

agement approach with financial measures. Integration with Kalman filter prediction method is proposed. And thus the model can be used in the project, for progress tracking, risk analysis, and predictions for the future of performance targets. A comprehensive model presented for an actual project implementation is described and

its results will be compared with the standard methods of project management.

Key Words: Performance evaluation, risk analysis, financial management, decision support systems, construction investment project.

WITH STOCHASTIC CONSTRAINTS WITHIN BACKORDERS AND LOT SALE CASES

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Abstract

There are two methods for inventory control, the continuous review and periodic system. The continuous method is employed for important items, while periodic system is used for items whose importance is on average level. In this paper, we present two models for a constrained multi-product inventory control problem with stochastic demand under periodic review policy. The objective of the model is to minimize the total cost. The total cost is the sum of holding cost, shortage cost and set-up cost. In the model, shortage is allowed. In the first model, shortages are completely backordered and in the second model, we consider lost sale for shortages. We have considered stochastic constraints, such as warehouse space and restriction on order quantity and in hand budget. The stochastic constraints are more reliable than exact case and it is compatible to real world. Also, the resources of constraints (right hands) are assumed as random variable. We have employed the service levels for products as a constraint. The problems have modelled as nonlinear integer models and we have employed genetic and particle swarm optimization algorithms for solving models. The inputs of these algorithms are tuned by response surface methodology and if we set these properly, the speed of the algorithms will grow up. We have compared employed algorithms both stochastic and MADM bases. The stochastic comparison is done by t test, and the methods have compared statistically while time of execution and objective value are criteria in MADM comparison. In fact, two criteria are considered simultaneously in MADM, but they are considered individually in statistical comparison. TOPSIS, as a popular method, has employed for MADM comparison. Finally, we have reported the efficiency of the algorithms effectively.

Key Words: Inventory control, periodic review, back order, lost sale, genetic algorithm, particle swarm optimization algorithm.

DEVELOPING A MODEL-BASED DSS FOR INTEGRATING PROJECT PERFORMANCE EVALUATION AND RISK MANAGEMENT (CONSTRUCTION INVESTMENT PROJECT)

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Abstract

Today, the construction industry is complex and ambiguous, and the active agents are forced to use the new tools of project management and knowledge of the world to focus on key areas which will enhance them inevitably and thus success is guaranteed. One of the main areas to focus on is the context of project management issue, in this way the performance management is optimized and operational performance is improved to support the risk management and reach the strategies of the organization. With the science development, the optimization of possibility of projects and implementation process, is a critical step in the process of completing the project. According to studies, about 60% of the failure of construction companies, has been due to financial matters. According to the literature, to meet the demands, deficiencies in risk management and financial management of the project were discussed to evaluate the performance. In this research, the evaluation of project performance and risk management is integrated and evaluated. Therefore, a comprehensive model for integrated performance evaluation models and risk analyses, using a model-based decision support system, was considered that aims to increase accuracy, convenience, efficiency and effectiveness in both the planning and implementation of project. A decision support system (DSS) is a model-based or knowledge-based system intended to support managerial decision making in semi-structured or unstructured situations.

The proposed model for project performance targets, contain: time, cost and finance. The model fits with the discussed projects to integrate performance evaluation with risk analysis, by developing earned value man-

AN INVENTORY MODEL FOR A TRI-STAGE SUPPLY CHAIN UNDER STOCHASTIC DEMAND

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Abstract

This research considers a tri-stage supply chain with multi vendors, multi retailers, and a warehouse entitled by vendor management inventory (VMI) to support the vendors. In the proposed model, the annual order and warehouse capacity are assumed to be limited. Also, the demand of retailers is considered as probabilistic, wherein it follows Normal probability density function. The main goal of the current paper is minimization of the total cost of supply chain, such as holding and ordering costs for retailers, vendors, and warehouse. The minimum cost is obtained by calculating the economic order quantity of the first retailer which is supplied by vendor i , and also the replenishment quantity of retailers and vendors based on the model and its constraints. First, a non-linear integer programming (NILP) is modeled, and then the mentioned model is considered with stochastic demand. The proposed models are solved by CPLEX software and analyzed by Taguchi method to determine the best demand for the abovementioned model. Finally, the method of analysis of variances (ANOVA) with significance level of $\alpha = 0.05$ applied to demonstrate the independence of the mean of demands.

Key Words: Tri-stage supply chain, inventory management, warehouse, stochastic demand, taguchi method.

A CHANGE POINT MODEL FOR MONITORING POISSON PROFILES IN PHASE II

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Abstract

In some process control applications, the quality of a product or process can be characterized by a relationship between two or more variables, which is typically referred to as a profile. In recent years, profile monitoring of attribute quality characteristics, such as Bernoulli, Poisson and multinomial distributed response variables using generalized linear models, has received a great deal of attention by academic researchers as well as practitioners. In spite of their ability to detect the state of a process, traditional control charts for monitoring profiles are not sufficiently capable to determine the real time of change when a process enters the state of out-of-control condition. In this paper, we investigate the use of likelihood ratio test (LRT) method to monitor Poisson profiles and compare its performance with that of the traditional approach which employs maximum likelihood estimator (MLE) of change point, once an out-of-control signal appears in Hotelling T^2 control chart for monitoring profile parameters. It should be added that this study considers only a single step shift in parameters of the profile. Simulation results indicate that the proposed method outperforms the traditional approach in terms of both average run length (ARL) of detecting out-of-control conditions as well as accuracy of change point estimation. The relatively high dispersion of estimation of small shifts of the parameters is the main consideration of the proposed method which can be attributed to the higher detection speed manifested by shorter average run length of control chart resulting in fewer data points accessible to identify the exact change point. Integrating the LRT method with exponentially weighted moving average (EWMA) chart has proved to be more powerful in detecting small process shifts as well as dealing with other types of process shifts, such as linear trend, which are the main areas proposed in the concluding remarks of the paper.

Key Words: Monitoring poisson profile, change-point model, generalized linear models, likelihood ratio test, phase ii of statistical process control.

MODELLING AND OPTIMIZING A PERIODIC INVENTORY PROBLEM

Abstract

Stochastic programming under endogenous uncertainty is a new topic in which the time of uncertainty realization is affected by optimization decisions. Development of application areas in this field has been of interest to researchers. Therefore, this paper addresses a novel variant of the vehicle routing problem as a new application of this topic. In this problem, a single vehicle with a limited capacity must serve a set of customers whose demands are uncertain and the actual demands are revealed upon the vehicle's arrival to customers. Under some circumstances, the vehicle may be depleted throughout the route before all customers are satisfied; in this case, it needs to return to the depot for replenishment. The objective is to find a policy to satisfy customers' demand with the minimum total expected cost.

The main point is that this problem is considered from a dynamic viewpoint. Indeed, the route is constructed gradually over multiple stages according to the realized information. For example, the primary decision determines a customer who should be visited in the first stage. Upon the vehicle visiting this customer, his/her actual demand becomes known; then, depending on the realized information, the next decision is to determine a customer who must be visited next, whether directly or after the replenishment at the depot. This process is repeated until all customers are visited. Finally, the vehicle returns to the depot. Clearly, the time of uncertainty realization is decision-dependent and hence, uncertainty is of endogenous nature. Therefore, the scenario tree becomes decision-dependent and nonanticipativity of decisions must be ensured by conditional constraints.

This paper formulates the problem as a multi-stage stochastic programming model with endogenous uncertainty. Then, since nonanticipativity constraints constitute a considerably large portion of the total constraints, efficient approaches are proposed to significantly reduce the problem size and improve the solution time. Computational results evaluate the proposed model and approaches on some randomly generated test problems.

Key Words: Multi-stage stochastic programming, vehicle routing problem, endogenous uncertainty, decision-dependent scenario tree, nonanticipativity constraints, elimination of redundant constraints.

MULTI-OBJECTIVE SUSTAINABLE SUPPLY CHAIN PLANNING WITH DETERIORATING PRODUCTS

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Abstract

Supply Chain Management is an important part of Operations Strategy in many large organizations. The concept of competition has shifted from firm against firms to supply chain against supply chains. In recent years, the subject of supply chain sustainability, with economical, environmental and/or social values, has attracted attention in the academia and industry. This includes both forward and reverse supply chains. In Particular, for deteriorating products, such as fresh products, the issues of timely supply and disposal of the deteriorated products are of high concern. Transportation, or in broader view, logistics options also play a large role in both economic as well as social and environmental aspects of the supply chain management. Deterioration rates may be a function of both transportation and stocking of the product. Considerable amount of the existing literature has been devoted to modelling the economic aspects of supply chain, while still there is not a complete planning model including all aspects of the sustainable management of forward and reverse supply chains.

The goal of this paper is to develop a possibilistic mathematical model and propose a new replenishment policy in a centralized sustainable supply chain for deteriorating items. Inventory and transportation costs, as well as environmental and social impacts, are considered. Some transportation vehicle options are given which produce various pollution and greenhouse gas levels. Several variables are uncertain, such as the end-customer demand, the partial backordered ratio, and the deterioration rate. Not only deterioration occurs for in-stock inventories, but also deterioration during transportation is covered in the proposed model. The solution provides the best transportation modes and routes and the inventory policy by finding a balance between financial, environmental, and social criteria. In this way, we develop a linear multi-objective mathematical model and present a numerical example to demonstrate its applicability and effectiveness.

Key Words: Sustainable supply chain, deteriorating products, transportation, possibilistic programming, greenness.

the presented model is considered, and eventually, Genetic Algorithm is used to calculate optimum values. Results showed that using adaptive control charts helps to notably reduce costs.

Furthermore, due to the increase in the mean of quality characteristics in a constant measurement error variance, the number of required samples is decreased, and the number of multiple measurements for process monitoring is increased.

In addition, through using Taguchi loss function for poor-quality products, an increase in distance from the mean will result in higher costs.

This should be mentioned that as a result of growth in the rate of occurrences in assignable causes, the multiple measurements should increase.

Sensitivity analysis is concerned in order to study the effect of input parameter's values on the optimum values. According to the results, the number of multiple measurements for the quality characteristic of each item decreases when the slope increases.

Key Words: Economic statistical design, measurement error, multiple measurements, \bar{X} control chart, variable sample size controls chart, genetic algorithm.

HYPERCUBE QUEUE MODEL FOR EMERGENCY FACILITY LOCATION PROBLEM CONSIDERING BACKUP FACILITY

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Abstract

Most of the studies, which deal with the congested facility location problems, assumed that each customer must be only served by a facility, such that if the corresponding facility is out of service, the customer's request will not be covered by other facilities. Considering backup facilities for customers help mathematical model to cope with the real-world situations; however,

the common queue models will not be suitable any longer for analyzing the service system. In these situations, a common queueing system is hyper-cube queue models, in which the states of the queue are represented by a binary vector, showing the availability (i.e., 1) and unavailability or busyness (i.e., 0) of the facilities. In this paper, we use the concept of hypercube queue system in modelling emergency facility location problem with mobile servers. The proposed model aims to select a number of facilities from a number of candidate sites in a way that total expected waiting time for customers is minimized. It is assumed that each customer's demand is provided by the closest free facility, and his or her arrival (call for service) process is considered to be Poisson process. Furthermore, in each facility, a single server with exponentially distributed service times is established.

All previous studies on the applications of hyper-cube queue models in location problems considered the structure of queue model in terms of steady-state equations in the body of the proposed heuristic algorithms. For the first time, the steady-state equations of the hyper-cube queue model are included in the mathematical model; hence, the optimal solution can be found by solving the proposed model. Moreover, since the problem is NP-hard, a genetic algorithm is developed to solve large-scale problems. In order to evaluate the accuracy of the proposed model and the effectiveness of the proposed algorithm, a number of numerical examples are presented and analyzed. The results of the numerical examples demonstrate the acceptable performance of the proposed genetic algorithm.

Key Words: Emergency facility location, mobile servers, backup facility, hyper-cube queue model, genetic algorithm.

ENDOGENOUS UNCERTAIN DEMANDS IN VEHICLE ROUTING PROBLEM

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AN EFFICIENT INTELLIGENT APPROACH FOR SHORT-TERM LOAD FORECASTING

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Abstract

One of the major issues for design and operation of power systems is load forecasting for the same hour in the next few days, known as a Short-Term Load Forecasting (STLF). Forecasts are required for proper scheduling activities, such as generation scheduling, fuel purchasing activities, maintenance scheduling, investment scheduling, and for security analysis. Accurate forecasting of electrical load leads to energy saving and careful planning. The aim of this study is to predict short-term consumption of electrical energy in one of the states of Iran (i.e., Mazandaran). This study used several techniques and tools of data mining to predict electrical energy consumption and demand in short-term time. Several methods, such as Neural Network, Support Vector Machine were used for forecasting and their results were examined. The first phase of this research is to identify the parameters that affect electrical energy consumption. Then, among these factors, those with the greatest effect will be selected. In the next step, data analysis and different behaviors of electrical energy consumption are discussed and classified based on their similarity. Afterwards, the required inputs will be identified and pre-processing will be performed. In the next step, Previous electricity load values with related data of each category are presented for the Multilayer Perceptron Neural Network and support Vector Machine recursively. In this model, the support Vector Machine could supply a better result. Then Principle Component Analysis (PCA)

is used to reduce the dimension of input variables. New data will be tested once again with proposed systems to observe the effects of principle component analysis on each method.

Finally, the results of all methods are compared with each other. The result will be compared with two measures: including coefficient of determination (R^2) and root mean square error (RMSE). The result shows the improvement in Neural Network and Support Vector Machine with the use of principal component analysis, which provide better results compared to classical predictions.

Key Words: Short-term load forecasting, neural network, support vector machine, principal component analysis.

ECONOMIC- STATISTICAL DESIGN OF VARIABLE SAMPLE SIZE \bar{X} CONTROL CHARTS BASED ON MEASUREMENT ERROR

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Abstract

Control charts are widely used for process monitoring, but the ability of the traditional charts to detect the small shifts in the process is low. As a result, adaptive control charts have been introduced. Quick diagnose of process shifts and fewer defective products make these control charts more practical. In order to use the entire control charts, design of related parameters is needed.

Because the sampling is used to ensure process stability, measurement error in control charts seems inevitable. There are many ways to reduce error's impact, one of which is multiple measurements of each product.

In the present study, multiple measurement parameters are added to control chart design parameters (sample size, sampling interval, and control limits) and cost functions are modeled for control chart and variable sample size control chart. Thereafter, a numerical example of

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Abstract

Membership in social networks has skyrocketed in the past few years in both social public type and formal organization networks. It is very important, however, to manage and control the potentials of Social Networks in non-governmental organizations, since they play an important role in the growth and strength of such organizations. The success of such organizations depends on their social networks. Social networks, regardless of computer and internet use, have existed for a long time in the history of mankind. This research seeks the critical success factors for using social networks in non-governmental organizations. By using and reviewing the existing literature and opinions of subject experts, we develop an initial model with 19 success factors. To examine, complete, and verify the initial model, 19 factor models were applied to two non-governmental organizations in Iran, which heavily depended on social networks to attract and keep their customers and users. The organizations under study are Gabrik Diabetes Group and Zoroastrian Student Center. The views and ranking of the selected experts from each organization were compiled and analyzed using Delphi method. Both in-depth interviews and questionnaire were used. Finally, using and comparing the results of two organizations, 6 critical success factors common in both organizations were chosen as the most critical success factors for the growth and strength of social networks in non-governmental organization. These six common critical success factors are: common objectives, learning opportunity, empathy, membership in larger group and bigger goals, culture, and value of objective. Furthermore, the critical success factors in only one organization were identified and justified. The remaining non-critical success factors were reviewed and discussed. It is suggested that, in further research, other non-government organizations and other contexts be included in the study. Particular attention should be paid to other factors such as member privacy, satisfaction with organization performance, and customer appreciation.

Key Words: Social networks, non-governmental organizations, critical success factors, customer appreciation.

BUNDLE PRICING AND INVENTORY PLANNING

CONSIDERING CUSTOMER BEHAVIOR

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Abstract

In this paper, we consider a multi-product newsvendor problem with the possibility of bundling the products. Selling price for each product and bundle as well as their quantities to be ordered at the beginning of the period are decision variables in the model. The objective is to maximize expected revenue of the newsvendor by considering holding and shortage costs. We also assume that the products are cross-elastic and demand of each product or bundle is a stochastic function of its price and the price of other products. With the best of our knowledge, this is the first study that considers a newsvendor problem with multiple products and stochastic demand determining the inventory related decision and sales price for each product and bundle.

The products can be grouped as bundles for sale, assuming that the price of each bundle is less than the sum of products' prices existing in the bundle. Therefore, the products and bundles are available for customers at the same time. The solution approach is a two-stage algorithm based on Multi Directional Search and Nest Partitioning algorithm. The solution algorithm benefits from advantages of both methods simultaneously. At the first stage, it makes the solution space limited in order to search for better solutions in a limited space at stage 2. Since only one set of variables is obtained by solving the model every time, the solution accuracy increases while the algorithm runtime decreases. The developed solution algorithm is strictly in line with conditions of our problem. Detailed examples are provided. The numerical results show the reasonable performance of the algorithm. Sensitivity analysis is done to provide managerial insights and conditions under which bundling is profitable. The results indicate that by applying the bundling strategy to newsvendor problem in the case of complementary products, large-sized markets and more bundle price sensitivity are highly recommended. Finally, the future studies are proposed.

Key Words: Bundle pricing, newsvendor, multiple products, nest partitioning, multi directional search.

that stochastic programming model has higher efficiency and cost than cost-based mode. So if the main purpose is efficiency it is better to use stochastic programming model: if the main purpose is to decrease cost, chance-constrained programming model is better and practical, because this model minimize the cost. This model has highly sensitive to income parameters obtained from recycling. By increasing income, performance is transferred to a higher level and if it decreases, the difference between stochastic programming model and chance-constrained programming (by the purpose of minimizing cost) decreases.

Key Words: Solid waste management, fractional programming, stochastic programming, stochastic linear fractional programming.

DESIGN OF WHOLESALE PRICE AND REVENUE SHARING CONTRACTS IN A TWO-ECHELON SUPPLY CHAIN

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Abstract

Supply chain contracts, e.g. revenue sharing contracts, are useful schemes for system coordination. In practice, however, because of different reasons, such as limited information or administrative difficulties, design of coordinating contracts may be hard or impossible. In this situation, the importance of a simple wholesale price contract becomes clearer. Even if a coordinating contract is usable, bargaining on the profit arisen from system coordination would be a challenging subject that requires due consideration. Thus, investigation of wholesale price contract and the bargaining issue between contract partners, in case of the revenue sharing contract, are two features of this research.

In this research, a two echelon supply chain consisting of a manufacturer and a retailer is considered. The manufacturer is contract designer. The retailer supplies its required material from the manufacturer and prepares final product for a selling season with stochastic demand. In case of a wholesale price contract, the retailer places order to the manufacturer, after receiving its wholesale price. Optimal pricing and ordering decisions, in case of the wholesale price contract, is investigated. Nevertheless this contract is not a coordinating contract, however it is important from practical dimensions. Therefore, as theorem one, a specific relation for the optimal wholesale price is presented. In this theorem it is assumed that demand has increasing generalized failure rate (IGFR). Usual demand distributions such as normal, uniform and gamma, has this feature.

In the following, the design of the revenue sharing contract is investigated. According to this contract the manufacturer reduces its wholesale price in return of receiving a portion of the retailer's sales profit. Considering a bargaining power for each member, as theorem two, the parameters of revenue sharing contract in Nash equilibrium are determined.

Finally, with the numerical analysis, optimal decisions and expected profit of contract partners, in cases of wholesale price and revenue sharing contracts, are analyzed. According to the results, if the changes in a system are towards improvement of situation, e.g. increase of price or decrease of costs, implementation of a coordinating contract will be more profitable compared to the wholesale price contract.

Key Words: Supply chain coordination, wholesale price contract, revenue sharing contract, bargaining model, nash equilibrium.

CRITICAL SUCCESS FACTORS IN SOCIAL NETWORKS FOR NON-GOVERNMENTAL ORGANIZATIONS

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Abstracts of Papers in English

USING STOCHASTIC LINEAR FRACTIONAL PROGRAMMING FOR WASTE MANAGEMENT (CASE STUDY: YAZD CITY)

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Abstract

The purpose of implementing a sustainable waste management system to select the most appropriate options

for waste disposal according to the environmental, social, and economical issues that lead to the optimization of the waste management system.

Yazd includes 3 residential area where waste generated by the citizens (people of the city) are carried to the landfill or recycling for processing or disposal.

In order for a better operation of recycling facility, the waste is separated into two ways: separation in the beginning and separation at the end. Separation in the beginning means sending wastes directly to the recycling facility and separation at the end means sending waste to the recycling facilities from landfills location. Also, based on the conducted researches, approximately 10% of the total waste input at recycling facilities is sent to the landfills as a whole.

In this research we have tried to use Zho & Hung model and their associates concerning the application of stochastic linear fractional programming to waste management discussion. This model can help us solve the predicament in which the objective function is formed by two different amounts of ratio and the right-hand of limitations which is random. Regarding the dates and results of solving stochastic linear fractional programming model by using Lingo software, it is concluded