

ABSTRACTS

Complete Closed-loop Supply Chain Network Design under Uncertainty of Demand and Return Products

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In this research, we focus on complete closed loop supply chain, which includes forward and backward flows of materials. So a network has been considered including suppliers, manufacturers, distributors, customers, and collecting and disposal centers. In addition, to conform to real word conditions, and examine uncertainty of demands returns, scenario technic was used. In this research, we used a mixed integer linear programming model to minimize total cost of supply chain. The location of the facility, the production quantity of different products in each sites, and the flow of products between different nodes of network are the decision variables of the model. The computational complexity of the model, leads us to develop a particle swarm optimization algorithm to solve the problem in large-scale cases. Results show the efficiency of proposed algorithm in uncertain situations.

Keywords: Closed-loop supply chain, Mixed integer linear programming, Particle swarm optimization algorithm, Uncertainty.

Monotonic Change Point Estimation in the Parameters of Polynomial Profile Model

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In this paper, a maximum likelihood estimator is developed to estimate isotonic change point in the parameters of a polynomial profile in phase II. In addition, performance of the proposed estimator is compared to the performance of the step change point estimator, under increasing change types using simulation study. Accuracy and the precision of the estimators are considered as the performance measures in this paper. Simulation results show that the proposed estimator has an acceptable performance in terms of the accuracy and precision of the estimations. The proposed estimator also does not require any awareness about the change type, and its only assumption is that changes occur in an increasing manner. This is the advantage of the proposed estimator over the step change point estimator.

Keywords: Change point estimation, Isotonic change, Maximum likelihood estimator (MLE), Polynomial profile, Statistical process control.

The Relationship between Productivity Factors and Organizational Performance with Regards Financial and Economic Benefits Using ISO 10014 Guidelines

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Productivity and the related indicators have great importance for organizations due to the direct effects on the organization's performance and efficiency. Otherwise, firms and organizations devote a considerable attention to the issue of financial and economic benefits, and relevant standards, in order to acquire competitive advantages. In the field of financial and economic benefits, the ISO 10014 standard is important. In this study, first the concepts of productivity and financial and economic benefits are considered separately. Then, the aspects

and the criteria of each of them are extracted. Then, for the productivity issue, 20 indices and for the financial and economic benefits, 16 indices were extracted from papers and researches. This study has been conducted through two research methods: exploratory and descriptive. In the descriptive portion, the indices and the concepts effecting on the issues of productivity, and financial and economic benefits were extracted separately. In the exploratory method, the relationships among the defined concepts and indices in the two fields of productivity, and financial and economic benefits, which have been acquired from the literature, have been specified. Regarding the introduced issues for finding a meaningful relationship between productivity, and financial and economic benefits, a questionnaire was developed which was filled in by the experts in the industry and university sectors. In the first set, the questionnaire was designed for finding a significant relationship between financial and economic benefits, and productivity. The related indices were extracted by means of t-test with significant level of 5 percent. Among the related indices, the ones with strongest relationships were determined and reported. In the second set of questionnaires, the relationships between indicators and variables were recorded, and the work was done by calculating the Pearson correlation coefficient. The data was analyzed by Minitab software. Finally, we compared the analysis output of the two series of questionnaires, and decided that how much and in which parts, the performance issues are connected to productivity.

Keywords: Financial and economic benefits, Indicator, Organizational performance, Performance evaluation, Productivity.

A Multi-objective Supply Chain Network Design Regarding Customer Relationship Management

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In recent years, for governments and industries waste management has become more important than ever due to legal requirements, economic profitability, environmental sensitivities and customer awareness development. The main objective of this article is to develop a mathematical programming model, in order to simultaneously improve the existing forward supply chain (SC) as well as to design reverse SC for the aim of collecting and recycling the used products, and also to coordinate the whole SC. The presented multi-objective model is solved by using revised multi-choice goal programming approach. The other objective of this work is to develop a more customer centric SC, which is successfully achieved by modeling the customer relationship management concept with strategic and tactical SC decisions. More importantly, the realization rate of the objectives, considering their importance to SC is shown to help senior managers in the decision-making process. The proposed model is designed for the new and emerging industry of recycling used tires in Iran, and is implemented by software with the cited industry data.

Keywords: Bi-objective mathematical model, Customer relationship management, Supply chain management.

Developing an Integrated Approach for Inventory Control, Pricing and Advertisement of Deteriorating Items

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In this paper, an integrated approach for inventory control, pricing and advertisement of deteriorating items is proposed. The demand rate is a function of the selling price and advertisement, which is modeled as the frequency of advertisement in each replenishment cycle. To reflect a more practical situation, not only the prices of substitute products affect demand, but also the inventory holding cost is defined as a time-dependent function. In order to characterize the optimal solution, several theoretical results are derived which demonstrate existence and uniqueness of the optimal solution. Then an iterative solution algorithm is developed. Finally, to show validity of the proposed model and applicability of the developed algorithm procedure, numerical results are provided.

Keywords: Advertisement, Deterioration, Inventory control, Pricing.

Integration of Inventory Decisions and Carrier Mode Selection in a Two-echelon Supply Chain with Deteriorating Items

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This study investigates a two-echelon supply chain consisting of a vendor and a buyer with deteriorating items. The deterioration rate of product is constant. To transport products from vendor to buyer, two carrier's modes with different traveling time and cost are considered. The difference between the present study and the previous ones, is that the deterioration of product continues during the traveling time, which depends on the carrier's mode to ship batches from vendor to buyer. So the structure of existing models changes. The purpose of this study, is to minimize the total cost of buyer and vendor,

and to obtain the number of shipments, the vendor's production cycle time, and the carrier's type. We propose an algorithm to solve the independent model of buyer and vendor with the affirmation of cost functions' convexity, and a heuristic algorithm to solve the integrated model. Sensitivity analysis is also carried out to examine the sensitivity of decision variables and the performance measure of supply chain. The proposed integrated model can produce lower cost rather than an independent decision by vendor and buyer.

Keywords: Deteriorating inventory, Integrated supply chain, Lead time, Optimization.

Inventory Control for Deteriorating Items in Closed-loop Supply Chain with Stochastic Demand

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Products such as ICs, computers, and cell phones can become out of date due to technology development; but they can be remanufactured and returned to market for sale. Determining the optimal inventory control policy for remanufactured products, that is considered in the closed loop supply chain, is one of the important problems in the supply chain management of deteriorating items (in closed loop supply chain, the customer is able to return the used products to the reverse flow for remanufacturing or reusing). In this paper, we analyze an inventory system for closed-loop supply chain with multi-manufacturing and multi-remanufacturing cycles under stochastic demands. The manufacturing cycle is used for direct flow of supply chain; while the remanufacturing cycle is applied for reverse flow, in which the used products return to the production system. The supply chain is for echelons including retailer, manufacturer, collector, and material

supplier in which shortage is allowed and completely backlogged. The decision is made initially by the down-stream player (from retailer to supplier). We generalize three different cases: 1. Single manufacturing cycle and single remanufacturing cycle, 2. Single manufacturing cycle and multi-remanufacturing cycles, and 3. Multi-manufacturing cycles and single remanufacturing cycle. Moreover, a heuristic algorithm is presented to obtain the optimal solution. Finally, a numerical example is described to prove the applicability of the model and its solution algorithm.

Keywords: Closed-loop supply chain, Deteriorating items, Multi-echelon inventory, Stochastic demand.

Scheduling in a Cross-Dock Based on the Departure Time of the Outboard Trucks

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According to the development of cross-dock network concept in theory and establishing cross-dock centers around the world, these centers have been attended by many companies. Cross-dock centers reduce transportation costs significantly by consolidating the loads and transferring them together. There are some problems in planning and scheduling cross-dock systems that can affect the efficiency and productivity of these systems. In this paper, a model, based on time and capacity constraints is developed. The model schedules inbound truck unloading time according to the importance, volume and existing costs of the products, and delay loads are stored in temporary storages to transfer at the next period. Furthermore, the problem is formulated in a mathematical model. It can be solved to find optimal

solution, and in large size problems a heuristic algorithm is developed.

Keywords: Benders decomposition technique, Cross-dock network, Heuristic algorithm, Scheduling.

An Integrated Approach for Product-Mix Determination, Two-Sided Assembly Line Balancing and Worker assignment, Based on the Bottlenecks of System

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In this paper, a heuristic algorithm for product-mix determination, two-sided assembly line balancing and worker assignment are presented. In this algorithm, in addition to assigning the tasks and workers to the stations for cycle time minimization, the quantity of each model is determined to have a suitable line to assemble the products. The efficiency of the heuristic algorithm is verified with several test problems and two different rules for worker assignment, which the obtained results showed the algorithm's efficiency.

Keywords: Heuristic algorithm, Mixed-model, Product-mix, Theory of constraints, Two-sided assembly line balancing problem, Worker assignment.

Prediction of Rotating Machineries Failure by Intelligent Systems

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Failure of machines, due to stopping the production line, results in financial losses.

Preventive maintenance, significantly extends the machineries life, and reduces the costs. On the other hand, predicting the remaining useful life (URL) of the equipment and machineries, provides adequate time for maintenance engineers to repair or replace the parts before failure occurs, and avoid the overhaul costs (conditional-based maintenance). These actions are more important for rotary machines such as turbines, pumps and compressors, than the others. Hence, in this paper, we predict the URL of the Olefin unit of Pars Petrochemical Company turbine pumps based on the bearings health by artificial neural networks (ANN) and support vector machine. First, we provided the prediction model by the RMS, mean, peak and crest factor of one bearing, which was used to estimate the RUL of the four bearings using the above methods. Results showed that the accuracy of prediction by SVM method was more than single-layer ANN.

Keywords: Artificial neural network, Bearing, Prediction, Remaining useful life (RUL), Support vector machine, Turbine pump.

Three Developed Meta-heuristic Algorithms to Solve RACP Minimizing Makespan and Total Resource Costs Simultaneously

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In this paper, a bi-objective resource availability cost problem (RACP) is studied, in which the first objective function tries to minimize the completion time of the project, and the second one tries to minimize the total resource costs. Due to the problem complexity, three developed meta-heuristic algorithms, namely NSGA-II and NPGA and MOPSO, are applied to solve the model. To evaluate the algorithms, a set of tests' problem are considered. In addition, a MADM approach

called TOPSIS is employed to compare the algorithms' results. Finally, the sensitivity analysis in terms of problem's performance is fulfilled.

Keywords: MOPSO, Multi-objective optimization, NSGA-II, RACP, RCPSP.

Air Cargo Revenue Management in Variable Operating Conditions of Capacity, Considering the Possibility of Double Booking

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Revenue Management (RM) is a subfield of operations research that aims at maximizing revenues acquired by selling perishable products/services in a specified period. Due to the substantial growth in air cargo industry over the past few years, some techniques are needed to maximize revenue. In this paper, space allocation problem in two cases including overbooking possibility and impossibility are studied. Since the proposed dynamic programming needs much memory for obtaining exact solution, three heuristics including deterministic integer linear programming (DILP), bid price (BP) and dynamic programming decomposition (DPD) are proposed. Results show that BP and DILP performance is better than other approaches. In addition, results show that when overbooking is possible, it leads to revenue increment by more than 10 percent.

Keywords: Air cargo, Canceling request, Overbooking, Revenue management.

Applying Queuing Theory to Optimize Perishable Products Supply Chain with (S-1, S) Ordering Policy and Increasing Customers Satisfaction

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Applying queuing theory to optimize inventory control systems, is an important field in the literature of perishable inventory systems. However, a few studies have considered it with $(S-1, S)$ ordering policy and customer satisfaction. In this paper, queuing theory was used to optimize inventory control system and to increase customer satisfaction in a two-stage supply chain of perishable products with exponential life time. The supply chain consists of a manufacturer and a supplier. Customers arrive at the manufacturer according to a Poisson process. Manufacturer uses $(S-1, S)$ ordering policy for stock replenishment. Lead time and processing time are exponentially distributed. The aim is to determine the optimal values of manufacturer's storage capacity and waiting room capacity. Therefore, the supply chain is modeled as a queuing system. After deriving steady state equations, system performance measures were calculated and a mathematical model was developed to minimize total cost. Optimal solutions were obtained by enumeration and direct search techniques. The sensitivity analysis of the model is performed by a numerical example.

Keywords: Perishable product, Queuing theory, $(S-1, S)$ ordering policy, Supply chain.
