests span the areas of Production/Manufacturing Systems and Operations Research. He is mostly interested in Environmentally Conscious Manufacturing, Reverse and Closed-Loop Supply Chains, Disassembly Modeling and Remanufacturing. He has authored or coauthored twelve books and approximately 600 technical papers published in edited books, journals and international conference proceedings. His publications have received over eleven thousand citations (with an h-index of 52) from researchers all over the world in journals, proceedings, books, and dissertations. He has traveled to all seven continents viz., Africa, Antarctica, Asia, Australia, Europe, North America and South America and presented his work at international conferences on six continents. Dr. Gupta has taught over 150 courses in such areas as operations research, inventory theory, queuing theory, engineering economy, supply chain management, and production planning and control. Among the many recognitions received, he is the recipient of outstanding research award and outstanding industrial engineering professor award (in recognition of teaching excellence) from Northeastern University as well as a national outstanding doctoral dissertation advisor award.

Michael G. Kay is Interim Director of the Graduate Program in Operations Research and Associate Professor of Industrial and Systems Engineering at North Carolina State University. He has degrees in economics and industrial engineering from the University of Florida, and he did his doctoral studies at NC State's Center for Robotics and Intelligent Machines. He teaches courses in production system design and logistics engineering and his research interests include logistics, metaheuristics, freight transportation, material handling, warehousing, and facilities design, and is currently focused on the development of home delivery logistics networks.He developed the Matlab toolbox Matlog to solving a variety of different logistics engineering problems, and has used it extensively in his teaching, research, and consulting. He has worked in the electric utility industry for three years on contested rate negotiations and his consulting experience has included logistics engineering projects with GlaxoSmithKline, GE, Caterpillar, Lowe's Home Improvement, Dollar Wholesale, and Circuit City. He developed a region-segmentation procedure that is a key component of an image surveillance system used by law-enforcement agencies worldwide, and has created scheduling algorithms that have been incorporated into commercial SAP-based plant maintenance software. He has directed an NSF/USDOT-sponsored project to develop public logistics networks and several AHFA-sponsored projects on strategic supply chain logistics for the furniture industry. He has twice been elected a member and is currently the President of the College–Industry Council on Material Handling Education, sponsored by the Material Handling Industry. He has published over 95 technical papers and is the coeditor of the books Multisensor Integration and Fusion for Intelligent Machines and Systems and Progress in Material Handling Practice.

Dr. Alexandre Dolgui is a Distinguished Professor (Full Professor of Exceptional Class in France) and the Head of Automation, Production and Computer Sciences Department at the IMT Atlantique (former Ecole des Mines de Nantes), France. His research focuses on manufacturing line design, production planning and supply chain optimization. His main results are based on the exact mathematical programming methods and their intelligent coupling with heuristics and metaheuristics algorithms. He is the co-author of 5 books, the co-editor of 16 books or conference proceedings, the author of 212 refereed journal papers, 25 editorials and 28 book chapters as well as over 400 papers in conference proceedings. He is the Editor-in-Chief of the International Journal of Production Research, an Area Editor of Computers & Industrial Engineering, and an Associate Editor of Journal Européen des Systèmes Automatisés, past Associate Editor of International Journal of Systems Science (2005-2008), IEEE Transactions on Industrial Informatics (2006-2009) and Omega-the International Journal of Management Science (2009-2012), consulting Editor of the International Journal of Systems Science (2009-). He is Member of the Editorial Boards for 25 other journals, including the International Journal of Production Economics, International Journal of Manufacturing Technology & Management, International Journal of Simulation & Process Modelling, International Journal of Engineering Management & Economics, Journal of Decision Systems, Journal of Mathematical Modelling & Algorithms, Journal of Operations and Logistics, Journal of Industrial Engineering and Management & Production Engineering Review, Decision Making in Manufacturing and Service, Risk and Decision Analysis, etc. Fellow of the European Academy for Industrial Management, Member of the Board of the International Foundation for Production Research, Chair of IFAC TC 5.2 Manufacturing Modelling for Management and Control, Member of IFIP WG 5.7 Advances in Production Management Systems, IEEE System Council Analytics and Risk Technical Committee, Guest editor of special issues of European Journal of Operational Research, International Journal of Production Research, International Journal of Production Economics, Omega – The International Journal of Management Science, Journal of Intelligent Manufacturing, Journal of Mathematical Modeling and Algorithms, and Annual Reviews in Control; he was General Scientific Chair of the 12th IFAC symposium INCOM'06, Chairman of International Program Committee of SCM'02, MOSIM'04, INCOM'09, INCOM'12, IESM'13, MIM'13, INCOM'15, IESM'17, GSC'18, MIM'19 and Chairman of Steering committee of MIM'16. Chairman of Organizing Committee of the International Conference MOSIM'01 and ROADEF'2011; last ten years, he was Member of Program Committees of over 200 International Conferences, etc.

Bahar Yetis Kara is a Professor in the Department of Industrial Engineering at Bilkent University. Dr. Kara holds an M.S. and Ph.D. degree from Bilkent University Industrial Engineering Department, and she worked as a Postdoctoral Researcher at McGill University in Canada. Dr. Kara holds "Best Dissertation Award" given by INFORMS - UPS-SOLA (2001), TUBA-GEBIP (National Young Researchers Career Development Grant) reward (2008), IAP Young Researchers Award (2009), and TÜBİTAK Young Scientist Incentive Award (2010).Dr Kara's current research interests include distribution logistics, humanitarian logistics, hub location and hub network design, and hazardous material logistics. She is currently an associate editor of IIE Transactions. Dr. Kara is also one of the founders and so one of the members of the current executive board of the EURO Working Group on Humanitarian Operations (HOpe).

PROGRAM AT A GLANCE

18 October 2018 / Thursday	09:00-10:20	**Opening Ceremony** *Hall Laodikeia*
	10:20-10:40	**Coffee Break**
	10:40-12:00	**Keynote Speaker:** Surendra M. Gupta "Reverse Supply Chains and Lean Manufacturing" *Hall Laodikeia* **Keynote Speaker:** Alexandre Dolgui "Replenishment Planning of Assembly Systems Under Uncertainty of Lead Times" *Hall Laodikeia*
	12:00-13:00	**Lunch**
	13:00-14:20	**Parallel Sessions** *Hall Laodikeia / Hall Hierapolis / Hall Afrodisias / Hall Colossae / Hall Apollonia*
	14:20-14:40	**Coffee Break**
	14:40-16:40	**Keynote Speaker:** Bahar Yetis Kara "Humanitarian Logistics" *Hall Laodikeia* **Keynote Speaker:** Michael G. Kay "Public Logistics Networks" *Hall Laodikeia*
	16:40-17:00	**Coffee Break**
	17:00-18:40	**Parallel Sessions** *Hall Laodikeia / Hall Hierapolis / Hall Afrodisias / Hall Colossae / Hall Apollonia*

19 October 2018 / Friday	09:00-10:20	**Parallel Sessions** *Hall Laodikeia / Hall Hierapolis* *Hall Afrodisias / Hall Tripolis*	**LECTURES** Tedarik Zinciri 4.0 Gülçin BÜYÜKÖZKAN *Hall Apollonia* Depo Tasarımı ve Yönetimi Mehmet TANYAŞ *Hall Apollonia*
	10:20-10:40	**Coffee Break**	
	10:40-12:00	**Parallel Sessions** *Hall Laodikeia / Hall Hierapolis* *Hall Afrodisias / Hall Tripolis*	**LECTURES** Deniz Taşımacılığının Temel Unsurları: Yük, Gemi ve Liman. Soner ESMER *Hall Apollonia* Lojistikte Optimizasyon Haluk CEZAYİRLİOĞLU *Hall Apollonia*
	12:00-13.30	**Lunch**	
	13:30-14:50	**Parallel Sessions** *Hall Laodikeia / Hall Hierapolis / Hall Afrodisias / Hall Tripolis / Hall Apollonia*	
	14:50-15:10	**Coffee Break**	
	15:10-16:50	**Parallel Sessions** *Hall Laodikeia / Hall Hierapolis* *Hall Afrodisias / Hall Tripolis*	**LECTURES** Stratejik Satınalma Yönetimi İsmail KARAKIŞ *Hall Apollonia* Lojistikte Kalite Aydan BİLGEL *Hall Apollonia*
	16:50-17:00	**Coffee Break**	
	17:00-18:00	**Turkish Cargo Sponsored Panel** Open Discussion on Future Trends in Logistics and Supply Chain Management *Hall Laodikeia*	
	18:30-19:30	**Transfer from Congress Venue to Richmond Pamukkale Thermal Resort**	
	19:30-23:30	**Gala Dinner and Concert**	
	23:30-00:30	**Transfer from Richmond Pamukkale Thermal Resort to Congress Venue**	

CONTENT

Paper Code: 9
A Comparative Study for Air Passengers of Turkey and Germany

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Abstract

Air transport is very effective sector for global growth estimates in terms of world trade, economic confidence and purchasing power in Turkey and rest of the world. With its location at the heart of Central Europe, Germany is an international air transport hub. There are aviation connections from Germany to every region in the world. An essential part of international transfer traffic in Europe is handled at German airports. Time management is inevitable nowadays with its effect on technological developments. With the increase of alternatives to improve the transportation of the people, people prefer the airway rather than the highway. Therefore, it is more important due to technological development and current trade trends. Through the rapid growth of the sector, Turkish government gives privileges to airway transportations. According to the budget planning, the highest share was given to the transport sector with 31%. In addition, in the 2015 Annual Program, the highest share (31%) of public fixed capital investments was awarded to the transport sector. In this context, it is possible to say that the air transportation sector has a special significance in the year 2015 policy planning. From this stand point, in this study air passengers in Turkey and Germany are examined via descriptive statistics and correlation analysis along with scatter plots. Moreover, forecasting air passenger for both Turkey and Germany is performed until 2020. A ratio is proposed to reveal difference between 2 countries. For findings, within last years (periods) this change points out a sharp decrease showing that Turkey's growth rate is more incremental than Germany. Hence, Turkey's capacity becomes closer to Germany's capacity.

Keywords

Data analyses, Descriptive statistics, Air passengers, Forecasting

Paper Code: 11

A Model for Supplier Selection under Environmental Considerations

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Abstract

PURPOSE Green supplier performance assessment and selection plays a critical role in establishing an effective supply chain management. The objective of the study is to propose a methodology to determine the most appropriate environmentally conscious supplier considering green and traditional criteria in filtration industry. METHODOLOGY In this study, two robust multi attribute decision making techniques, Intuitionistic Fuzzy AHP (IF-AHP) and PROMETHEE are utilized in combination to better address this selection problem. The criteria importance weights are determined via IF-AHP which enables the opportunity to handle the uncertainty within the evaluation process of decision makers. Afterwards, the obtained importance weights are used in the PROMETHEE method for the best ranking of the alternative suppliers. A case study in an air filtration company is presented to demonstrate the feasibility and effectiveness of the proposed methodology. RESULTS Five HEPA filter media suppliers (A,B,C,D,E) were determined but suppliers' names were not disclosed due to the confidentiality and privacy policy of the companies. The complete ranking of suppliers is determined by PROMETHEE II method according to the obtained data. As a result of the complete ranking with PROMETHEE II, the best supplier is identified as supplier E. Other suppliers are listed as C-B-D-A. CONLUSION The proposed model applied IF-AHP to calculate criteria weights and PROMETHEE technique to carry out a final ranking of alternatives. The application was realized in the filtration industry which is never studied in the literature.

Keywords

Green supplier selection, Green supply chain management

Paper Code: 13

Heuristic Approach for Two Echelon Vehicle Routing Problem with Simultaneous Pickup and Delivery

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Abstract

In recent years multi echelon distribution systems are widespread with hierarchical level strategies in distribution systems. Especially two-echelon distribution systems have positive effects on environment and traffic congestion. In this study two-echelon vehicle routing problem with simultaneous pickup and delivery (2E-VRPSPD) is considered. In this problem simultaneous pickup and delivery activities are conducted simultaneously only in the first echelon. First, we propose a node-based mathematical model and adapt four valid inequalities strengthen the formulation. Since the 2E-VRPSPD is an NP-hard problem, a heuristic approach based on variable neighborhood descent (VND) and local search (LS), called VND_LS, is developed. An experimental study is conducted to demonstrate the effect of the valid inequalities and performance of VND_LS. According to the computational results, valid inequalities have effect to strengthen the mathematical formulation and VND_LS is also efficient to obtain good solution for the problem.

Keywords

Metaheuristics, Simultaneous pickup and delivery, Two-echelon vehicle routing problem

Paper Code: 16

Supplier Selection based on Artifical Neural Networks

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Abstract

Supplier selection problem has received a great deal of attention from practitioners and researchers, because this decision has an important impact on achieving the target of the enterprises. Besides, the problem itself is complex and involves various criteria. This paper presents a 2-phase decision making methodology using artificial neural network which groups suppliers into 3 categories. At the first step evaluation criteria will be determined by decision makers and then the importance of the criteria and the rank of the suppliers' are determined. The model uses the decision makers' judgments as input and divides the suppliers in to three group which are good, neutral and bad. The proposed rule based model can be used as a decision support system while classifying the performance of a supplier.

Keywords

Supplier selection, Artificial neural networks, Decision making model

Paper Code: 17

Multi-Criteria Sorting of Third-Party Reverse Logistics Providers

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Abstract

Increasing environmental problems and the rise in electronic commerce have forced many firms to focus on the issues associated with reverse logistics which involves all the activities required for the collection and either recovery or disposal of products returned for any reason (e.g., warranty, end-of-life). If a firm builds its own reverse logistics network, it has to deal with various problems including the high fixed costs associated with sophisticated material handling equipment and the cost of the dedicated workforce required for the operation and maintenance of collection and product recovery facilities. Hence, an increasing number of companies avoid those problems by outsourcing reverse logistics operations to third-party reverse logistics providers. Evaluation and selection of third-party reverse logistics providers is an active research area. However, to the best of our knowledge, there is no study on the sorting of third-party reverse logistics providers. We fill this research gap by using a multi-criteria analysis technique called VIKOR for the sorting of third-party reverse logistics providers.

Keywords

Third party reverse logistics provider, Multi-criteria analysis, Sorting

Paper Code: 24

Mitigating Customer Initiated Warranty Fraud for Remanufactured Products in Reverse Supply Chain

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Abstract

A remanufactured product may perform as well as a new product; however the consumer may not perceive that as being the case. This shows up as a level of uncertainty in the mind of the consumer regarding the apparent quality of the remanufactured product, and might lead to a decision to opt out of buying it. Remanufacturers therefore feel the need to provide additional assurance to the consumer through the use of tools such as product warranties. In systems such as warranty servicing, which involve multiple parties, each with their own goals, motivations, and competing interests working together, it is inevitable that fraud will appear. Methods of tackling new product frauds have been proposed in recent literature. However, no significant literature exists relating to investigating issues related to fraud detection and prevention in the remanufacturing sector. The issue of warranty fraud arising from a warranty service agent has been recently addressed by Pandit and Gupta (2018) [1]; however the issue of remanufactured product warranty frauds arising from the customer has yet to be explored. Customer driven fraud is motivated by and can occur in more scenarios than service agent fraud and conversely there are fewer avenues available to penalize such types of fraud. As a result, mitigating problematic sources of fraud before they run rampant is of keen interest to the warranty provider. The advent of sensor embedded products allows for constant monitoring that might yet offer unexplored avenues to tackle this issue. This study aims to examine problems in the remanufacturing sector, and examines strategies available to the warranty provider to tackle fraud originating from the customer through the use of a simulated model example.

[1] Pandit, A., & Gupta, S. M., (2018).Warranty fraud in remanufacturing. Proceedings of the Global Interdisciplinary Conference: Green Cities, June 27- 30, Nancy, France.

Keywords

Remanufacturing, Fraud, End of life, Warranty substitution fraud, Supply chain

Paper Code: 27

Comparison of the Transportation Problem Initial Solution Methods

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Abstract

The transportation problem is one of the important problems in the field of operations research. This is an optimization problem that arises especially in the planning of the distribution of goods and services from different sources of supply to a certain number of demand points. The Transportation Problem concerns the transfer of products from a certain number of sources to a certain number of destination points with minimum transportation cost. At this point, transportation models are used to determine the minimum cost shipping plan to meet the customer's requirements under certain constraints. In this research, we compare the solution speed of the initial solution methods for this problem using 25 different data sets. Different methods are used to obtain the initial solutions. For optimal solutions, the well-known Stepping Stone method is preferred. MATLAB software is used to encode the specified methods. In the first stage, the initial solutions were created by the seven methods mentioned above. Subsequently, optimal solutions were obtained by applying the Stepping Stone Method to these initial solutions. The performance of the methods was evaluated using solution values and solution times. The best initial solution values were obtained with Vogel's Approximation Method, Russel's Approximation Method, Matrix Minima and Row Minima methods, respectively. The Row Minima, the Column Minima and the North West Methods provide best solution times, respectively, when both initial and final solution times are compared. When the second stage solution times are taken into consideration, it is seen that the optimal solutions can be found faster from the solutions obtained by the Vogel's Approximation Method.

Keywords

Transportation problem, Initial solution methods, Stepping stone

Paper Code: 28
Design Problems in Closed-Loop Supply Chain Networks with a Feedback Route for Recovered Materials

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Abstract
Mass consumption and depletion of resources have become serious global environmental problems. To address this, manufacturers of assembly products need to design an economical closed-loop supply chain (CLSC) network that determines forward and reverse logistics, that is, transporting assembly products from factories to markets and end-of-life (EOL) products from markets to recycling/disposal centers. There are two types of CLSC: with and without feedback of recycled materials to assembly factories. This study proposes a model for a CLSC network with the feedback route. First, the model of a logistics network is formulated using integer programming. Here, the total cost is minimized, including the transportation, route and facility opening, disposal, and recycling costs, while the target recycling rate is constrained. An example of a product and network scenario is presented and numerical experiments are conducted to validate the proposed model. Finally, two types of models—with and without a feedback route—are compared and discussed.

Keywords
Reverse logistics, Facility location, Opened and closed loop, Recyclability evaluation method, Integer programing

Paper Code: 29

Evaluation of Asian Supplier and Disassembly Parts Selections for Carbon Emissions and Costs

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Abstract

In recent years, global warming due to CO_2 emissions and the depletion of natural resources have become increasingly serious environmental issues facing the world. The recycling of assembled products can reduce the consumption of exhaustible materials and the CO_2 emission by avoiding the procurement of new materials. The CO_2 emissions produced from material manufacturing differ significantly between countries, as each country has a different energy mix (i.e., the combination of energy sources such as coal, natural gas, solar, wind, and nuclear power, among others). In general, emerging countries have higher CO_2 emissions and lower procurement costs, while developed countries have lower CO_2 emissions and higher procurement costs. Therefore, to reduce CO_2 emissions, the development of a supplier selection that is both low-carbon and economic should be achieved by procuring materials from suppliers in both developed and emerging countries. One of the methods to save natural resources is recycling parts from end-of-life (EOL) assembly products. Thus, selection for parts that are economic and low-carbon is conducted to select disassembled parts for recycling that can reduce CO_2 emissions in an economic manner. However, the low-carbon supplier selection and the disassembled parts selection were evaluated separately, although the CO_2 emissions of each step are different among the countries considered. This study evaluates two methods for supplier selection of procurement and disassembly parts selection during the recycling stage. First, a bill of materials (BOM) is prepared using Asian supplier selection with the 3D-CAD model and LCI database. Second, disassembled parts of the EOL assembly products from the BOM data are selected for either recycling or disposal using 0-1 integer programming with an ε constraint method. Finally, the results of the disassembly parts selection, in terms of CO_2 emission reduction and costs, are analyzed.

Keywords

Material circulation, CO2 reduction, Recycling, Assembled products, Life cycle inventory database

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Paper Code: 30
Effects of Carbon Trading System with Multi Criteria Decisions of Optimal Order Quantity and Best Supplier Selection

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Abstract

Since manufacturers require to pursue lower costs, materials and parts for assembly products are often produced and transported in global supply chain including both developed and emerging countries. However, the company discharges greenhouse gas (GHG) emissions when the materials are produced from natural resources on the supply chains. With regard to resolve global warming caused by GHG emissions, material-based GHG emissions needs to be measured and reduced in the global supply chain. Moreover, material-based GHG emissions are different among the countries due to energy mix for electric power. To reduce the GHG emissions, the government have introduced carbon tax and emissions trading system in many countries and regions such as Asia. Under the emissions trading system, the companies are quantitatively allocated the free emission credits by a government, and the companies with beyond or under the target GHG emissions can trade in an emissions trading market. These systems promote the low-carbon society to manufacturers by reducing GHG emissions. This study proposes a multi criteria decisions of optimal order quantity and best supplier selection by introducing the emissions trading system in Asia, and investigates the effect of the emissions trading system in procurement. First, a low-carbon and economic supplier selection method with an optimal order quantity considering the emissions trading system is formulated by using integer programming to minimize the total procurement cost and GHG emission. Next, numerical experiments are conducted to obtain the best supplier and the optimal order quantity for each part under the emissions trading system. Finally, the effect with and without the emissions trading system is discussed.

Keywords

Global warming, Cap-and-trade, Global supply chain, Asian life cycle inventory database, Bill of materials

Paper Code: 31

A Hyper-Heuristic Algorithm based on Simulated Annealing for Vehicle Routing Problem with Simultaneous Pickup and Delivery

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Abstract

Companies need to reduce their costs and work more efficiently with less cost in today's competitive conditions. This has forced firms to look for ways to be more productive in both in-house workspaces as well as distribution activities that have a very important place in the supply chain. Vehicle routing problems (VRP), aimed at obtaining optimal sets of routes for delivering customer orders, have wide application area in logistics and distribution management. Thus, solving VRPs reduce the distribution costs effectively. This study considers a variant of the problem called vehicle routing problem with simultaneous pick-up and delivery (VRPSPD) in which customers have both delivery and pickup demands. The VRPSPD deals with optimally integrating goods distribution and collection when there are no precedence restrictions on the order in which the operations must be performed. Because of the NP-hardness of the VRPSPD, different heuristic approaches have been proposed in the literature to solve the problem. Recently, hyper-heuristics, which explore the space of heuristics rather than the solutions, have emerged as a powerful approach to produce high-quality solutions within limited computational times for a broad range of hard problems. In this study, we propose a hyper-heuristic algorithm based on the simulated annealing (HH_SA) for the VRPSPD. To the best of our knowledge, this is the first attempt to apply a hyper-heuristic algorithm in solving VRPSPD. An experimental study on different benchmark problem instances is conducted to evaluate the performance of the proposed HH_SA. The computational results indicate that the HH_SA exhibits competitive performance in comparison with the heuristic approaches in the literature.

Keywords

Logistics, Vehicle routing problem, Simultaneous pickup and delivery, Hyper-heuristic, Simulated annealing

Paper Code: 32

Forecasting Annual Passenger Number for Air Travel

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Abstract

The number of air travel passengers is increasing rapidly by time. This is due to the fact that time is getting more valuable and costly in business life and supply in air travel is increasing. When there is an increasing trend in a process, it needs more effort to control and plan the future of that process. In addition more costs may be incurred due to inaccurate forecasting and false data. Similarly, for the increasing trend in air travel passengers, effective and accurate forecasting is necessary. In order to make effective planning for airline companies and airport terminals and to supply sufficient quality in air travel, forecasting future passenger numbers is important. Future passenger number will give the demand for air travel. This demand should be satisfied by the supply of airline companies. Therefore, for planning the number of flights, the type of aircraft which are part of capacity and logistics decisions of airline companies, it is important to determine future demand in air travel. In this study, domestic passenger numbers from 2003 to 2016 in Turkey are analyzed. Linear, exponential, logarithmic, polynomial regression methods and Holt's method are applied. These methods are compared according to mean absolute percentage error and the methods which fit the data in the best way are selected. Forecasts for passenger numbers in 2017, 2018, 2020 and 2025 are computed using the selected methods.

Keywords

Regression, Holt's method, Mean absolute percentage error

Paper Code: 33

Bi-directional Cause and Effect Relationship between Competitiveness and Logistics Performance of Countries

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Abstract

In this study, the link between competitiveness of countries and their logistics performance is investigated. For this purpose, a hybrid methodology is proposed. Initially, the causal directions between competitiveness of countries and their logistics performance are set up by using a Bayesian Net (BN) and then the cause-effect information gathered from BN is taken as input in a Partial Least Square Path (PLS) Model to highlight which competitiveness components are more critical in contributing to the logistics performance of countries. As a last step; importance-performance map analysis (IPMA) is conducted to specify to specify the pillars that have high importance but that show low performance and hence to provide a roadmap to the governments. BN is a special type of causal map that, represents probabilistic relationships between multiple variables and is especially useful in modeling uncertainty in a domain. PLS, on the other hand, is a structural equation modeling approach to model the relationships between latent variables and requires minimum assumptions about the statistical distribution of data sets and it is based on maximizing the explained variation among various constructs. IPMA extends the results of PLS path modeling by taking the performance of each category into account. Throughout the study, two basic indexes are used: (1) The Global Competitiveness Index (GCI) is used to track the performance of countries, and (2) Logistics Performance Index (LPI) is used to analyze the logistics performance of the countries. According to the results, the most important pillars that affect the logistics performance of a country are found as: "Business Sophistication", "Financial Market Development", "Infrastructure" and "Market Size".

Keywords

Global competitiveness, Logistics performance, Bayesian net, PLS

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Paper Code: 36

A Capacitated Vehicle Routing Problem due to Production Scheduling with Time Windows, Shifts and Precedence for Simultaneous Pickup and Delivery of Contract Manufacturers of an Electronic Company

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Abstract

Vestel Electronics has many subcontractors (contract manufacturers) in Manisa which are responsible for picking up the semi products and the delivery of products both partially and independently. In the current system, according to the production schedule of Vestel, truck of each subcontractor arrives to the gate of company first and if the arrival time meets the given appointment time, the truck can enter the company field through the security check and moves to the depot ramps (loading docks) for loading or unloading. On time delivery of the outsourced materials with minimum logistic costs is one of the main objectives of Vestel Electronics. In this paper we represent a model to reduce the logistic costs by combining shipments from different suppliers in order to reduce the transportation cost and vehicle traffic in the gateway and ramps. Also model looks for priorities of suppliers to catch just in time production needs. Another objective is to pick up and deliver materials simultaneously, using minimum number of vehicles and find the shortest path within the determined time window and shifts in order to increase vehicle utilization and reduce transportation cost. The Vehicle Routing Problem (VRP) is a well-known optimization problem in operational research that searches delivery routes to meet requirements or constraints with minimum transportation cost. VRP with Time Windows involves pickup and/or delivery of goods or services which can begin within the time window defined by the earliest time and the latest time when customer permits the start of service. Vestel's case is defined as heterogonous fleet vehicle routing problem with time windows (hard time window) and simultaneous pickup and delivery. A mixed integer linear programming model is proposed for pickup and delivery processes of materials, outsourced from subcontractor in order to minimize logistic cost and vehicle traffic. The result of the model shows that inefficient shipments managed by subcontractors are avoided, numbers of vehicles are decreased and utilization rate of each vehicle is increased moreover vehicle traffic is reduction in the gate and ramps.

Keywords

Vehicle routing problems, Vehicle routing problems with time window, Vehicle routing problems with simultaneous pickup and delivery, Mixed integer programming

Paper Code: 37
An Exact Solution Approach for Two Echelon Location Routing Problem with Simultaneous Pickup and Delivery

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Abstract

Recently, companies have started to use intermediate facilities in their freight transfer, since direct distribution from main depots to final customers in urban areas is not cost efficient. The distribution system using intermediate facilities in delivery activities between main depots and customers is called two-echelon distribution system. This study addresses Two-Echelon Location-Routing Problem with Simultaneous Pickup and Delivery (2E-LRPSPD) encountered in this kind of systems. The 2E-LRPSPD deals with optimally locating primary (main depots) and secondary (intermediate) facilities, and performing the pickup and delivery activities simultaneously by the same vehicle through main depots to intermediate facilities in the first echelon and from intermediate facilities to customers in the second echelon. Beverage industry and grocery store chains can be given as examples for application areas of the problem. In this study, we firstly propose a two-index node-based mixed integer programming formulation and then develop a branch and cut algorithm using some valid inequalities to solve the problem. An experimental study is carried out to evaluate the performance of the solution approach on the instances derived from the literature. The computational results show that the proposed approach provide better results compared to LP/MIP Solver CPLEX in reasonable computation time.

Keywords

Logistics, Two-echelon location-routing problem, Simultaneous pickup and delivery, Exact solution approach

Paper Code: 44

A Comparative Analysis of Passenger Transportation in Cities Considering Green Transportation

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Abstract

Transportation is very important for creating livable cities and urban design. Green (eco-friendly) transport must be considered first to talk about smart transportation. Green transportation options not only make our lives easier but also reduce congestion and our dependency on cars & foreign oil. It is safer & less costly which contributes saving the planet. The aim of transportation companies and legal authorities of the region should be to design a sustainable and eco-friendly transportation system for especially public transportation. In this study, we first summarize green transportation modes by explaining the advantages and disadvantages. Next, we compare the transportation modes in terms of energy usage for sustainable and green transportation planning of cities. We explain details of the alternative precautions to design more eco-friendly transportation systems inside the cities. In the last part, two examples for Turkey and Canada are given to clarify the importance of using eco-friendly public transportation systems.

Keywords

Bus Transportation, Green Transportation, Public Transport Modes, Rail Transportation.

Paper Code: 45

An Inventory Control Problem in an Emergency Department of a Hospital

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Abstract

Inventory control is one essential lever to use the resources efficiently. Especially, in hospitals, inventory control problem is a challenging task because of the several issues: a high service level of medical supplies are required under the unpredictable demand, medical products constitute a significant portion of the overall costs, and the management of these supplies requires considerable effort to check the levels, to track usage and to distribute them. Therefore, it is pertinence to apply Operations Research tools to cope with the managerial issues of the hospital inventory system. In this study, we focus on an (s, S) inventory control problem in an Emergency Department (ED) of a hospital in Izmir. Our aim is to manage the medical supplies inventory at the ED of the hospital, efficiently. We model the system by using simulation and optimize the (s, S) levels by considering that there is a pre-defined customer service level constraint (i.e., 95%) in the system. We aim to minimize the amount of medical supplies carried in the hospital by considering this constraint. First, we analyze the unpredictable nature of the demand (i.e., medical supplies) and then incorporate this demand in the simulation model. It is assumed that the demand is stochastic, and ED has a finite capacity for medical supplies. We utilize Arena 14.0 commercial software for the modelling purpose and OPTQuest tool in this software for the optimization target.

Keywords

(s, S) inventory, Emergency department, Hospital inventory

Paper Code: 50

Multi-Criteria Decision-Making Model for Analysis of Product Designs

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Abstract

Organizations are becoming aware of the environmental impact due to the disposal of product wastes. Governments have started to impose rules and regulations on Original Equipment Manufacturers (OEMs) to make them responsible for processing their products at the end of their lives. Reuse, remanufacturing, recycling and disposal are some of the widely used End-Of-Life (EOL) product recovery options. Disassembly is an important process that is almost always performed before any of the EOL product recovery processes. If a product cannot be reused, then remanufacturing is perhaps the next most environmentally friendly recovery process. There are several uncertainties related to the quality, quantity, and conditions of the components in the returned EOL products. Embedding sensors and RFID tags in the products at the time of their production help in reducing these uncertainties by constantly monitoring their conditions during their use phase. The information captured by these devices help in estimating the remaining lives of the components. Optimal product recovery decisions can be made once the remaining lives of components are known. Product design, apart from remaining lives can also affect the optimal product recovery decision. A product needs to be designed in such a way that it can ease the process of disassembly and remanufacturing at the end of its life. This paper identifies and discusses various qualitative and quantitative characteristics of a product's design such as size and shape of the product, and materials used, which can lead to a more favorable product recovery at the end of its life. A model is proposed to evaluate characteristics of the product using linear physical programming which is a multi-criteria decision making technique. The designs are evaluated based on multiple criteria such as total profit, quality level, and number of disposed items, to determine a favorable design option. A numerical example is provided to illustrate the methodology.

Keywords

Product recovery, Disassembly, Remanufacturing, Multi-criteria decision making, Product design

Paper Code: 51

Use of a Robust Optimization Approach in Designing a Closed-Loop Supply Chain Network

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Abstract

This paper addresses the design of a Closed Loop Supply Chain (CLSC) network where the impact of government regulations on carbon (generated during the production processes and the transportation activities) is considered. CLSC is a result of the integration of forward and reverse supply chains. We consider multiple manufacturers, remanufacturers and collection centers with only a single distributor and a single disposal center. To ship the product between the facilities in the CLSC, multiple transportation alternatives are evaluated where each one has a different carbon emission rate and load capacity. Due to the uncertainty in the demands of new products, remanufactured products and number of returned products, a scenario-based robust optimization model is proposed. In the proposed model, the design variables include the number of facility centers to activate (viz., manufacturers, remanufacturers, collectors) while the control variables include the number of new and remanufactured products to produce and ship in the CLSC. Due to variability in demands, product substitutions are allowed for the remanufactured products. Here, one-way substitution is considered where a new product may be substituted for the shortage in demand for a remanufactured product (downward substitution). For the carbon emission regulation, we consider the carbon tax policy, in which a financial penalty is incurred due to carbon emission from production and transportation activities over the planning horizon. For the analytical part, we study the impact of carbon emission regulation on the substitution rate and the impact of the substitution on the design of the CLSC network.

Keywords

Closed loop supply chain network design, Downward substitution, Carbon tax policy

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Paper Code: 53

A Relational Analysis of the Performance Measures for Logistic Firms Under Uncertainty: A Case of Turkey

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Abstract

Performance evaluation is one of the most important issues for organizations since it has effect on many managerial decisions. It also has strategic importance since a good performance measurement and management system enables firms to have competitive advantage. There are many developed methods and techniques used for the performance evaluation of logistic operations. One of the important points in performance evaluation system is revealing the relationships among the performance measures and also prioritizing them which requires an in-depth analysis. This study presents an analytic method named Decision-Making Trial and Evaluation Laboratory (DEMATEL) for analyzing the causal relations among the performance measures and revealing the degree of relation or the strength of influence analytically. Since this method takes into consideration the subjective judgements of the decision makers, it contains uncertainty due to inappropriate human judgments and imprecise information. In order to represent this uncertainty, the grey and fuzzy extensions of DEMATEL method are handled in this study. The two extensions of the method are successfully applied for the relational analysis of the performance measures of a Turkish logistic firm and also the comparison of the obtained results is presented.

Keywords

Logistic performance, Uncertainty, Relational analysis, DEMATEL

Paper Code: 54
Societal Marketing Approach in Logistic Firms: Analyzing Corportate Social Responsibility Initiatives of Logistic Firms in Turkey

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Abstract
Managers are increasingly adopting societal marketing approach and so corporate social responsibility today. The main reason underlying this tendency is to contribute to society as a whole, as well as gaining profits. When the potential damages that will be given to environment and society by logistics operations are considered, logistics managers are also regarded as the ones who have to take social responsibility approach into account. However, to what extent Turkish logistics companies engage in corporate social responsibility activities have not been examined in detail yet. Thus, to provide insight about the current conditions of logistics companies in Turkey in terms of adopting corporate social responsibility initiatives, this study aims to depict the extent and nature of corporate social responsibility activities of Turkish logistics companies. The findings of the study present that there is a positive relationship between the extent of the corporate social responsibility activities of the logistics companies and their brand awareness.

Keywords
Societal marketing, Corporate social responsibility, Logistics firms

Paper Code: 55

Multi-Criteria Disassembly-To-Order System for Components and Materials with Limited Supply, Stochastic Yields and Quantity Discount

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Abstract

To save consumption of natural resources, it is essential to promote reuse and recycling of assembly products environmentally friendly and economically. For reuse and recycling, end-of-life (EOL) products are received from multiple suppliers with quantity discount. Then, the EOL products are separated into each component by disassembly operations. Each EOL product is consisted of different components and involved stochastic disassembly yields due to uncertainties of EOL statuses. In order to satisfy the components and materials demands environmentally friendly and economically, a disassembly-to-order (DTO) system should be designed to achieve multi-criteria such as profit, purchase EOL products, outside procurement components and disposal costs. However, the maximizing profit does not always ensure the minimizing those costs since the profit is defined as a difference between the sales of components and materials revenues and a sum of a variety of costs including disassembly, holding, recycling costs. Therefore, the research question is how to determine the number of purchased EOL products for disassembly from each supplier and of processed components for reuse and recycling in order to fulfill the demands of components and materials while achieving multiple criteria simultaneously. This study proposes a solving method for the multi-criteria DTO system problem, which determines the optimal purchased combinations of different EOL products in order to satisfy the demands of components and materials with the stochastic disassembly yields, by using linear physical programming (LPP). By adopting LPP, a decision maker is removed from the weight allocation processes for solving a multi-criteria problem with single objective function. The proposed DTO system is formulated by using LPP to find satisfied solution. A numerical experiments are conducted to demonstrate a design method.

Keywords

Linear physical programming, End-of-life products, Multi-criteria decision making problem, Reverse supply chain, Recycling

Paper Code: 56

Forecasting in Reverse Logistics: Grey Prediction Model for Reused Materials

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Abstract

Nowadays, recycling, reusing, remanufacturing or reconditioning of used products and materials is becoming a crucial activity for green logistics. Re-use provides a flow of goods back to the manufacturer from the users. In "reverse logistics", the company should make strategic decision-making for re-used materials. These decisions are for the future and the level of uncertainty of these decisions is very high. The estimation periods of products that can be reused at this stage can become complicated. Uncertainties regarding the quantity, timing and quality level of returned products in "reverse logistics" systems make it difficult to determine the location, capacity determination, production planning and inventory decisions. In order to overcome these difficulties and to reduce the uncertainties relatively, it is necessary to determine the time and amount of returns or amount of re-used materials and to determine the uncertainty and risks of business management in reverse logistics. Grey prediction method is a predictive model that can be used with limited number of data. Also, grey prediction method is good at uncertain systems, with knowledge that is partly known through the production of available information. With using grey prediction method based on amount of re-used products for Turkey, it is aimed to reduce uncertainty for the country. In this study, it is aimed to predict the yearly reused amounts of products of Turkey and to make a forecast for the next years to reduce uncertainty for the country. Reducing uncertainty in the amount of re-used materials is the key point in this study. Although, the re-used materials data is limited for countries, grey prediction method is useful to work with less data. Therefore, prediction of amount of re-used materials is essential for countries in order to eliminate uncertainities.

Keywords

Grey system, Recycling, Green logistics

Paper Code: 58

Evaluation of Shipping Scheduling Method Considering Shortage and Disposal in Logistics Warehouse of Apparel Products

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Abstract

In apparel supply chain, there are many kinds of products due to differences in color and size, and it is necessary to sell them during the season. On the other hand, the inventory space of stores is limited, so it is important to decide the shipping timing from the logistics warehouse to stores. However, because in the apparel industry the same products aren't sold every season, it is difficult to predict the demand. Therefore, it is better to modify the initial shipping plan after actually selling the product. In many cases, modification of the shipping plan was performed by humans. However, there are many types of apparel products, so there are limits to manually modifying shipping plans. As a way to modify the shipping plan for apparel products, there is Quick Response (QR) which has demand-driven characteristics. QR was first implemented in the middle 1980s by American apparel supply chains (Fisher and Raman (1996), Choi and Sethi (2010)). In the basic QR, a retailer sends POS data to its supplier, who then uses this information to improve demand forecasting and adjust schedules. Tsukagoshi et al. (2016) proposed a flexible ordering strategy at a retailer to change demand with QR. On the other hand, Tanaka et al. (2018) identified that the products whose shipping plan should be modified is a QR type product and it decided the shipping timing on the basis of inventory data in the logistics warehouse. Furthermore, opportunity loss due to shortage can be reduced if similar products are shipped at the same time. However, disposal of remaining apparel products at retailers becomes large, and it causes environmental problems. The aim of this study is to extract shipping pattern and evaluate appropriate timing to modify the initial shipping plan by analyzing. In this study, opportunity loss and disposal are simultaneously considered.

Keywords

Apparel supply chain, Shipping schedule, Environmental factor, Shipping record, Just-in-time inventory

Paper Code: 59

Machine Replacement Scenario Analysis: A Case Study of Food Industry

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Abstract

Machine replacement is one of the major problems for a maintenance department. One of the trends in food consumption is the use of ready-to-eat meals. In Asian countries most meals are an integration of a major part of rice with minor parts of vegetables and/or meat. With ready-to-eat manufacturers, the rice cooker is an important machine to produce rice as a main ingredient. Our objectives are to estimate the lifetime of parts of an automatic rice cooker and to determine when to replace the parts by scenario analysis. We study the worst cast, best case, average case and simulation for two situations: before and after Total Productive Maintenance (TPM) implementation. The input parameters include the lifetime and cost of 30 parts of a rice cooker. For the purpose of a simulation analysis, the lifetimes of the parts are considered to be random variables according to a probability distribution determined by a simulation software. The output of the simulation is the total maintenance cost of the parts replacement between one and ten years. In other cases, the lifetimes of parts are determined based on a scenario such as minimum, maximum and expected value of lifetimes according to the historical data and supplier data. The result shows that the average case model after TPM implementation is the best estimator with 10.55% difference to the actual maintenance cost. The simulation after TPM implementation is the second best method with 16.97% difference. It implies that the TPM implementation is able to lengthen the part life and results in maintenance cost reduction. In addition, the inventory of parts is categorized by means of ABC classification. It helps to allocate the resources to monitor the right parts. In summary, the average case analysis should be implemented to determine when to replace a part and to estimate the maintenance cost of rice cooker. In the future, this model might be used as a decision support system for investment of different types of machines.

Keywords

Machine replacement, Simulation, Scenario analysis, TPM, Inventory classification

Paper Code: 60

Effect of Robust Optimization Approach on Multi–player Multi–objective Production Planning Problem Using Linear Physical Programming

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Abstract

Each player in the supply chain needs to optimize two or more objectives simultaneously. Furthermore, in decision–making regarding products offered throughout the supply chain, the profit of the entire supply chain is determined by the degree to which each player sets its level. However, the objectives under consideration conflict with each other, and optimizing a solution with respect to a single objective can result in unacceptable results with respect to the other objectives. Goal programming (GP) is one of the methods to optimize two or more mutually opposite linear objective functions with desirable target values simultaneously under the constraints. However, real–life problems often include not only linear functions but also nonlinear functions. Linear Physical Programming (LPP) has the similar structure of the GP extended to nonlinear. LPP has the piecewise preference functions of them to approximate the nonlinear preference functions by using the several-stage preference ranges. However, LPP has been applied only to multi–objective problems of single decision maker. In this study, a model of multi–player multi–objective decision making is designed by using LPP. Improving the sum of the preference functions of all decision makers can cause the bias of the sums of the preference functions among decision makers. Yatsuka et al. (2018) extended LPP to multi–player with robust optimization to keep balance of the sums of the preference functions. However, both of improving the sum of the preference functions of all decision makers and keeping balance of the sums of the preference functions among decision makers need to be achieved simultaneously. In this study, it is possible to give each decision maker balanced choices by giving a set of solutions satisfied by the decision makers.

Keywords

Supply chain management, Multi–player decision making, Nonlinear objective functions, Preference functions

Paper Code: 61

Plant Protection Products 2D Code Tracking System and an Application

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Abstract

Plant Protection Products (PPP), means a pesticide product used to prevent or control any harm during the production and processing of agricultural food products. The Plant Protection Products Tracking System is a system that includes computers, databases, computer software and communication infrastructures that are used to manage plant protection products that have been provided with traceability with data codes, which are established to follow the notifications from every point of production or importation. The 2D code is a 2D barcode that can be printed in square or rectangular shapes. Compared to normal barcodes, 2D codes having much more storage capacity and data rate of the facility, was first used in pharmaceutical boxes and packaging in Turkey. Each unit is a unique code that is uniquely formed to represent the product. It is planned that the usage stages of PPP, storage and distribution will be traceable with the application of "Plant Protection Products 2D Code Tracking System" which has been passed by the T.C Ministry of Food, Agriculture and Livestock on January 1, 2018 and at the same time it is planned to prevent public health and substandard production. Within the scope of this study, the operation process will be explained through a software developed by creating a conceptual model of Plant Protection Products according to the 2D Code tracking system.

Keywords

Plant protection products, Tracking system, 2D code

Paper Code: 63

The Study of Cold Storage and Temperature Controlled Transportation: A Case Study of a Chain Restaurant in Thailand

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Abstract

The safety and quality of agricultural raw materials is important in food service industry because raw materials are temperature sensitive and perishable. Hence, they should be stored in a cold storage and temperature-controlled truck to maintain the quality and safety. This study investigates the current cold chain management of a chain restaurant. The objective is to identify the problems and suggest how to establish the proper cold storages and temperature-controlled trucks. The scope of study is a restaurant having nine branches, two refrigerated containers (20 feet) for storing raw material and three temperature-controlled trucks for sending raw material to each branch. We conduct in-depth interviews with restaurant owner and operators and check the temperature in cold storage and during transportation of raw material by using infrared thermal camera and data logger to identify the problem. Then, we analyze the causes of the problem and suggest solutions for the improvement such as the design of cold storage and delivery platform. In summary, this research will be beneficial to other cold storage and temperature-controlled truck users. It can enhance the cold chain efficiency and food safety as well as energy and cost saving.

Keywords

Cold chain management, Cold storage, Temperature-controlled truck, Restaurant, Energy saving

Paper Code: 64

Analysis of Software Implementation in a Thai Restaurant with Food Delivery

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Abstract

At present, food service business in Thailand has an increasing trend about 4-5% from 2017 with the expected volume of 41.1-41.5 billion baht in 2018. Due to life styles change, people prefer to eat out for convenience. Meanwhile, the volume of food delivery is about 26-27 billion baht in 2017 since its service satisfies the customers who need convenience as well. This research aims to analyze the business processes of a Thai restaurant which uses both POS and food delivery service application and to identify the problems and needs for a software platform. First, we conduct the in-depth interviews with a restaurant owner and survey how software is exploited in the restaurant. Next, the Integration Definition for Function Modeling (Idef0) was used to analyze the business processes. We found that there are two separated platforms: point of sale (POS) system and delivery system. The delivery data is not included in POS system, thus the analysis of customers cannot be integrated. Hence, we suggest the government to encourage the software provider to integrate the POS and delivery systems to enhance the information flow and efficient management in forecasting, inventory and production planning.

Keywords

Food delivery service, POS, IDEF0, Restaurant

Paper Code: 65

Analyzing the Relational Drivers of Suppliers' Sustainability Compliance

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Abstract

The difficulty of monitoring the suppliers that have dispersed geographically inhibits the standardization of buyer companies' sustainability practices across their supply chain. Although companies have followed different strategies to ensure sustainability among its suppliers, the literature provides little understanding on the effectiveness of these strategies. Among those diverse strategies, the current study particularly focuses on the relational foundations of buyer-supplier sustainability integration. Following the Kohlberg's moral development model and (neo)institutional theory, the study proposes that a supplier's sustainability compliances depends on its level of moral development; a supplier at the conventional stage might primarily seek the approval of major actors in its own setting - – such as its buyer, government, certification institutes, competitors etc. – to involve more into the sustainability activities. By analysing this process through the mimetic isomorphism path, the current study attempts to address whether and how buyers effectively use the relational strategy towards their suppliers. The study attempts to explore the proposed links between moral and institutional drivers of sustainability compliances by conducting several semi-structured interviews on a sample of suppliers, which are selling their products to multinational companies and operating in Turkey. The results of qualitative study reveals the high level of congruence between moral and institutional drivers at the supply chain context. The study contributes to the literature by providing a viable theoretical framework to comprehend the multifaceted nature of buyer-supplier relationship and some useful insights for the practitioners to strengthen their relations along the supply chain.

Keywords

Sustainable supply chains, Institutional theory, Isomorphism, Ethics, Sustainability

Paper Code: 68

Bayesian Decision Making for Hybrid System with Classifying Returns

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Abstract

Reverse supply chain comprises sequences of activities required to recover a used product from a customer to manufacturer. Product recovery management deals with the collection of used and discarded products and explores the opportunities to remanufacture the products, reuse the components or recycle the materials. Remanufacturing of used products is one of the most desirable opportunities among the product recovery choices. Remanufacturing is an industrial process in which used products are restored to "like-new" conditions. In this research we consider a hybrid manufacturing/remanufacturing system for a single remanufacturable product and model the hybrid system as an open queueing network (OQN) with a stochastic return of used products and demand. In remanufacturing systems it's critical to coordinate the recovery operation and disposal decisions of the inducted cores satisfy non-stationary demand. The classification of the return products and associated decisions provide substantial cost savings originated from the remanufacturing operations and also it prevents lessen the value of the return products. To this end we utilize Bayesian approach in dealing with return and recovery rate uncertainties of the remanufacturing system. In Bayesian updating procedure recently obtained data is pooled with the formerly existing data about the parameter that we interested. We have analyzed the effect of recovery rate adjustment on the profit function and other system performance measures with various stages of product life cycle of the recoverable product. To capture the full characteristics of the model we utilize the demand and return rates during a typical life cycle of a remanufacturable product.

Keywords

Reverse supply chain, Remanufacturing, Bayesian update, Queueing network

Paper Code: 74

Comparison of Studies on Retailing in the World and Turkey between 2008 -2018 : A Bibliometric Study Abstract

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Abstract

Background: The number of bibliometric analyses which are being used for researching accumulative scientific studies about a specific subject in the sense of quality and quantity rises each day in Turkey and the world. Aims: This study carries out bibliometric analysis of the journals which has a place among international indexes and which are produced in Turkey are evaluated. Retailing journals in Web of Science (WOS) and JCR databases are scanned and listed according to their impact factor. Also journals from Turkey are the ones that were scanned through official social sciences database ULAKBIM site. Journals' domains are both products and services, the supply chains and distribution channels which serve retailers. This study aims to specify research topics which are featured in retailing. Study's other objective is to determine the place of Turkey's retailing literature in international citation indexes. Methods : In this study; highly inspected retailing fields in the last decade in retailing journals, the writers of publishings, the most studied countries, the most cited publications, Turkey sourced publishings and the features of these studies are analyzed. In addition word count analysis of figuritive title expressions is conducted utilizing MaxQDA, that is a world leading software for qualitative research. Conclusion: Results of the study are findings which determine the differences and similarities of topics that are studied in Turkey and in other countries around the world. Considering the fact that these findings put development stages of retailing forth, results are significant. The results are essential for researchers as well regarding the conditions and tendencies in retailing field lately and which fields need to be studied in the future.

Keywords

Retailing, Bibliometric, Turkey, Maxqda

Paper Code: 79

The Impact of Three-Dimensional Printing Technology in Logistics

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Abstract

Nowadays, 3-dimensional technologies which we often hear with applications in many different sectors, are divided into 2 classes, virtual and physical technologies. Simulation, computer modeling and modeling of scanned objects enter into the class of virtual technology and the conversion of these models into physical objects with 3D printers is in the physical technology class. Customized high-value products with 3D writing technology; low energy usage, low carbon footprint, low inventory volume and more streamlined physical operations makes systems more productive. This new production technology is expected to have a significant impact on the logistics industry due to lower inventory levels and lower storage requirements, as more end-products are more fully customized, resulting in more frequent orders. In this study, the future effects and the potantials of 3D writing technology, which effects and which is expected to create effects in many different sectors such as automotive, home appliances etc. in the process from design to modeling, is discussed for the logistics.

Keywords

Additive manufacturing, 3D printing, Supply chain, Logistics

Paper Code: 80

A Literature Review on Success Factors And Methods Used In Warehouse Location

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Abstract

The fact that the production and consumption amounts are different from each other gives a dynamic feature to the concept of storage. In addition, an effective storage activity hinges upon the selection of the right warehouse location that takes into account capital and labor investments; minimizes the transportation cost and time. The aim of this study is to investigate the preliminary researches in the selection of the warehouse location and to present information on which success factors and methods are preferred. Within this scope, many academic studies have been examined by filtering various databases. According to the results of the study, the most used methods in warehouse location selection are multi-criteria decision making methods such as AHP, ANP and TOPSIS; and the most commonly used success factor is determined as the cost-based factors.

Keywords

Warehouse, Location selection, Logistics

Paper Code: 81

A Literature Review on Aircraft Maintenance Routing Problem

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Abstract

The airline industry which is projected to grow at an annual average rate of 3.7% globally in the period of 2016-2034 is a challenging sector for companies that want to have a market share. The strong position in the market can be achieved by reducing many of the costs, such as personnel expenses, fuel expenses, professional service purchases, aircraft rent and depreciation expenses, airport fees, maintenance material costs. Because these costs are a consequence of the problems (flight scheduling, fleet assignment, aircraft maintenance routing, crew scheduling, and etc.) encountered in the airline industry, OR professionals both within and outside of airlines have been working on the development of methods for obtaining optimal solutions to these problems since the 1950s. In this context there are numerous academic studies related to airline operations in literature. Although one can refer to surveys related to airline operations, it isn't sufficient to cover the rich literature of airline scheduling, especially for the last decade. So, this study's aim is to remove this shortcoming by reviewing the papers concerning airline operations published between 2010 and 2017 and to focus on the studies within these papers especially related to aircraft maintenance routing problem.

Keywords

Aircraft maintenance routing, Literature survey

Paper Code: 86

Challenges Encountered by Port Employees and Analyzed by Multivariate Statistical Analysis

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Abstract

The world economy has gained momentum thanks to technological developments and globalization, which increased the importance of ports by growing the share of freight transport in intercontinental trade. Turkey, is one of the countries where port trade is most intense due to its geopolitical position. The private sector has made large investments and built ports, fueled by the policies granting permission to serve third-party carriers particularly by the end of the 1980s. The growth in port operations and business have provided the port employment rate increase in Turkey and also lead to a variation in scale from white collar to blue collar workers. Focusing on the evaluation of the employee satisfaction, productivity and the difficulties that the employees face is crucial as the port activities constitute the backbone of the maritime industry which is a multidimensional business employing a wide variety of workforce. The aim of this study is to investigate the dimensions of sectoral problems such as the bureaucratic obstacles faced by the port staff working at various levels, quota applications, problems arising from the introduction of new customs automation systems, as well as port and pier operators. In this study, the level of burnout of port workers will be measured by the Maslach Burnout Inventory which has been recognized for more than a decade as the leading measure of burnout, incorporating the extensive research that has been conducted in the more than 25 years since its initial publication. The MBI includes three questionnaires – the Human Services Survey, the General Survey, and the one this report is on, the Educators Survey. So this study provides the research data will be obtained by employing the questionnaires and the data will be analyzed by SPSS (Statistical Package for the Social Sciences) statistical package program to disclose the problems and results and to provide policy recommendations and suggestions.

Keywords

Maritime sector, Port, Port employees, Multivariate statistical analysis

Paper Code: 87

The Impact of Orbit Size on the Admission Control of Returns for a Hybrid Production System

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Abstract

Reprocessing of products at the end of their useful lives has become a beneficial business option in terms of waste management, material recovery and sustainable manufacturing for many markets. Both original equipment manufacturers and third-party remanufacturers collect products back from the end users and reprocess them to satisfy the demand. OEM's that also undertake remanufacturing activities are called hybrid production systems. In some cases, hybrid production systems experience distinct demand flows for new and reprocessed, while in others they receive a consolidated demand that is only concerned with the product functionality. In both cases, the number of reprocessed products is bounded by the number of new products sold. The literature on the analysis and control of remanufacturing processes does not consider the correlation between demand and return flows except for a few studies, none of which regards the fulfilled demand for new products as potential returns that can satisfy the second-hand demand. Models on the analysis of inventory control of hybrid systems always assume that returns arrive at a fixed and known rate. For those models it is shown that an up-to-S base stock policy is optimal. However, return flows depend on the usage time, the probability of a product being returned at the end of its useful life, and the number of products in use, viz. orbit size. In this study, a hybrid production system with an optimal control policy for new products based on the correlation among demand and return processes is analyzed. The supply chain structure is modeled as a queueing network and optimal stationary policies that consider the number of products in use are studied for production control by using Markov decision process models. Additionally, the effect of admission control for returned products is modeled for both optimal control and fixed return rate models for a more realistic comparison in terms of production/admission decisions and system costs.

Keywords

Hybrid production control, Markov decision processes, Remanufacturing

Paper Code: 92

Production Planning Problem with under Uncertainty in Electronics Industry: CVAR Method

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Abstract

Today, the competition environment is increasing with the developing technology. The consumer electronics industry with the short product life cycles and demands bring uncertainty with many risks. Nowadays controlling of these risks is becoming more important for reserving the market share. We study the planning processes of the company which is among the largest OEMs (original equipment manufacturer) and ODMs (original design manufacturer) in the world. The company produces LCD TVs and digital consumer products in the electronics industry. We address the production planning and scheduling problem with independent sequence and eligibility constraints in the electronics industry. We have developed a mixed integer linear programming model for the independent production scheduling. This model aims to minimize penalty costs which arise due to earliness and tardiness of the orders. In order to conduct a risk management study on the model, the conditional value at risk method is used. Due to the mathematical structure, this method is chosen to evaluate the risk scenarios. The previous mathematical model has been reformulated and scenario trees have been created. In the model, Conditional Value at Risk (CVaR) method has been applied for examining model's output with the risk scenarios. The possibilities of each scenario tree according to the determined risk factors have been calculated and analyzed.

Keywords

CVaR, Electronics industry, Production scheduling, Risk management

Paper Code: 94

The Determinants of Transportation from Hatay to Europe: An Application of a Hybrid MCDM Method

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Abstract

Long years of war and of instability in the Middle East have affected many sectors in Turkey, causing serious losses to the companies. One of the damaged sectors is the logistics sector. This sector is a very important source of income particularly in Hatay province, which is one of the most affected by the turmoil in the region. Transportation costs have increased substantially due to the war in Syria, forcing many logistics companies dealing with transportation business fire workers and even close down. For this reason, most of the logistics enterprises in Hatay have turned their route to European countries. The criteria that logistics companies take into consideration while deciding their destinations are focused in this study, depending on the literature and expert views. The determinants such as allocation of transit certificate, ECMT Licences, the transport costs, country specific regulations, fuel costs, driving limits in Europe, the cost of customs clearance and the costs of not finding a backhaul have been employed. An integrated multi-criteria decision making (MCDM) model is utilized in the weighting and ranking of the criteria for the logistics firms engaged in transportation from Hatay to European countries. SWARA was used to determine the criteria weights. Due to the nature of the method SWARA, the objective weights of the criterion are derived from the expert opinions, not depending on the subjective results. After the weights of the criteria have been determined, the MOORA-Ratio, MOOSRA and TOPSIS which are highly reliable and practical methods were employed in the second phase of the study to rank the countries in Europe. The study provides policy recommendations for the authorities and logistics companies that provide the transportation service and can also guide the companies about the areas for improvement.

Keywords

Logistics, Multi criteria decision making, Hatay, Country selection criteria, European countries, Logistics, SWARA, MOORA-Ratio Method, MOOSRA, TOPSIS

Paper Code: 95

Supply Chain Strategy Management in Wood Based Industry Sector Case Study

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Abstract

Nowadays as known not only firms are competing but also their supply chain operations do. Supply Chain strategy is connected with firms' business strategy and also align with firms' rival strategy in the market. To be able to make a difference in the market and to be able to be known as best practice among others to build an efficient strategy is important; to do that there are some strategy tools and some analysis. In this study we aim to prove that strategy building is necessary and important to make a difference in the market to become more profitable and to do smooth operations. We will use SWOT analysis in a company and also we will take some appointments with the company top management team which is in the wood based production Industry. With this study we prove that strategy determination is needed for a firm to be more successful in the market in the field of supply chain management and 6 strategy tools will be used for that with SWOT analysis. The company which we mention in this study is the market leader in TR and 30% marketshare in the sector, called Kastamonu Entegre (KEAS). KEAS is one of the leader manufacturers in the world at the same time, has 6 factories in TR and facilities; operations in Europe, Russia, USA. KEAS is giving importance digitalization, ICT (Information & communication technologies), Innovation, building up productions channels and distribution channels strategy and so on. The question for this study is what else KEAS should do for e better logistics and supply chain operations? We will state this question by making SWOT analysis at KEAS and notice the needs. By the result of our analysis we will decide which supply chain strategy tool to be adapted to the KEAS supply chain operations. This study aims to prove that KEAS is a sector leader not only for product quality but also logistics operational excellence by the help of SCM strategy adapting.

Keywords

Supply chain strategy, Wood based production industry, Swot analysis

Paper Code: 98

Portfolio Optimization using an Interactive Genetic Algorithm and Artificial Neural Networks

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Abstract

In this paper, we present a Portfolio optimization method based on Interactive Genetic Algorithm and Artificial Neural Networks. Portfolio optimization is a formal mathematical approach to making investment decisions across a collection of financial instruments or assets. We will be using the classical approach, known as modern portfolio theory (MPT), that involves categorizing the investment universe based on risk (standard deviation) and return, and then choosing the mix of investments that achieve a desired risk versus return tradeoff. We present in our method an Interactive Genetic Algorithm (iGA), able to propose optimized portfolios for a given user/investor by taking into consideration his preferences, whether he is a risk averse type or a risk seeking type, since it is difficult to introduce a fitness function for this kind of problem, we will exploit instead the user knowledge by making him interact with our Genetic Algorithm, however the iGA is limited by the user fatigue, in order to speed up the process and reduce the fatigue, we will use Artificial Neural Networks, that will be trained from real stock market Data, to classify our proposed portfolios, and help the user in deciding the choices given to him by iGA. Finally, we will discuss and evaluate the final solution by using a Fuzzy satisfaction function as termination criteria, that takes into account the investor's subjective preference toward risk and/or return, and evaluate his satisfaction toward the proposed solution.

Keywords

Portfolio optimization, Interactive genetic algorithm, Decision making, Artificial neural network

Paper Code: 101

Using Conjoint Analysis to Elicit Preferences for Freight Transport Mode

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Abstract

Freight transport mode choice is an important decision in logistics and supply chain management. An understanding of the drivers of decision maker's choice to move freight in a certain transport mode is critical to the development of related logistics services and policies. Conjoint Analysis is a systematic tool for creating and ranking potential design configurations with multiple conjoined features to measure decision maker's preferences. This study develops a mode choice model to the analyze the freight shipper's stated preferences when moving freight between Istanbul, Turkey and Cologne, Germany. The model focuses on attributes such as alternative transport modes (i.e. road, rail-sea, and road-sea) along with the cost, duration, reliability, emissions and damage and loss. A web-based choice-based conjoint survey was conducted among practitioners making transport decisions. The analysis provides the relative importance of the attributes, revealing reliability as the most important attribute followed by damage and loss across all respondents. Based on results from all respondents' and clustered respondents' preferences the paper provides recommendations for service providers and policymakers.

Keywords

Inter-modal transportation, Choice based conjoint analysis, Mode choice

Paper Code: 102

A Review of Mathematical Programming Models for Supply Chains in the Forest Products Industry

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Abstract

Many companies and organizations dealing with forest products have used mathematical models in the context of Operations Research to support their supply chains. In this study, an overview of these applications on the forest product supply chains is reported to present the research opportunities in the field. For this purpose, papers published in the last 30 years related to lumber & sawmill, paper & paper pulp and wood panel & furniture industries are reviewed and classified. Papers are classified based on modelling approach as well as decision level and the purpose of the work. Our classification according to the modelling approach revealed that researchers mostly used mixed integer models.

Keywords

Forest products industry, Supply chain, Mathematical programming, Review

Paper Code: 104

Implementation of Performance based Logistics at the Defence Sector and Performance Indicators

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Abstract

States have sought to develop alternative solutions to the classical logistics system in order to be able to sustain their complex and expensive defense systems in their inventory with decreasing defense budgets. As a result of these search for solutions; Performance Based Logistics (PBL) was chosen by the US Department of Defense as a new logistics support approach and procurement strategy, and over time PBL has begun to be used in countries which have a strong defence industry. The PBL's motto is to purchase the performance, not the spare parts. In this context, the PBL has given the logistical support of systems to the contractor's responsibility, enabling state/user to concentrate on operation of the system. For a successful PBL, 12 application steps must be implemented without compromise, respectively. The basis of these steps is to determine the performance requirements that the user expects from the system, i.e., which performance indicators/metrics will be requested at what level, and to transfer them to the Performance Based Agreement (PBA) by coordinating with the contractor. In this report, awareness was provided by giving a difference according to the definition of the PBL and the classical system, and the important steps in the PBA are given by giving information about the 12 steps of the PBL. In the last part of the report, firstly the performance indicators in the PBL are explained in comparison with the indicators used in the classical system, and secondly the performance indicators stated in the contract of a combat aircraft in the US are given as an example and the meaning of these indicators are explained. As a result of this study I concluded that when the performance parameters have been determined correctly and the optimum values have been assigned to these parameters, there will be a win-win solution for contractor and state/user so they will benefit both from the PBL.

Keywords

Performance based logistics, Logistics management, Performance parameters

Paper Code: 106

Engagement of Logistics Service Providers in Humanitarian Relief Operations

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Abstract

Over the past years, humankind has been facing many varying disasters where humanitarian relief operations, particularly logistics activities, are of great importance in alleviating sufferings of vulnerable people who are isolated and in need of basic supplies. Logistical operations play a vital role and, thereby, logistics service providers (LSPs) that has come more to the fore. However, in spite of this vital position given to LSPs within the humanitarian context, existence of limited numbers of normative text causes a barrier to understand what LSPs can bring into the humanitarian domain. Moreover, although there is a growing number of logistics companies that engage with humanitarian operations, only a few LSPs have the capabilities and tools to offer extensive strategic solutions for humanitarian relief. Vaguenesses in performance measurement systems and determining key indicators in humanitarian logistics operations bring along additional shortcomings for LSPs to overcome. Accordingly, in this on-going study, the authors aim to investigate the operations of LSPs in the humanitarian context through a strategic evaluation tool, the Business Model Canvas, that help to examine an organisation comprehensively from different aspects. Thus, this study provides a novel way to advance the insights on strategic missions of LSPs in humanitarian relief operations and to propose future opportunities for further studies in the humanitarian logistics field.

Keywords

Logistics service providers, Humanitarian logistics, Business model canvas

Paper Code: 107

Sustainable Biomass Supply Chain Optimization: A Review and A Case Study with Biogas Production from Chicken Farm Waste

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Abstract

Recent researches have been of the opinion that fossil fuels are not sustainable any more. Therefore, the issues of the sustainable energy and bioenergy have been more important in recent times. The objective of this study is to demonstrate the importance of sustainability concept for biomass supply chain network design, and to support with an ongoing casa study. For this purpose, first, literature review on the sustainable biomass supply chain (BSC) is presented to investigate gaps in the literature. Sustainability concept and its importance for BSC are presented. Previous literature review articles are investigated according to conceptual points and its sustainability frameworks, then, a classification scheme to analyze the papers on sustainable BSC is offered. The ongoing case study, BSC optimization with multi objectives, has been conducted. In the scope of the case study, the issue of biogas production from chicken farm waste are discussed, thus electric generation is being planned to be obtained from biogas. The problem is formulated as mixed integer linear programming model with minimization of the cost and the environmental damage, and includes the establishing of biogas facilities by determining numbers, capacities and locations of them. Also, the schedules and planning of the flows and supply chains between chicken farms and biogas facilities, the production quantity of electricity at each facility will be considered. A two-stage solution approach is purposed; firstly, the candidate locations where be proper to establish biogas facilities will be determined by ecological constraints through geographic information systems. In the second stage, candidate facility locations determined in the first stage will be evaluated in the economic framework. The contribution of this study is the combination of geographic information systems and an optimization method as a decision support system to ensure sustainability in biomass supply chain network design.

Keywords

Sustainability, Biomass supply chain, Bioenergy, Supply chain management, Supply chain design

Paper Code: 108

Hazardous Material Storage and Evaluation of Warehouse Management Systems Selection Criteria with AHP Method

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Abstract

A hazardous material is any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Transporting, storing, handling and using of these materials may expose them to a variety of accidental hazards which are flammable, burning, explosive, abrasive and poisonous in the environment. These products are dangerous on their own and can become dangerous by interacting with nearby products. For these reasons the storage and traceability of hazardous materials are very important. WMS is a system designed to manage all operations that can occur in a warehouse in an efficient and efficient manner, to ensure that operations are completed with minimum human and machine resources in the shortest time without errors, to make decisions, to perform online operations online and to present the information of the realized transactions in reports. In this study, hazardous materials and their storage will be explained; the criteria for WMS will be determined and these criteria will be assessed by AHP method.

Keywords

Hazardous material storage, WMS selection, AHP

Paper Code: 111
Data-Driven Analytics for Freight Transport

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Abstract

In this research, we examine a case study of a freight fleet by analyzing GPA-produced data. This dataset reviews the overall truck movement throughout a whole day in evert part of Greece. With this dataset and some data mining techniques, we attempt to support the planning and scheduling of the logistics and supply chain processes of the respective company. Our goal is to provide a framework that facilitates a better understanding of the system's operation and forecasts the demand through pattern recognition models. We need, thus, to create a profile for each vehicle in order to understand the utility and the impact that each one of them makes on our system. To make this happen we collect information about the truck route, the delivery stops and the queue time of each vehicle in a daily basis, as this data can provide insights about the product demand, the frequency as well as the pattern observed on the respective point. On this basis we try to develop a forecasting model of the demand points for the following week or month. To reach this goal, we make use of machine learning algorithms and artificial intelligence techniques by solving a typical classification problem. We ultimately want to provide the company with a complete tool set that can be used to regulate the daily vehicle routes and to improve the overall decision making process which will be now based on carefully collected data.

Keywords

Data analytics, Floating car data, Pattern recognition

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Paper Code: 112
Industry 4.0 in Warehousing

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Abstract
Industry 4.0 declared by the German government focuses on the future of the manufacturing environment (Kagermann et al., 2013). The production of the future tends to be characterised by shorter product life cycles, increased number of variants and, short-term production cycles triggered by the customers. This leads to the rise of many new complex challenges for companies. Industry 4.0 holds huge potential to overcome all these complex challenges. Today's complex supply chain networks involves uncertainty, variability, inventory, stock outs, and a myriad of problems causing waste, cost, and time losts shared by all stakeholders on the networks. Efficient supply chain networks aim to optimize multiple objectives such as response time (speed), cost, flexibility, reliability and environmental sustainability in the process of "order fulfilment". Achieving all these objectives requires a more intelligent appraoches when designing and managing the supply chains including warehousing systems. This study is devoted to clarify what Industry 4.0 brings for warehouses and how a smart warehousing system could be developed through Industry 4.0 revolution concept. The study may benefit to researchers and practitioners to develop more up-to-date and warehouses leading to efficient material handling and related information flow on the supply chains.

Keywords
Industry 4.0, Warehousing, Warehousing 4.0, Smart industry

Paper Code: 114
A Mathematical Programming Based Solution Approach for Solving the Distribution Planning Problem of a Company

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Abstract
This study proposes a two-stage mathematical programming based solution approach to solve the real-life distribution planning problem of a company. This company distributes its products from Izmir to all cities of Turkey on a daily basis to fulfill the demand of each city. Since the company does not have its own fleet of vehicles, a carrier is subcontracted by this company to make deliveries to cities. Therefore, the company is only concerned with the cost of the path to the last delivery. In the first stage of the solution approach, alternative routes to reach each city are determined and a set-covering model is used to find an optimum subset of routes which includes all cities that have demand to be satisfied. In the second stage, a mixed-integer programming model is used to find the minimum cost distribution plan. The model handles problem characteristics such as, heterogeneous and capacitated vehicle fleet, different vehicle costs, split deliveries and limited number of visits of vehicles. This solution approach is tested by using the data of five different days with different number of cities and different number of alternative routes. The results show that the proposed approach is effective in solving this distribution planning problem.

Keywords
Distribution planning, Set–covering, Mixed-integer programming

Paper Code: 115

A Simulation Optimization Approach for Solving Integrated Berth Allocation and Quay Crane Scheduling Problem

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Abstract

Today, together with the increasing globalization, maritime transportation has become very important and the competition between container terminals have considerably increased. In order to gain superiority in this competitive environment, container terminals should improve their operational efficiency. For this aim, they primarily focus on the seaside operations which include berth allocation problem (BAP) and quay crane scheduling problem (QCSP). Since the number and operation sequence of quay cranes assigned to a vessel determine the handling time of the vessel, the seaside problems are directly related to each other. Therefore, solving this integrated problem gives more reliable and realistic results. In this study, a simulation optimization approach has been proposed for solving integrated berth allocation and quay crane scheduling problems. The development of this solution approach is comprised of five stages. In the first stage, a conflict-free quay crane scheduling algorithm, which takes into account the stochastic handling times, has been developed. In the second stage, a general parametric simulation model which is able to represent container terminals different in size and physical structure is designed by using simulation software ARENA. Additionally, previously developed quay crane scheduling algorithm is embedded into the simulation model. In the third stage, to form the simulation optimization approach, a simulated annealing based search procedure is developed in MATLAB and integrated with the simulation model. In the final stage, computational analysis for a real-world inspired container terminal is conducted. The results of the computational analysis demonstrated that the proposed solution approach is efficient in solving integrated BAP and QCSP with the objective of minimizing makespan of all vessels.

Keywords

Simulation optimization, Berth allocation, Quay crane scheduling

Paper Code: 118

Information Exchange as the Key for Sustainable Urban Freight Transportation: The AEOLIX project

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Abstract

The integration of information systems and the increased complexity of urban environments has forced transport businesses to be more agile than ever. To ensure profit, they have to gain added value by combining different information sources, including openly available data. Furthermore, the market fragmentation creates additional problems, when the relevant stakeholders need to communicate. As a result, information flows are disparate and more often than not must be accessed individually and manually. Hence, there is the need of a system that will facilitate information exchange among the various stakeholders (public and private) enabling increased use of the information with the purpose of gaining added value from it. The purpose of the current paper is to present AEOLIX, a project funded by the EU's Horizon 2020 (Architecture for EurOpean Logistics Information eXchange). The project aims at developing an architecture for a system that will allow information exchange among key logistics actors. To ensure the viability of the system, several characteristics need to be respected: The system must be open and distributed, re-using/linking current platforms/systems, simplifying the connectivity and access to the data services and finally be secure. The AELIX platform is currently demonstrated (and validated) in a number of living labs. One of the most interesting consequences of the project's approach is that it promotes the development of a collaborative logistics eco-system that could reduce the negative impacts of the chain in urban environments, while at the same time provide value (monetary and otherwise) to private actors. An example of such an application is the use of the platform for cargo bundling from different companies.

Keywords

Supply chain visibility, Logistics information exchange, Collaborative logistics

Paper Code: 119

A Constraint Programming Approach for the Pickup and Delivery Problem with Time Windows

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Abstract

This study considers the pickup and delivery problem with time windows (PDPTW). It is named as the single-commodity vehicle routing problem with pickups and deliveries, in which a fleet of vehicles satisfy a collection of customer requests. Each customer request requires the use of a single vehicle both to load a specified amount of one type of commodity at one location and to deliver them to another location. All requests must be performed without violating the vehicle capacity and the customer time windows specified for each location. The PDPTW is a widely seen NP-hard problem with the objective of minimizing the total cost that is comprised of the variable costs associated typically with the distances between the customer locations and the fixed costs that are incurred for the use of the vehicles. In this study, we propose a novel Constraint Programming (CP) model for the PDPTW. CP is an exact solution approach which is well known for its abilities to express complex relationships and to obtain good quality solutions within reasonable computational times for densely constrained combinatorial optimization problems such as the PDPTW. In our model, we use interval variables that are capable of expressing several critical decisions such as start time, end time, duration and usage rate of a vehicle visit under one variable. On the other hand, global constraints (Alternative, NoOverlap, Pulse etc.) are used, which are extracted from IBM's CP Optimizer to reduce the number of variables and constraints. Moreover, interval sequence variables and alternative constraints are used to intelligently handle vehicle assignments to visits in such a way that a tour structure is maintained while subtours are prevented. The performance of the proposed CP model is evaluated using benchmark instances from the literature. The computational results show that the proposed CP model is effective in finding good quality feasible solutions for large size problems.

Keywords

Pickup delivery problem, Constraint programming, Time windows

Paper Code: 120

Determining Task Assignment Priorities for Disassembly Line Balancing Problem with ELECTRE

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Abstract

Disassembly line balancing has a key role in reverse supply chains. Disassembly line balancing problem has a multi-objective nature. In the literature, there are only three studies which used multi criteria decision making (MCDM) techniques. AHP, fuzzy AHP, M-TOPSIS, PROMETHEE and multi-grouping hierarchy are the MCDM tools used in the disassembly line balancing literature. In this study, it is aimed to determine assignment priorities of tasks in disassembly line with ELECTRE. Criterias are determined according to the studies and clustered in structural (number of successors and part disassembly times), economic (demand and profit), environmental (hazardous and state of the material) and quality (fragility and remaining life) dimensions. Weights are determined via a unique methodology based on binary comparisons of experts across dimensions and factors in consistency with ELECTRE logic. Economic dimension and hazardous criteria are found the most important. ELECTRE gives opportunity to consider both concordance and disconcordance. Application results on the 10-part numerical example (McGovern&Gupta, 2003) shows that sixth part is placed in the first rank different from the other techniques.

Keywords

Disassembly line balancing, Reverse supply chain, Multi criteria decision making, ELECTRE

Paper Code: 122

Classification of Barriers to Adoption of Electric Vehicles and Electric Freight Vehicles

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Abstract

Despite their environmental benefits and the incentives provided for the proliferation of Electric Vehicles (EV), the adoption rate of EVs in logistics and transportation systems is well below the potential identified in various projects. A challenge for all actors and policymakers is to define barriers, measures and policies to foster the use of EV in commercial transport. This paper investigates barriers to EV adoption both for passenger and freight transport, based on an extended literature review and provides a classification of those barriers over eight defined types: infrastructure, technology, awareness, operational, charging, political, cost, and vehicle characteristics. The paper also provides a discussion of each barrier and gives research and policy related implications of the findings of the review.

Keywords

Electric vehicles, Barriers to adoption

Paper Code: 123

Optimizing Warehouse Storage Assignment under Seasonal Demand Pattern

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Abstract

Picking is the most costly operation in the warehouse management. Picking effectiveness is linked to many interrelated factors, such as warehouse design, order batching, routing and storage assignment strategies. In this study, we investigate the effects of various storage assignment approaches on the order picking cost of an FMCG warehouse. We aim to find a near-optimal assignment of items to the storage locations. The most frequently used assignment approaches are random, turnover-based and affinity-based assignment. Random assignment places items to any available place. Turnover-based assignment locates items which are ordered most frequently. Affinity-based assignment locates items with respect to each other based on the existence of multiple items together in the picking lists. Extensions to these traditional strategies have been studied in the literature. Some of those are as follows: (I) consideration of the congestion in the aisles during picking (Kofler et al., 2015), (ii) or consideration of the order sizes together with the affinity (Wutthisirisart et al., 2015), (iii) investigating a multi-period formulation (Kofler et al., 2014) or (iv) consideration of the picking sequence of the items in the pick list (Trevino et al., 2009) In this study, we aim to use a hybrid picking sequence, turnover and affinity-based slotting strategy under the consideration of seasonality. We use a 10 month FMCG warehouse delivery data. First we explore the seasonal breaks of the dataset and then optimize the item assignments to storage locations with minimum seasonal rearrangement and order picking costs. The solution of the warehouse assignment problem has been handled by various approaches in the literature such as fuzzy association rule mining, mathematical programming, clustering and heuristic approaches. In this study, we use an efficient heuristic algorithm to obtain near-optimal solutions and then explore the effects of various factors on the optimal solutions.

Keywords

Warehouse management, Storage assignment, Seasonality, Optimization

Paper Code: 124

Problems and Possible Solutions in Urban Transport Planning in Gaziantep

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Abstract

With its 2,005,515 population in 2017, Gaziantep is the 8th most crowded city of Turkey. Due to high increasing trend in population, the city of Gaziantep has several problems in urban transportation that must be taken into consideration. The aim of this study is twofold (i) determining urban transportation problems and (ii) providing possible solutions for those problems. In this respect, public transportation systems of Gaziantep city (tram, bus etc.) are analyzed. Surveys and annual reports of Gaziantep Transportation Systems Office are used as a methodology to obtain the data. The bottlenecks and inadequacies of current urban transportation system such as physical constraints of roads, parking area poorness and formless intersections are determined. To overcome aforementioned problems, potential solution approaches such as park and ride system, 3-phased traffic lighting, re-planning of serving carts are developed and presented.

Keywords

Urban transportation, Gaziantep, Improvement, Problems

Paper Code: 125

A Decision Support System for the Order Picking Operations in a Spare Part Warehouse: A Case Study in an Automotive Company

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Abstract

Spare warehouse management is a challenging problem due to high product variety and dynamic demand structure. This study considers the order picking operations in the spare part warehouse of an automotive company. The company receives orders of spare parts from 180 different customers on a daily basis. In order to increase the efficiency of the operational plans, the material flows from the storage areas to the dispatching area are taken into account. First, considering the technological and operational restrictions of the company, three order picking strategies are analyzed: aisle-based, zoning-based, and priority rule-based strategies. In the aisle-based and zoning-based strategies, orders are grouped and picked according to the proximity of their storage locations, and then sorting is performed. The aisles are grouped into the work zones in the aisle-based order picking whereas two zones are formed with respect to the central corridor in the zoning-based strategy. In the priority rule-based one, the orders are grouped according to their priority, and then sorting is performed. Compared to the aisle-based and zoning-based strategies, storage locations can be visited more than once in the priority rule-based strategy. Next, the order picker routing is classified as a capacitated vehicle routing problem. In order to obtain good solutions within a reasonable time, the capacitated version of the nearest neighbor algorithm is used, and the routes are generated. Then, a time study is conducted to determine the standard times for the material handling, transportation and sorting operations. Finally, the workloads of the order pickers are evaluated in terms of order picking strategies. A decision support system is designed for this purpose. The proposed approach provides a flexible tool for the decision maker to analyze and select the best strategy according to the labor costs on a daily basis. The use of the proposed approach provides a reduction in the labor costs.

Keywords

Warehouse, Material handling, Order picking, Decision support system, Spare part

Paper Code: 127

Measuring Sustainability of Ports in Turkey: An Example of Green Port Project

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Abstract

The Ministry of Transport, Maritime Affairs and Communication of Republic of Turkey introduced a new certificate program called "Green Port/Eco Port Project" in 2015. With this Project, the Ministry set the rules of certification procedures in order to increase competitiveness of the Turkish ports by focusing on the consciousness to the environment, occupational safety and prestige. In this study, we aim to determine the factors of Green Port concept from the current literature, then to measure the importance of the factors according to the stakeholders of the ports, and finally comparing the green performances of selected ports. As the research methodology, we use the Fuzzy AHP Method which is one of the most commonly used multi-criteria decision making methods in literature. The data used in this study were collected in two sources: the secondary sources (publication databases) used to determine the green port criteria factors, and then primary sources by conducting a survey of comparing those factors in order to weight the factors to apply them to calculating the performances of the selected 2 ports in Turkey. In conclusion, we aim to contribute to the current literature by matching the Green Port certificate program criteria introduced by the Ministry of Transport, Maritime Affairs and Communication of Republic of Turkey and Green Port concept criteria collected from the academic literature.

Keywords

Green ports, Sustainability, Green port criteria

Paper Code: 128

A Mathematical Model For In-Plant Milk-Run Routing

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Abstract

Milk-run which is one of the lean logistics applications is a cyclic materials delivering system. As this system is widely used for in-bound and out-bound logistics, it is also used for in-plant logistics. In-plant milk-run system runs for the delivering materials within the plant from warehouse to assembly stations in a cyclic manner. In this system, routes and time periods should be determined in terms of space requirements, number of vehicles and their capacity. In-plant milk-run system is implemented using Automated Guided Vehicles (AGV) which provide automated materials handling in plant. The objective of in-plant milk-run system is to minimize the total inventory holding and transportation cost so as to ensure no parts shortage will occur in assembly stations. In this study, a mixed integer mathematical model is proposed for the determination of milk-run routes and its time period for AGV simultaneously. Mathematical model is coded using GAMS software. The success of the proposed model is shown on randomly generated test problems and the results is discussed widely.

Keywords

Milk-Run, In-Plant logistics

Paper Code: 130

Analysis of Actors' Roles in Sustainable Agri-Food Waste Management

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Abstract

Food loss and waste is a major concern for both developing and industrialized countries. Globally, one-third of the food produced for human consumption is lost or wasted throughout the supply chain, from the initial agricultural field until its final consumption, i.e. during harvesting, storage, packaging, transportation, and post-consumption. The agri-food supply chain has many parties (actors) involved, not only farmers and consumers but many intermediaries in between (such as consolidators, traders, commissioners (agents), wholesalers, retailers) with varying plans, motivations and constraints. Efficient waste management requires collaboration between actors in the supply chain. To address this issue, the MACTOR method is used to examine the relationship between the actors, and the role and power of them on the waste management strategies. The MACTOR method is a valuable tool for analyzing actors' strategies and as a result positioning actors in relation to their objectives and providing tactics for possible alliances and conflicts as well as strategic recommendations. The conflicting objectives of actors may affect the actions taken to realize the supply chain strategies. Thus, analyzing the convergences and divergences help us to evaluate the power balance between the actors and formulate more efficient waste management strategies. Improving the supply chain efficiency would positively affect not only the supply chain parties involved but also consumers and government.

Keywords

Food waste management, Agri-food supply chain, Sustainability, MACTOR method

Paper Code: 131

A Decision Support System for Industry 4.0 Technologies: A Business Case

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Abstract

For the first time in 2011, Industry 4.0 was started to be used at Hannover Fair. While industry 4.0 is often aimed at new developments in production, it is a clear goal for innovations, developments in the technology world and all aspects of life with legal regulations. People, systems, robots, and production will be linked to each other in the new level to be reached with Digital Transformation and Industry 4.0. Industry 4.0 has the possibility to optimize itself according to various criteria such as low cost, low resource using, easy accessibility and high speed. On the other side, there is a problem that the quality control standards can reach the desired level by automating the production process, the data security and the cybersecurity, the decrease of the employment costs cannot meet the costs of the new technology. Analyzing of errors and costs caused by human-induced and errors and costs caused by high-tech techniques will try to find an answer to the questions about the performance of technological enterprises if the risk is taken by enterprises. In this study, a business process based on SCOR model will be examined, then related industry 4.0 solutions will be listed based on literature. The main purpose of this study is to choose the right technology for the specific process. At this point selection criteria, constraints, parameters and expert opinions will play an important role. As a result, it is aimed to make the most appropriate and optimal selection based on a mathematical model. In this respect, it is expected that this mathematical model will guide for enterprises who are on the way to Industry 4.0 applications and it may create a background for related projects.

Keywords

Digital transformation, Industry 4.0, Decision support systems

Paper Code: 132

Quality and Performance Management in Supply Chain: An Example from Food Sector

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Abstract

Extended shelf life as a result of improved manufacturing and packaging technology yielded the possibility to provide the foodstuff at desired quality criterion anywhere in the world in recent years. This situation has also changed the behavior of consumers. In this context, food supply chains are becoming increasingly more complex. Accordingly, supply chain (SC) performance criteria from production to reliable delivery should be handled meticulously. Determination of essential factors and monitoring of potential flaws turns out to be an important issue in assessment of the performance and efficiency of the entire supply chain. The selection of appropriate SC performance indicators is quite complicated due to multiple inlet and outlets in the system. Incidentally, one of the essential factors that plays an important role in the success or failure of the SC in food sector is food safety. The main objectives in food supply chains then are to minimize operating costs, to make the SC economically sustainable, and to maintain flexibility while providing consumer satisfaction at the same time. To achieve these objectives certain quality performance criteria need to be determined. The purpose of this research, which examines the activities of manufacturers operating in the food sector, is to determine the quality and performance indicators that these companies ponder. By creating a more efficient and economical structure on this issue, enhancing the success of the SC of the company is aimed. The companies selected for the research are in the production branch of milk and dairy products in vicinity of Eskisehir. Given the difficulty of receiving feedback, interested quality performance indicators have been analyzed and determined by individual interviews with these companies. Considering the results obtained from firms applying different logistic approaches, critical indicators for each will be determined and the results will be discussed.

Keywords

Food sector, Logistics performance measures, Supply chain management

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Paper Code: 134

Integration of Urban Consolidation Centers with Industry 4.0 Technologies

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Abstract

Today, the growth of urban population and e-commerce lead to a multifold increase in logistics activities in cities. The increase in all these logistical activities is causing problems such as traffic congestion, environmental pollution, energy waste and more logistics costs in the city. Bringing an optimal solution to all these problems is not easy, since the objectives and motivations of the city's stakeholders are not common. Considering this, the regulation and planning of urban transport and warehousing activities will only partly help to deal with the complexity of urban logistics activities. Industry 4.0 is a relatively new concept that aims to reduce and possibly eliminate the human need in the transportation and warehousing aspects of logistics. Smart and sustainable cities will also gradually take up our daily lives with the integrated use of Industry 4.0 technologies. In this study, a literature review has been conducted to examine the characteristics and working principles of the urban consolidation centers which is a part of city logistics. Furthermore, the study discusses the improvements which would be possible via the use of Industry 4.0 technologies in urban consolidation centers and how these improvements would solve the problems caused by transportation and storage activities related to city logistics.

Keywords

City logistics, Industry 4.0, Smart logistics, Urban consolidation center

Paper Code: 136

A Comparative Analysis of Site Selection Criteria for Conflicts and Natural Disasters

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Abstract

Both natural disasters and conflicts cause population displacement and therefore, shelter and settlement needs in different scales depending on their nature and magnitude. Disaster risk reduction strategies of national and international organizations have addressed siting response to displacement due to conflicts, such as refugee crises, as well as natural disasters, such as floods, hurricanes or earthquakes. A top-down approach including government and national and international organizations has been shown in refugee siting response, however a community based approach has been considered in many natural disaster cases. The local communities' knowledge of safe shelters, buildings and settlement areas and a human factor which accounts for social affinity or disruption of affected population have been included in site selection criteria for sheltering in cases of natural disasters. However, site selection criteria in cases of conflicts take into account humanitarian standards set by international humanitarian organizations, whereas refugee sites are located in host countries different than the country of origin of people of concern (PoC). These criteria include average space area per person, covered living area per person, proximity to major towns, distance from natural reserves, access to health and educational services, links to local communities and humanitarian agencies. Regardless of the disaster type, multi-criteria decision making methods (MCDM) have been used to address PoC siting. Therefore, in order to address PoC siting, a multi-agent system modeling approach has been proposed in this study. Intelligent agents use MCDM methods, Fuzzy Analytical Hierarchy Process (FAHP) and Fuzzy axiomatic design approach with risk factors (RFAD) to select the best alternative site based on a range of site selection criteria and risk factors. Furthermore, a comparative analysis of site selection criteria in conflicts with respect to natural disasters has been done.

Keywords

Natural disaster, Refugee siting, Selection criteria

Paper Code: 137

A Literature Review on the Definition of Food Waste and Food Loss Within Supply Chain Context

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Abstract

According to FAO, one-third of the world's overall food produced by weight is lost or wasted every year. Fruits and vegetables are the categories with the highest amount of losses and waste, which are followed by meat, fish and seafood, and milk. In developed countries, the highest contribution to food waste often occurs at household level due to cultural, social or economic decisions; while in developing countries food loss occurs mainly in the earlier stages of the food supply chain due to a lack of financial, technical and managerial resources. At every step of the supply chain, food waste has an impact on economic (direct loss for farmers, retailers, and consumers), social (failure to secure food for a wider population) and environmental aspects (soil, water, energy implications and GHGs: greenhouse gas emissions). Thus, elimination of food loss and food waste become extremely important. One of the most important issues in minimizing food loss and food waste is to define the difference between food waste and food loss. However, in the literature there is no consensus on definitions of food loss and food waste and quantification. Thus, this study aims to identify the difference between food loss and food waste. Finally yet importantly, this study attempts to identify which type of quantifications were used in previous studies in calculating food waste.

Keywords

Food loss, Food waste, Food loss and waste drivers, Food supply chain, Literature review

Paper Code: 138

An Artificial Bee Colony Algorithm for Capacitated Location Routing Problem

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Abstract

It is clear that the costs of logistics do have an important share in business. It is thus crucial to store and transport raw materials, semi-finished and finished products efficiently throughout distribution in supply chain management. Facility problems are related to the location of factories or warehouses at strategic decision level, while vehicle routing problems are concerned with determining routes at tactical or operational levels to supply customer demands. Location-Routing Problem (LRP) combines these two kinds of decisions. The classical LRP includes a subset of depots that must be open; customers should be assigned to open depots and vehicle routes should be determined. While the literature related with supply chain and logistics management is reviewed, it can be obviously seen that LRP takes place in many practices from the design of telecommunication networks to cargo transportation, distribution of non-durable goods to military equipment logistics. Capacitated Location Routing Problem (CLRP) is an important part of the problem which takes into account depot and vehicle capacity, simultaneously. As these kinds of problems have NP-hard structure, it is inevitable to use heuristic methods for solution. Artificial Bee Colony (ABC) is one of the population-based algorithms inspired by the intelligent behavior of honey bees. It is a simple algorithm, and uses only common control parameters such as colony size, maximum iteration number etc. In this study, an ABC algorithm is implemented to solve CLRP. Performance of algorithm is tested by the standard set of Prodhon instances derived from literature. Results and suggestions are provided for researchers and practitioners. Experimental results show that ABC algorithm can be alternative for CLRP.

Keywords

Artificial bee colony, Location-routing problem, Supply chain, Heuristics

Paper Code: 139

Classifying Container Shippers for Value Added Services: A Decision Tree Approach

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Abstract

Container shipping market has been subject to serious challenges in recent years. Customer service has become very important, but the core services of shipping companies have become very similar to each other due to the strategic alliances. Value added services (VAS) of container lines can be the main focus for differentiation and a better customer service. By delivering superior value added services, container lines can achieve more satisfied customers. In this way, the lines can also enjoy premium charges. However, expectations of customers are heterogonous, which means that not all customers attach equal importance to VAS. For an effective delivery of VAS, classification of customers is necessary. Thus, the purpose of this study is to classify container shippers in terms of their expectations in VAS. Based on a survey research in Turkey, the study first conducts measure development and explore the factor of VAS through exploratory and confirmatory analyses. Then, the study carries out chi-square automatic interaction detection (CHAID) by using factor score of VAS as dependent variable and several nominal company demographics as dependent variables. The analysis creates segments of shippers which are identified by industry of shippers, size of shippers, and delivery terms

Keywords

CHAID, Decision tree, Value added services, Container shipping, Shippers

Paper Code: 140

The Evaluation of the Efficiency of Antalya Port with Entropy Based VIKOR and ARAS Methods

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Abstract

The impact of globalization and e-commerce is increasing the share of worldwide maritime trade. Such developments highlight the importance of the ports that are part of the sea freight transportation. Ports, one of the logistics and trade routes, offer significant opportunities for the economic development of the cities and countries in which they are located. The efficiency and productivity of ports depend on their management. The aim of this study is to evaluate the efficiency of the Port of Antalya, where most of the trade in the Western Mediterranean Region is made. In the study, 10 years data between 2008-2017 of Antalya Port along with 5 criteria were used. Expert opinions are taken to affect on the performance of the port; the number of vessels, the size of ships, the amount of cargo handled (import + export), the number of containers (import), and the number of containers (export). Weight scores were first calculated by the Entropy method for those criteria. Then, performance ranking for 2008-2017 were determined by VIKOR and ARAS methods and the results were compared. According to both methods, the most efficient year for the Port of Antalya has found as 2013.

Keywords

Entropy, VIKOR, ARAS, The Port of Antalya

Paper Code: 143

Mobile Navigation Apps' Satisfaction Impact on Urban Transportation Problems

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Abstract

Traffic problem, as one of the biggest problems of Istanbul, is growing in accordance with the urbanization and the increase of personal vehicles. Since more cars are joining to the city traffic each day, and there are only limited possibilities to increase the capacity of roads, authorities pay more attention to traffic management than capacity building; as well as private companies see this an opportunity to create a new business: navigation tools. Currently, not only Istanbul Metropolitan Municipality (İBB), but also several private corporations provide technological solutions to inhabitants of mega-cities, such as Istanbul. These solutions are generally mobile apps powered by a GPS navigation engine to help end-users an efficient routing in their daily urban transportation experience. There are more than 100 mobile applications providing maps and navigation. At the beginning of the study, six of these apps are selected as they are the most downloaded apps. After preliminary survey, three of the least used apps are omitted from the study. A structured equation model (SEM) containing three constructs is built in order to understand the users' behavior of satisfaction on their choice of the apps within the context of usability and trust. The model is tested with SmartPLS3 software to see how the constructs are relate each other. Results reveal the satisfaction behavior of users through measures of how trustable and useful the applications are. From results, we also see for what purposes the applications are used the most. Therefore, analysis of usability parameters contributes to the study in terms of developing solutions to the urban transportation problems. Satisfaction Model analysis has importance to the app developers and municipalities to better see how users evaluate the functions and overall experience. Even though the tests are carried only in Istanbul, due to the size of the city's inhabitants, we believe that results are common for most mega-cities.

Keywords

Urban transportation, Apps, Navigation, SEM

Paper Code: 147

Review of Performance Measurement Literature in Reverse Logistics and A Proposal how to Develop it for Fourth Party Reverse Logistics

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Abstract

Reverse Logistics has increasingly become an important activity as a result of developments in economical, judicial and environmental factors. Reverse logistics which builds a part of a supply chain is related to reverse flow from the consumption point. Fourth party reverse logistics, which is a subset of reverse logistics, establishes a reverse flow of goods from end-users to new potential users thereby offering strong potential to optimise the use of resources in society. Performance measurement provides important tools to managers in identification of problems and for the improvement of reverse logistics chains by facilitating measurement of efficiency and effectiveness of the system under consideration. When compared with a forward supply chain, reverse logistics has a more complex structure and therefore systems developed to measure the performance of reverse logistics are still in maturation stage. In this regard, this study first aims to fulfill an important need in the literature by making a systematic review of studies regarding performance evaluation and performance measurement in reverse logistics. There are variety of studies made with different goals and different approaches either for performance evaluation or performance measurement of reverse logistics. While some of these studies are focused on performance evaluation from a perspective, some others try to provide a performance measurement system in a broader perspective. However, there are few comprehensive studies which regard the life cycle of a performance measurement system which starts from the design of a mature system, implements it and then works to make it up-to-date. The main contribution of study is a systematic review of performance measurement in reverse logistics, and a proposal how to develop a performance measurement system for fourth party reverse logistics which has been lately started to draw attention from academia.

Keywords

Reverse logistics, Supply chain, Performance measurement; Performance measurement framework, Procedural approaches

Paper Code: 150

Present Status and Future Trends in Electric Vehicle Routing

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Abstract

The engine technology used in vehicles has been recently evolving from conventional to plug-in hybrid and fully-electric. In the near future, electric vehicles will completely take place of the internal combustion motor vehicles. Therefore, electric vehicle routing studies gained an increasing importance in the last decade building on top of well-investigated vehicle routing literature. The computational load to solve the electric vehicle routing problem (EVRP) is even greater than the original vehicle routing problem (VRP) because of the added complexity of EVRP variations. In this study, the EVRP literature is thoroughly examined. Vehicle types, problem assumptions and constraints, problem variations, factors on energy consumption and various solution approaches are evaluated in detail and finally, future research directions are presented

Keywords

Electric vehicle routing, Review, Present status, Future trends

Paper Code: 153

Fuzzy Cognitive Map Approach for Supply Chain Configuration in Automotive Industry

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Abstract

Today's competitive market conditions and evolved organizational structure compel firms to design their supply chain more efficiently. Supply chain becomes more important because of growing global competence and effectiveness concepts. Therefore, professionals endeavor to find best supply chain configuration (SCC) for their firms. This paper investigates the detailed evaluation of supply chain management factors by analyzing relationships and strength of them in order to determine the most appropriate reactions to the risks. Fuzzy cognitive map (FCM) methodology is used to determine the most important factors in SCC. FCM methodology is appropriate due to cause-and-effect relationships among factors, positive as well as negative relationships, and the lack of crisp data. The application is conducted in an automobile factory, which is one of the largest manufacturers in Turkey, and the results are analyzed.

Keywords

Supply chain configuration, Supply chain management, Fuzzy cognitive maps

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Paper Code: 155

A Multi-Objective Approach for a Multi-Product Multi-Node Supply Chain Network Design Problem with Stochastic Demands

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Abstract

Supply chain network design problem is one of the most important optimization problems encountered in the supply chain management. During the past decades, there are many studies published in the area of network design problem. In this study, we consider a multi-product, multi-node supply chain network design problem with stochastic demands. The studied supply chain consists of suppliers, plants, distribution centers, retailers and customers. The aim is to satisfy the demands of each node with the minimum total cost throughout the chain while minimizing sum of the maximum amount of shortages. A mathematical model is developed to optimize these two objectives. A scenario based approach is used for modeling uncertainty and the proposed model is solved by employing the non-dominated sorting genetic algorithm (NSGA-II) which is a meta-heuristic algorithm developed for solving multi-objective optimization problems. The performance of the proposed approach is tested on a variety of problems having different sizes.

Keywords

Supply chain network design, Uncertainty, Genetic algorithm

Paper Code: 156

A Fuzzy Decision Making Approach for Fuel Provider Selection: A Case Study for Turkey

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Abstract

Fuel is a material that reacts with other substances in order to release chemical or nuclear energy as heat. The heat energy released by reactions of fuels is converted into mechanical energy via a heat engine. Heat is utilized for warming, cooking, or industrial processes. This work presents a fuzzy decision making approach for fuel provider selection problem. Evaluation criteria are weighted employing fuzzy cognitive map methodology, then the most suitable fuel provider alternative is determined using fuzzy TOPSIS method. Lead time, reliability, sustainability, cost, service quality, location and warranties are taken into consideration. In order to illustrate the application, a numerical example is provided by conducting a case study in Turkey.

Keywords

Fuel selection, Fuzzy decision making, Fuzzy cognitive map, Fuzzy TOPSIS

Paper Code: 157

Ranking Agile Supplier Alternatives Employing a Fuzzy DEA Approach

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Abstract

In competitive markets, companies have to give immediate response to unpredictable changes and uncertainty, and they should construct their supply chain according to dynamic environment. An agile supply chain is flexible, quick, responsive, and competent in increasing global competition. In order to gain supply chain agility, agile supplier selection has become a crucial managerial problem to be solved. This work aims to solve agile supplier selection problem employing a fuzzy data envelopment analysis, which is an extension of data envelopment analysis by incorporating imprecise and qualitative data into the decision framework. The proposed methodology selects the most appropriate agile supplier without requiring subjective assessment of decision makers for determining the importance of evaluation criteria. In order to illustrate the proposed decision approach, a case study is conducted in a dye manufacturer company that performs in Turkey.

Keywords

Agility, Multi-criteria decision making, Fuzzy decision making, Supplier selection

Paper Code: 159

Determining the Appropriate Open Innovation Model for Logistics Firms Using an Integrated Fuzzy AHP-VIKOR Approach

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Abstract

Innovation activities in the global economies have become more interrelated and open in their nature. So, firms want to increasingly enter into collaborative relationships with their environments to exploit innovation. This trend shapes a new approach called as Open Innovation. It involves forming collaborative relationships with other organizations as the basis for achieving competitive advantage through the development of new or improved products and services. Open innovation has an effect the logistics firms because these firms have many services and products and also various relationships with their shareholders. The main purpose of this study is to determine the appropriate open innovation model of logistics firms. The application process is performed by a Multi Criteria Decision Making model. This model includes both alternatives (inbound, outbound and coupled open innovation models) and criteria (control, focus, innovation process, knowledge, cost, capacity, market, utilization, policy, motivation). It determines the weights of the criteria by fuzzy AHP and ranks the alternatives by VIKOR. According to results, the most important three criteria are innovation process, motivation, and market respectively. Outbound is the appropriate open innovation model for logistics firms.

Keywords

Open innovation, Logistics, Fuzzy, AHP, VIKOR

Paper Code: 160

The Integration of the Blockchain Technology in the Supply Chain Management

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Abstract

Supply chains and operations are becoming more and more dynamic and complex. The companies have a vast environment with large product variants and multiple parties. Maintaining a competitive advantage in the global market and innovation are the goals of any leading company and the supply chain management is the key success. After digitalization and computerized systems, the blockchain is the new revolution that will change the supply chain and the logistics industry by increasing the transparency, security and visibility of the operations. This paper will cover the benefits of the blockchain technology and how the companies would integrate this revolution in their supply chain management process. The objective of the study is to show how the blockchain will play a role of a remedy to the fragmented infrastructure of the firm. And also, through this paper, the results of the blockchain application will be shown. This study will be based on an extended literature review.

Keywords

Supply chain, Digitalization, Computerized systems, Blockchain technology, Logistics

Paper Code: 161

City Logistics 4.0: Smart and Engaged Environment with Industry 4.0 and IoT Tools

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Abstract

As urbanization increases, more than 70 percent of the global population is predicted to live in large and crowded cities by 2050. The expected consequences of crowded cities are increase in resource consumption, permanent traffic gridlock and polluting logistics operations. How can municipalities, governments and initiatives cope with these challenges? Both industry 4.0 and IoT might be useful to find innovative solutions. Digitization in production is called the industry 4.0 while IoT describes an environment that the highly connected, smart and internet enabled digital and physical world. By using Industry 4.0 and IoT tools a smart city logistics environment can be created. Regarding low-cost, less pollutant, connected and intelligent transportation, a city logistics center also plays a crucial role for a sustainable city logistics environment. In this paper, literature related to city logistics, industry 4.0, and IoT is briefly reviewed and a linear mathematical programming model have been proposed for location selection of a city logistics center is provided. A numerical analysis is also provided to validate the mathematical model by using GAMS solver. It is found that the location of city logistics centers and using of smart or electrified vehicles are so critical to reduce congestion and pollution of transportation.

Keywords

City logistics, Logistics 4.0, Internet of things, Industry 4.0

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Paper Code: 162

Assessing Contract Logistics Facilties: Results from a Survey in Italy

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Abstract

E-commerce and retailing companies have been recently experiencing a rise in their revenues. This has led to the search for new logistics facilities compliant with their needs. Such research of new spaces and top quality facilities has driven the logistics real estate industry to an unexpected rebirth after the slowdown caused by the last economic crisis. Some example of assessment models for industrial buildings are reported in literature, but they mainly evaluate warehouses from a sustainability perspective. Conversely, the measurement of quality and functionality has been scarcely addressed so far. The paper aims to fill this gap by describing the state of art of contract logistics warehousing in Italy using an original model to assess logistics buildings. The model allows to identify, structure and rate the most relevant features for two main types of logistics buildings, namely warehouses and cross-docking platforms. The proposed model builds on previous literature and integrates the practitioners' perspective. It is structured into four sections, each representing the most important features for logistics building evaluation: location, external spaces, building technical characteristics, and internal areas. Each sub-section contains multiple-choice questions. The significance of each section is given by specific percentage weights defined by the experts involved during multiple semi-structured interviews. Finally, the rating model was validated by pilot tests. The model was applied extensively on 65 contract logistics facilities located in Italy, ranging from 2,000 to 150,000 square metres.

Keywords

Logistics real estate, Warehousing, Rating systems, Building performance, Sustainability, Benchmarking, Facility location

Paper Code: 163

Warehouse Supply Chain Management in Healthcare

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Abstract

In Turkey, pharmaceutical industry has an economic and strategic importance in healthcare since it provides and protects public health. Pharmaceutical industry with active production is an economic gain, not only it creates employment, value, investment and export opportunities but also has a strategic benefit in unusual situations like embargo, war, epidemic and pandemic diseases. Turkish pharmaceutical market grew by 16.5% in 2016 and sales reached 20.7 billion TL, with 7.6 % CAGR during 2011-2016. The real growth in the industry has been 5.5% CAGR in the past six years, reaching 2.23 billion of boxes by the end of 2016. Global pharma giants have been present in Turkey, engaging in both manufacturing and R&D. Also, direct and contract manufacturing by multinationals are developing which creates a competitive structure in healthcare industry of Turkey. For manufacturing pharmaceutical companies with aggressive sales targets, it is vital to synchronize with suppliers of raw materials from chemical industry. In this study, for a pharmaceutical company's warehouse, the future period sales forecasts are provided via analyzing previous sales data, which will be used in controlling inventory levels of warehouse and raw material supply chain management.

Keywords

Healthcare, Pharmaceutical industry, Supply chain management, Sales forecast

Paper Code: 164
Design of Job Assignment and Routing Policies in Service Logistics

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Abstract
In this study, we consider to improve efficiency of an after-sales technical service in home appliances industry, through newly proposed job assignment and routing policies for technicans. The objective of this study is to minimize total working hours spent in a day in the after-sales service. A mixed integer programming model is proposed which assigns technicians to jobs and determines the routing for each technician so as to minimize total time (man-hour) spent in a day. The model takes the technician competencies and customer locations into account and gives job assignments, routes of jobs (in other words, customers' visiting sequence) for each technician, start and completion time of jobs, waiting time of technicians before starting a job and the jobs which are left for the next day. This model solves the problem in a static way at the beginning of each work day, based on the expected job durations according to past data. However, planned and actual job durations may be different. Therefore, a dynamic algorithm is developed which can be implemented based on the outputs of the mathematical model by considering realizations at the customers. During a day, in case of observing a difference between the actual and the predicted time of a job, the dynamic algorithm is applicable at the completion time of each job, to check whether to continue with the planned program or not. Due to the dynamic nature of the problem and deviations from the planned output, the dynamic algorithm may yield a different plan than the mathematical model and a new program may be constructed. The proposed solution methodology is validated through hypothetical case studies.

Keywords
Job assignment, Routing, Mixed integer programming

Paper Code: 165
A Review on Application Based Studies in Reverse Logistics and Closed-Loop Supply Chain Network Design

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Abstract
Waste management is an important issue in today's world facing with scarce natural resources, environmental pollutions and health problems as a consequence. Many researchers and practitioners who envisage potential problems have been working on the waste issue in the practical and/or theoretical way for years. Reverse logistics (RL) and closed-loop supply chain (CLSC) literature is an evidence of this attempt in the field of logistics and supply chain. The purpose of this study is to provide an overview of selected application based studies in the field of RL and CLSC published in last 10 years. The papers are analyzed and categorized according to product types/sector, modeling perspective, inventory, uncertainty, solution methods, relation with life cycle assessment methodologies and sustainability. Thus, this study provides a comprehensive framework for future research. In this manner, there will be an additional part investigating application based research studies published in Turkey.

Keywords
Literature review, Reverse logistics, Closed loop supply chain, Network design

Paper Code: 166

Optimization of Cargo Loading Plan for a Roll-on/Roll-off Ferry under Parking Lot Space Limitation

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Abstract

A roll-on/roll-off (RORO) ferry is a large vessel used to carry passengers together with wheeled cargos such as cars, trucks, and trailers that are driven on and off the ship on their own wheels or using a transporter. The plan for loading RORO cargos to such a ship must specify not only the exact location of each cargo within the cargo deck but also the order of loading the cargos to their respective locations. The cargo locations should be determined so that the utiliza-tion of the cargo space is maximized, while at the same time taking account of the weight bal-ance of the ship for safety. The order of the loading should be determined in such a way that each cargo can be driven to its destined location in the cargo deck without hindrance. The car-gos to be loaded must be reserved by the day before departure. Planning for cargo loading starts after the reservation is closed, when all the cargos to be loaded can be identified. However, planning becomes especially difficult if all the cargos are not made available in the waiting area or parking lot prior to loading because the cargos cannot be loaded as planned. This difficulty worsens when the space of parking lot is smaller than the cargo capacity of the ship. In this pa-per, we propose to use a genetic algorithm to optimize the plan for loading RORO cargos onto a ferry under the condition that the parking space is much smaller than the cargo deck. Our meth-od repeatedly builds a loading plan whenever the parking lot gets filled up. After a plan is built, it is repaired so that some cargos in the beginning part of the loading sequence are replaced by those currently available in the parking lot. After these available cargos are loaded, the next round of planning is done for the rest of the cargos when the parking lot gets full again. Simula-tion experiments have shown that the proposed method outperforms the heuristic method that can be regarded as the common practice seen in most real ferry terminals.

Keywords

RORO cargo, Loading plan, Optimization, Genetic algorithm

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Paper Code: 170
Supplier Selection with Fuzzy TOPSIS in the Automotive Industry

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Abstract

Supply Chain Management has become very important as today's companies are required to be more customer-focused. In order to respond to increasing and ever-changing customer demands on time, companies need to work with suitable suppliers that will provide the right quantities with the right price and at the right time. Therefore, identifying the most appropriate suppliers is crucial. Supplier selection is performed generally by evaluating alternative suppliers based on some criteria Hence, one of the most important issues in the supplier selection problem is determining the criteria to be used in evaluating the suppliers. Literature indicates that the evaluation criteria are usually determined by experts at the company where the selection process is performed. In this study, we perform supplier selection for an automotive company using fuzzy Technique for Order Performance by Similarity to Ideal Solution (TOPSIS). A multi-criteria decision making approach, fuzzy TOPSİS handles the vagueness in the linguistic terms used for comparison and mathematically represents the rankig of alternatives. Various interviews were conducted with the experts at the company in order to determine the criteria to be used in supplier evaluation. As a result of those interviews, 3 main criteria and 17 sub-criteria that can be used for evaluating the alternative suppliers of the company were determined. Alternative suppliers named by the experts at the company were then evaluated using the selection criteria, and the fuzzy TOPSIS method was implemented to choose the most suitable supplier.

Keywords

Multi-criteria decision making, Supplier selection, Fuzzy TOPSIS

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Paper Code: 171

Sales Forecasting for a Product Group of a Company in Textile Industry

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Abstract

In this study, daily sales of Istanbul stores of a company in textile industry are forecasted for a product group to assist the planning process of logistics operations. The data include three-year period daily sales. Regression with autoregressive errors method is used as the forecasting technique. This method provides a forecast model which includes a regression model that allows observing the effects of predictor variables on the forecast variable and an autoregressive model that accounts for the autocorrelation of the errors. The forecast variable is the number of sales transactions for the product group. Dummy variables are added to the data for the effects of holidays, special days, weekends and working days. Temperature and precipitation data are used for examining the weather effect. In order to meet customer demand at high service level, the right products should be provided at the right quantity, at the right place, and at the right time which depend on accurate sales forecasting. Forecasting sales with the minimum error will help the company maximize profit, minimize inventory costs and prevent lost sales. Sales forecasting based on soft computing methods such as neural networks can produce better results and therefore, it can be considered as a further study.

Keywords

Sales forecasting, Regression with autoregressive errors, Textile industry

Paper Code: 173

Staggred Working Hours Approach for Traffic Congestion Problems

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Abstract

In the world, there are lots of unsolved problems especially in the big cities. Today traffic congestion is one of the most important problems that adversely affect human life. Many transportation demand management strategies have been efficiently used in recent years. Traffic congestion is appeared during the beginning and the end of the working day. The main cause of the traffic congestion at the peak hours is that both government agencies and private companies start and finish work at the same time. To spread the travel demand over the longer time period would be decreased the traffic congestion during the peak hours. The staggered working hours is one of the methods used for this aim. In this study, the staggered working hours approach is proposed to solve the traffic congestion. The mathematical 0-1 integer goal programming model is developed and applied. By the help of this study results, traffic congestion problem can be solved especially in the developing cities.

Keywords

Traffic congestion, Travel demand management, Staggered work hours

Paper Code: 176

A Stochastic Model for WEEE Recovery Logistics and Operations Planning

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Abstract

Due to legislations, reuse or recycling of the end-of-life products has become compulsory. Especially, wastes of the electrical-electronic products (WEEE) require that harmful materials are disposed properly, and waste metal, plastic components are recovered and recycled in specialized facilities. However, there are uncertainties in amount of material that can be recovered from WEEE related with the quality of the product returned. Moreover, some uncertainties exist in scrap prices of materials that are obtained out of the waste products. To perform logistics and operations planning of WEEE recovery, we modeled this problem as a two-stage stochastic programming model, by considering the above mentioned uncertainties. Since waste recovery is performed due to environmental legislations, and these reverse logistics activities are costly, the objective of the model is the minimization of the net total cost. In the objective, the revenue earned by sales of the material recovered is also considered. Safe recovery of the harmful oil and gas substances are forced within the constraints. Besides, collection target percentage defined by the legislation is also taken into account within the constraints.

Keywords

Reverse logistics, Stochastic programming, WEEE, Operations planning

Paper Code: 177

A Decision Support System Proposal Based on Internet of Things (IoT) For Recyclable Waste Collection

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Abstract

Waste management is the whole of process including the collection, transportation, storage, recycling, disposal and control of these for all of the waste types. The process of collection and transportation are covered for recyclable waste in this study. The speed of accumulation of recyclable waste are not same the household waste and it is also influenced by different demographic characteristics of the region, the location of the container, consumer behavior etc. Accordingly, a different planning is required for each region. Instead of scheduling for each, a smart system will be easier and more cost-effective. A decision support system has been proposed to plan waste collection according to real-time data in this study. Currently, all containers are visited in fixed frequency without considering how logistics costs will increase. In the proposed system, it is desirable to establish a smart and dynamic waste collection system to prevent the unnecessary use of resources and to collect the wastes on time by knowing fullness of the containers in advance. By using internet of things (IoT), the occupancy rates of the containers are known and the collection plan is prepared according to these rates. Vehicles do not visit the containers until they reach the specified fullness. Thanks to the IoT system, real-time data can be gathered so that waste in containers can be collected at the right time. In the proposed model, it is aimed to reduce the route length and total time traveled. With this system, carbon emission and total traveled distance are reduced as well as transportation costs. The current and proposed system are compared with a simulation study according to total time they traveled. As a result of the study, it is seen that there is a significant difference in terms of the total time between the proposed system and the current system. In addition, sensitivity analysis is also included in the study, by taking different occupancy limits into account.

Keywords

Internet of things, Recyclable waste, Simulation

Paper Code: 179

The Role of Accessibility for Determining Locations in Airports and Passenger Demands in Turkey

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Abstract
The accessibility of airports and the airport preference of users' are significant criteria for the competitiveness of airports. When passengers choose a route, they actually expect the completion of the transportation chain and they want to travel to the door from the door. For this reason, the factors that affect the passenger's decision for a particular option go beyond the price and quality of air services. The decision for a specific air service and a particular airport depends on the accessibility of the airport to a considerable extent. Factors affecting the choice of the airport can simply be divided into two categories. The category that reflects the number of air fares, frequencies and served destinations is defined as "air side". The category of airport accessibility, namely access, is also called "land side". The locations of the airports are usually set up around the periphery of the city's with an reasonable length such as 50 km. The access of the airports may affects the passenger demands, so this study investigate the Turkish airport coverage in length of 50, 75 and 100 km radius from city centers. The main purpose of this study thus investigates whether a new airport construction is needed or not for domestic flights. Results showed that if 100 km radius length is used as a criterion for building new airport, only 10 cities with total population of about 2.5 million people will be outside the airport access.

Keywords

Airport, Accessibility, Transportation

Paper Code: 180

IoT-Based Warehouse Design for Smart Logistics

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Abstract

The concept of the Internet of Things (IoT), first introduced by Kevin Ashton in 1999, is a transformative technology that enables physical objects to be connected with each other through the internet and to carry out their tasks in a desired manner. The IoT is a technology that must be integrated into business systems in order to achieve better results in production and logistics. This technology forms the basis of smart logistics concept and connects people and businesses in our developing and changing world. Along with all this changing and evolving technology, the changing needs of customers and the need for real-time data, have significantly changed the role of warehouses in logistics activities. By means of the IoT, it is possible to prevent excessive production and storage in warehouses and to reduce the number of goods and costs. The products that are low on the stock can be followed-up in real-time and reordered when necessary, lead times can be shortened and lost or stolen goods can be prevented. Improper and inefficient storage processes inevitably and adversely affect the fulfillment of orders in warehouses where this emerging technology is not integrated. The purpose of this study is to examine how the IoT technology can be integrated into the design processes of warehouses, one of the most important elements of logistics. In this direction, the Quality Function Deployment (QFD) approach has been used to transform customer needs into technical requirements. For IoT-based warehouse design for smart logistics, the technical requirements are analyzed from customer needs and Grey Relational Analysis (GRA), a multi-criteria decision making (MCDM) technique, is used to prioritize the technical requirements. The effectiveness of the methodology is verified with an application.

Keywords

Smart logistics, Warehouse design, Internet of things, QFD, MCDM

Paper Code: 181

Agile Supplier Selection in Digital Supply Chain

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Abstract

Today's competitive market necessitates supply chains to act and react faster and more flexible. Agile supply chains (ASCs) provide a quick response to the ever growing speed, uncertainty and complexity in today's market conditions. ASC basically refers to the use of quickness, flexibility, competency and responsiveness to manage how well supply chains operate on a daily basis, which constitute one of the main pillars of Digital Supply Chain (DSC). ASCs need to be highly flexible in order to reconfigure themselves quickly in response to changes in their environment. DSC provides this flexibility to act in such instances. The DSC is described as an intelligent best-fit technological system that is based on excellent communication capabilities of digital networks to synchronize the interaction between entities by making services more accessible with consistent, agile and effective outcomes. ASCs use updated information and real-time data to leverage current operations to improve the overall productivity and efficiency of the given entity. The determination of an appropriate agile supplier in the DSC environment provides greater benefits. The rapidly changing and highly uncertain market environment makes the selection of ASC service providers an extremely complex and vague problem. In order to find a solution to this complex decision, this study identifies suitable decision points in the process of ASCs supplier selection by considering the vagueness that affect the process. Intuitionistic Fuzzy Sets provide a powerful method to cope with uncertainty by considering the degree of membership and non-membership function as well as hesitancy. For this purpose, VIKOR technique is combined with Intuitionistic Fuzzy Sets in a Group Decision Making setting for effective evaluation of the most appropriate ASC supplier. The application of this decision-making approach is illustrated in a case study to validate the proposed methodology.

Keywords

Agile supply chains, Supplier selection, Multi criteria decision making, Intuitionistic fuzzy VIKOR

Paper Code: 182
Smart Technology Selection for Smart Warehouse

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Abstract
In the logistics environment, advanced technologies, such as the Internet of Things, sensors, robotics, etc. entered our warehouses, which are not only indispensable in sorting centers but also even in the final-mile delivery. Amid these changes in the technology, smart systems in a warehouse are becoming ever critical for effective logistics services. Nowadays, smart systems are vital for error-free processes, reducing equipment damage, increasing productivity and efficiency, which mean a competitive advantage for the company. Considering the variety of smart products and their suppliers, companies that want to integrate smart technologies in their processes need to decide on the best supplier that matches their specific needs and expectations. This study focuses on the smart technology selection subject for the smart warehouse to address this research gap. A 2-Tuple Linguistic Model-based Axiomatic Design (AD) is developed for this selection problem. Key indicators are identified as decision criteria to be able to select the most appropriate smart technology. In this setting, a 2-Tuple-based SAW method is applied to designate the weights of the criteria. At this problem, 2-Tuple linguistic representation provides a flexible environment to the decision makers, and it enables the use of linguistic variables during evaluation. Furthermore, the AD suggests a consistent selection process with the minimum information required. This study contributes as the first-time application of 2-Tuple-based AD for a smart technology selection subject, and it provides a decision-making model to a smart system selection subject for a smart warehouse. A case study is conducted in order to test the applicability of the proposed methodology. This application covers the smart technology selection problems for a warehouse. Finally, the results of the case study are discussed, and the conclusions are provided.

Keywords
Sensor technology selection, Supplier selection, Multi criteria decision making, 2-tuple linguistic model

Paper Code: 183

Cloud Computing Technology Selection for Supply Chains

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Abstract

Cloud Computing (CC) is a trending topic nowadays. It has become a widely used concept and a catchy buzzword in almost every industry. However, many businesses have not yet fully understood the term and its implications on their business line. Different perceptions in the literature exist with regards to CC. The U.S. National Institute of Standards and Technology (NIST) defines CC as a ubiquitous, convenient and on-demand network model that possess access to a common pool of adjustable computing resources such as networks, servers, storage, etc. that can be quickly provisioned and released with minimal provider interaction. With its adjustable, on-demand network models, the CC technology attracts businesses. It has several advantages, such as no up-front investments, lowered operational costs, scalability, easy access, and flexibility. These advantages help businesses to gain a competitive advantage over competitors by enhancing their cost structure and operational efficiency. Furthermore, CC can be a handy and innovative way to gain a competitive edge as it can optimize the processes in the supply chain management (SCM). Before starting to use cloud SCM systems, businesses struggle to select the most suitable CC technology. For this purpose, companies first identify their technical requirements for the needed system. CC technology selection is a vital decision for a company. To this end, this study proposes a new CC technology selection framework for supply chains (SC) that is necessarily a fuzzy logic-based EDAS method. The CC technology requirements are identified first with a literature review and opinions of industry specialists to apply this methodology. Then, the proposed Fuzzy-EDAS method is applied to select the most appropriate CC technology provider for an SC company. To test the applicability of the integrated method, a short case study is presented for a company from Turkey, and the results are evaluated.

Keywords

Cloud computing, Cloud computing technology selection, Fuzzy-EDAS

Paper Code: 184
A New Service Quality Model for Aviation Industry

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Abstract
Today, many companies focus on their service quality and sustainability for competitive advantage in a global market. Service quality is achieved by meeting the expectations and demands of each customer. However, it is becoming a challenge to meet customer demands because of competition due to globally growing service channels and the complexity of logistics and supply chain activities. While the level of service quality is difficult to measure, even in the classical manner, it is getting harder to measure it. Because, all industrial areas including service industry is being influenced by digital transformation. Behavior of customers is changing, and their experience are digital now with digital transformation. Hence, firms have started to see digital transformation as a necessity. Service quality perception is evolved with time over technological developments and service quality measurement tools also changed. By considering this, the aim of this study is to construct a new model for measuring the digital service quality, and the performance of the services provided on digital channels. To measure digital service quality, in the first part of the study, a detailed literature survey is carried out for the SERVQUAL model. Different research reports and white papers are also reviewed for this purpose. Various service quality measurement methods are examined, with a focus on the electronic and mobile service industries. Researches showed that there is no appropriate model to measure service quality in the aspect of digital transformation yet, in the literature. Consequently, a new service quality model is proposed for the aviation industry that is directly related with logistics and supply chain with a digital transformation perspective. The main service quality dimensions and their sub-criteria are determined for this purpose, and a new model is constructed that can guide business managers and researchers in better designing digital services.

Keywords
Digital service quality, Digital transformation, Aviation industry, SERVQUAL

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Strategic Analysis of Turkey Aviation Industry's Digital Transformation

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Abstract

The consequences of technological developments penetrate almost every sector today, and a new era has begun as digital transformation. One of the most affected sectors in this transformation is the aviation industry, which is closely bound to logistics services and supply chains that connect firms with customers. Behavior of customers and structures of these supply chains are changing with the digital transformation. Changing demands due to new technological possibilities offered to customers, are observed and, customers are digital now. Customers' digital expectations influence the aviation industry in the global marketplace, forcing them to define competitive digital transformation strategies. To determine digital transformation strategies and to be sustainable and competitive in the market, companies in the aviation industry must determine their strong and weak sides with opportunities and threats. So, in this paper, a SWOT-based integrated fuzzy multi-criteria decision making (MCDM) method is used to determine these strategies. For this purpose, digital transformation factors are determined with a SWOT analysis based on expert opinions and literature review. The hierarchical structure is constructed, and weights of criteria are determined via AHP method. Alternative strategies are revealed as output of AHP. Finally, the strategy selection is performed by using the VIKOR method. Analytic tools are extended to fuzzy sets by considering uncertainty.

Keywords

Digital transformation, Aviation industry, SWOT analysis, Fuzzy MCDM.

Paper Code: 186

Evaluation of Smart City Logistics Solutions with Fuzzy MCDM Methods

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Abstract

City logistics, which started to examine as a subdivision of logistics, aims the planning and management of transportation, efficiency, protection of the environment, reduction of traffic, security and energy saving. Rapidly growing population and migration from rural to urban areas have an important place in many of the problems of cities. The smart city is an approach that has a significant potential to solve urban logistics problems with information technologies. "Smart city logistics solutions" such as full adaptive traffic management system, security and emergency systems, electronic detection system etc. present based on information technologies to meet the increasing demand for logistics services more efficiently, safely and environmentally. In this study, the evaluation of smart city logistics solutions that contain many components is considered as a multi criteria decision-making (MCDM) problem. Considering the complex profile of this problem need to be taken into account by experts for deciding on the suitable solution when information is in uncertain nature. In this context, the smart city logistics solutions in Istanbul determined by literature review and expert opinions are modeled, analyzed and the results are interpreted by using the House of Quality matrix of Quality Function Deployment (QFD) approach with fuzzy MCDM methods.

Keywords

Smart city logistics, Smart city logistics solutions, House of Quality, Fuzzy MCDM.

Paper Code: 187

Digital Transformation Maturity Assessment for Supply Chains

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Abstract

Digital Transformation (DT) is one of the most discussed topics both on academia and business. DT aims to improve operational efficiency, create new customer experience and generate new revenue streams. DT affects the whole business and supply chains have been affected from this transformation. Leveraging the new emerging technologies with new business models makes widespread information available, enhances visibility of supply chain, creates high level collaboration and communication across digital platforms. However, the new digital business models should be systematically shaped. At this point, Digital Maturity Models (DMMs) help firms for analysing their current situation in terms of DT. This paper aims to develop a maturity model for supply chain DT assessment and proposes an original evaluation framework by integrating the model with an analytical method. The maturity dimensions and factors are determined by literature review, industry reports and experts' opinions. The factors' importance degrees are computed by using Fuzzy Analytic Hierarchy Process (AHP) method and the maturity score of the supply chains are calculated. The evaluations of experts are collected by using linguistic variables and fuzzy logic is preferred because of the uncertainty. At the end of study, an application is given and the future perspectives are presented.

Keywords

Digital supply chain, Digital maturity model, Fuzzy multi criteria decision making

Paper Code: 188

Risk Assessment Study in a Port by Using Fuzzy Proportional Risk Assessment Technique and AHP

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Abstract

Since the maritime sector has an important role in an economy of a country, many serious investments have been made in the port industry. However, lack of qualified labor and lack of sufficient infrastructure bring along the problems of job security in the busy ports. Therefore, risk management is vital for every port where a large part of imports/exports are carried out. In this study, a port-specific risk assessment study was carried out for one of the most important ports of Turkey. Firstly, a risk analysis was applied and the hazard sources were determined. The risk scores were calculated by using the conventional Proportional Risk Assessment Technique (PRAT). In the second phase, the fuzzy linguistic assessment model was developed and the fuzzy risk scores were obtained by using fuzzy PRAT. The results of both PRAT and fuzzy PRAT were compared by ranking. However, there were still many equal fuzzy risk scores in the ranking. Then, by utilizing the logic of the AHP approach, comparison matrix was used and the hazards with the same fuzzy risk score were prioritized among themselves. As a result, the importance ranking was obtained and the shortcomings of PRAT and fuzzy PRAT were eliminated.

Keywords

Risk analysis, Fuzzy logic, Port, AHP

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Paper Code: 189

A Mathematical Model for the Milk Collection Problem with Various Milk Types

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Abstract

Milk collection problem (MCP) is concerned with the collection of raw milk with different qualities from dairy factories via tankers under problem specific constraints. During this process, collection of milk without mixing is at least as critically important as production quality since final milk quality is accepted to be equal to the quality of the milk with the worst quality when milk of different qualities is mixed. MCP is concerned with decisions of selecting farms/milk collection centers to be visited, milk quality to be selected, type of tanker to be used, tanks to be stored and finally, the visiting sequence to be optimized. MCP is a rich variant of vehicle routing problem that additionally considers incompatibility and loading constraints specific to milk collection. In this study, an integrated mathematical model that aims to minimize total distance for tanker assignment and routing problems by simultaneously considering vehicle routing constraints and incompatibility constraints is proposed. Results show that developed mixed integer linear programing model is promising on efficiently solving small sized real-life instances.

Keywords

Milk collection problem, Vehicle routing problem, Logistics, Mathematical modelling

Paper Code: 190

A Variable Neighborhood Search Approach for Beverage Distribution Problem under Uncertainty

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Abstract

Beverage distribution companies often collect demand of local shops, markets and restaurants on the previous day and distribute beverages to demand points on the next day. Therefore, the demand of the customers is deterministic and known the day before the delivery. On the other hand, transfer durations between stores and depots are stochastic due to day time traffic congestions and/or truck and driver related problems. Similarly, the service time at the customers have uncertain characteristics. This duration can be affected by various factors including availability of parking spot near customers' store, handling equipment to transfer bottles and cans, lift options for top floor restaurants and bars, presence of assistant staff or customer related other problems. Considering streets without parking spots and off-traffic, service personnel may have to carry beverage packets from a long distance. This study therefore, aims to design daily service network of beverage distribution by minimizing the total distribution cost under fuzzy traffic conditions and service operations. An efficient variable neighborhood search (VNS) is tested on several well-known benchmark instances from vehicle routing problem literature. Then, a case study from the beverage industry has been addressed and solved. The findings of this study indicate that the approach has a potential of enabling the decision maker to make effective decisions related to the design of distribution networks.

Keywords

Beverage distribution, Heterogeneous fixed fleet vehicle routing problem, Variable neighborhood search

Paper Code: 194

Determining Time Window Solutions in City Distribution

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Abstract

To lessen the negative effects of urban freight transport, local governments in many cities have implemented time windows, which limit the time during which freight vehicles are allowed to enter city centers to short periods. The delivery time windows for each city is determined by the city authority itself and the retailers have to comply with the restrictions imposed. However, the time window restrictions that a particular city applies affect not only store deliveries in that city, but also the store deliveries in neighbouring cities, since retailers try to make combined trips. In this paper, we use a game theoretic method to find time windows that improve on the currently used time windows, by cooperation between the cities. Using the municipal time preferences for truck deliveries, regression based models are developed to represent the city satisfaction functions which take into consideration the interaction with the time windows of the neighbouring cities. Using these regression functions, joint optimal time windows can be determined resulting from the possible city coalitions. A case study is presented to illustrate the approach and the results.

Keywords

Cooperative game theory, City distribution, Time windows

Paper Code: 196

A Model for Determining the Locations of Electric Charge Stations in Istanbul

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Abstract

Regarding the environmental concerns of the classic transportation systems, the studies about hybrid vehicles have become more important and increased in the last years. One of the problems to consider at this point is to determine the proper locations of recharging stations for hybrid and electric vehicles (EV). The aim of this paper is to determine the optimum locations of charging stations in Istanbul considering the existing number of EVs and hybrid vehicles (HV). The locations of charging stations are determined by using a mathematical model based on the p-median model with the aim of minimizing the total distance traversed.

Keywords

Assignment problem, Electric vehicles, Electric stations, Hybrid vehicles, P-median model