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Abstract

Quality Function Deployment (QFD) is a customer-oriented tool that aims to meet customer requirements in a better way. Indeed, this function can be described as a methodology that makes every process of product development transparent, starting from understanding the qualities demanded by customers all the way down to establishing quality planning and determining design quality. For achieving the first step of QFD, namely understanding the qualities demanded by customers, this process used House of Quality (HOQ). To that end, major elements of the process are vagueness of the customer's assessments and their different level of experience. Since every customer has different knowledge level and experience about the subject under consideration, they use different fuzzy sets with different cardinalities fitting their levels. With regard to this situation, there would appear multi-granularity in information for which we need a procedure to make data homogeneous for solving this problem.

In the real world, there exist problems that need to assess their variables with linguistic term sets that are not uniformly and symmetrically distributed; we call this type of linguistic term sets "unbalanced linguistic term sets". In some cases, the unbalanced linguistic information appears as a consequence of the nature of the linguistic variables that participate in the problem as it happens usually for showing the attitude of their users. So, for dealing with this situation, we need a process to make information uniformly distributed.

Between choosing different Brands, customers usually have some risks. So, for building an effective HOQ, we need a weighting model to consider this issue. Considering the whole of these limitations, we use Hierarchical Ordinal Model which makes the data homogeneous and balanced without any loss of information. Moreover, for avoiding any loss of information during conversion process, this model uses 2-tuple representation model. For considering the risk factor, we also propose the OWA weighting model that has numerous benefits. In the next step, the balanced homogenous information is used in 9-step HOQ building procedure, and the paper is concluded with the ranking of HOWs based on customer's assessments.

Key Words: Quality function deployment; house of quality; unbalanced multi-granular verbal sets; ordered weighted averaging; hierarchical ordinal model.

Abstract

Warehouses are one of the most important parts of the organizations. Decreasing inventories in warehouses cause reduction in the costs and increase in the productivity if their amount is calculated in a scientific manner. the production systems are devided into job shop and flow shop systems. In the job shop production systems, some places are usually considered as warehouse for work in processing parts. In the Flow Shop systems, usually there is not any special place to keep this kind of parts, and in fact, there should not be any place as warehouse to keep the work in process as inventory. So, calculation of WIP is very important in this production systems, because if they are not determined correctly, they will cover a great amount of the area in the production lines and will distribute the workers for doing their duty in the best manner and a messy place will appear in this area. So, work in process (WIP) is an important issue in flow shop systems. How much the amount of this stock should be is one of the factors that the management is faced with. Increasing this inventory causes blocking of the money, wasting area, and increase of expenses; on the other hand, more material handling causes reduction in the quality of the commodity. In this paper, a Linear Programming approach for decreasing work in process in flow shop production systems is introduced regarding unbalanced machine capacity and emergency breakdowns. By an optimization method, it can be claimed that work in process is optimized. This model is solved by some numerical examples. Because the approach is an optimistic method, it can be claimed that the result, which is the amount of inventory and overtime and quantity of the production, is the best. The proposed model can be used in every continuous production system.

Key Words: Optimization,; flow shop systems; wip; emergency maintenance.

COMPARISON OF NEURAL NETWORK MODELS IN THE CREDIT RATING OF THE BANKING SYSTEM AND PROVIDING THE BEST (OPTIMAL) MODEL

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Abstract

In simple terms, banks operate in two areas of equipment and allocation of resources. Meanwhile, by taking into account the credit risk of customers, banks provide customer demands based on their requested facilities. One of the most important problem of management of loan portfolio is bankruptcy and bank failure. So, one of the most important techniques of financial and banking sections, conspicuously noticed, is the technique of risk management.

With the aim of selecting the optimal model and effective variables to rank customers credit, this study is presented by the models used in this research including Neural Networks back propagation the error, neural network algorithms, neural networking "GMDH", neural network algorithm with radius axis, "Logit" model, "Probit" model, and discriminate analysis model. This paper analyzes the internal and external factors influencing credit risk of "Ayandeh bank". For this purpose, 200 cases of actual customers of the state-owned banks were selected during seasonal intervals of 2006-2011 (1385-1390) to provide an effective strategy for reducing the risk and help to improve the implementation of the decision-making in "Ayandeh bank". In this data, we have 200 customers whom 105 of them were "creditworthy customers " and 95 of them were "uncreditworthy customers ". In the first phase, 9 variables were recognized as ineffective and five of them were removed. Finally, the comparison of these models show that neural network algorithms and neural network-centric radius "GMDH" have the highest accuracy in predicting the credit behavior of banking customers.

Key Words: Credit ranking; credit risk; neural networks; actual customers; gmdh model; logit model; probit model; the banking system.

BUILDING THE HOUSE OF QUALITY IN QFD PROCESS BY UNBALANCED MULTI-GRANULAR DATA

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analysis. In order to implement the proposed models, we have used data from audited financial statements of 20 insurance companies in Iran that are listed in the Tehran stock exchange (TSE). The sample period is one fiscal year from march 2010 to march 2011. According to the literature on the performance measurement of the insurance companies, three inputs have been used in our analysis, namely total assets, equity, and insurance expenses. Moreover, three financial ratios (profitability ratios) have been used as outputs in order to capture the performance of the companies. These are the ratios of underwriting profit to average assets, the investment profit to average investment, and the directly-written premiums to operating expenses. The results reveal that the bootstrap technique can resolve bias problem in efficiencies. So, efficiency scores will have less sensitivity relevant to the choice of the financial ratios or data adopted.

MULTI-BOUND ROBUST MODEL OF FACILITY LOCATION PROBLEM TO DEAL WITH HISTOGRAM-BASE UNCERTAINTY

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Abstract

A fundamental assumption in classical optimization is that all data are certain. However, many real-world problems contain uncertain parameters. The ignorance of these parameters affects the optimality and even feasibility of the solutions. That is why it is crucial to develop an optimization method to support real time fluctuating parameters. Robust optimization techniques have been developed for tackling the uncertainties which address data uncertainty while ensuring feasibility in different scenarios.

Most of the robust approaches which assumed the uncertain data belong to a convex space and single deviation band that may be too limited in practice. The aim of our work is to propose a new algorithm to consider real circumstances by applying histogram-base uncertainty. The suggested algorithm finds the robust counterpart of models with non-convex space built based on historical data as an uncertain space.

The new algorithm changes the problem to multi-range robust model which assigns value from more than one uncertain range to the uncertain parameter. The extension of Bertsimas and Sim approach is used to find the robust counterpart model in which an uncertain parameter is allowed to take values from more than one uncertain band. Bertsimas and Sim approach deals with uncertainties in a tractable manner and does not add complexity to the deterministic problem. Moreover, the conservation level of the solution can be handled in their model. Consequently, the obtained robust model of the algorithm guarantees the optimality and the feasibility of solutions in real scenarios with predefined level of conservation.

The suggested robust optimization approach is applied to the capacitated facility location problem with a histogram-base uncertainty for demand deviations, since considering probability-based uncertainty is very likely in real facility location problems. The experimental results show the benefits of using the proposed method.

OPTIMIZING WIP CONSIDERING UNBALANCED MACHINE CAPACITY AND EMERGENCY MAINTENANCE IN FLOW SHOP SYSTEMS

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TECHNIQUES (CASE STUDY: INDUSTRIAL PARKS & INDUSTRIAL DEVELOPMENT ORGANIZATION)

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Abstract

The most important factors in achieving an organizational sustainable competitive advantage in today's competitive world is organization's appraisal and management systems. The purpose of this research is to design an integrated and flexible model for performance management based on a modified Balanced Scorecard by combination of AHP and DEMATEL techniques, so that it can identify and prioritize the relative significance of and direct & indirect cause and effect relationships of organizational criteria. This research is made to present the modified balanced scorecard with developing a new perspective. The modified Balanced Scorecard, developed in this study, could be considered as a multidimensional performance appraisal system based on the pillars and principles of the organization. By incorporating decision-making techniques, this model is able to appraise all aspects of organization's performance. Along with quantitative and qualitative attitudes, methodology of this research provides a structured and comprehensive framework in 9 steps. Each step of the model adds value to the previous step. The steps are to begin with pillar's survey and to modify and develop BSC. Then, they lead to the design of strategy map and key Performance Indicators. Finally, in order to validate the proposed model, it is implemented in Industrial Parks & Industrial development organization, and the results of each steps are reviewed and evaluated by 10 experts of the organization. Expert choice software is used; calculation of consistency rate and total consistency rate (0.04999) show the consistency of all calculations. The results of this research show that the proposed model is very practical, and it could be generalized and adapted to other organization. Also, the experimental achievements show that the integration of AHP and DEMATEL techniques for overcoming the limitations of the Balanced Scorecard is very effective and appropriate. Therefore, in practice, it is able to provide the optimal portfolio of the selected objectives and criteria.

COMPANY PERFORMANCE EVALUATION USING FINANCIAL RATIOS: AN APPLICATION OF BOOTSTRAPPED DATA ENVELOPMENT ANALYSIS APPROACH

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Abstract

Financial data and ratios have been commonly used in data envelopment analysis (DEA) models in order to produce a unified measure of performance. However, several researchers have indicated that the use of financial ratios in DEA models creates biased efficiency estimates in firms' performance evaluation. Namely, the efficiency scores may be influenced by the choice of the ratios adopted, and units could be erroneously classified as efficient or inefficient. Thus, the research problem that has been posed is how to perform performance evaluation with the use of the DEA methodology producing unbiased results. This paper answers the research problem by bootstrap technique. The main proposed hypothesis is that bootstrapping of the DEA efficiency scores can remove the sensitivity of the efficiency scores relevant to the financial ratios used in performance evaluation and avoid errors in efficiency estimation. To test the research hypothesis and examine the sensitivity of the efficiency scores relevant to the financial ratios used, seven different DEA models have been created. The idea behind every model is to test whether the efficiency scores are sensitive to the financial ratios used in our

and volume of the freight, the number and types of vehicles to be dispatched, and the amount of every product types to be delivered to each retailer. The carbon emission factor is defined as being dynamic in the sense that it changes based on the weight of the freight and the type of vehicle dispatched. The presented model is a mixed integer non-linear programming, which is first linearized through certain techniques, that allows us to obtain optimal solutions for small and medium sized instances. Moreover, different scenarios are provided in order to show the application of the model in practice, and certain managerial insights are given. Results show that with the increase of the number of periods, transportation costs and the total cost increase strictly. Moreover, there is a tendency to use vehicles with higher capacities whilst carbon emission costs never exceeds ten percent. Changes in the weight and volume of the products which are to be delivered affect the costs of the supply chain. Even when the total weight of the freight remains constant, these changes alter the percentage of the ratio of carbon emission costs to the total cost. Although increase in the weight and volume of products results in an increase of the total cost, this is not the case for carbon emission costs which are only affected by the weight and the type of vehicle dispatched. As tax rates increase, the total cost as well as carbon emission costs increases, whereas the amount of carbon emissions decreases. If tax rates increase, vehicles with higher pollution standards will be gradually used.

THE COMPARATIVE COLLABORATION STRATEGIES IN THE SUPPLY CHAIN OF AUTOMOTIVE PARTS MANUFACTURER- USING SIMULATIONS

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Abstract

It is generally accepted that "one size does not fit all". So, we can not design supply chain strategies for a wide range of products with different features and various markets. For members of supply chain of automotive parts manufacturing to improve their performance and respond to the diverse demands customers, specific strategies appropriate to the type of product, market, and demand are required. The purpose of this study is to answer this question: which strategy is the most appropriate under conditions of risk? and what is the purpose of/how to improve performance through collaboration among members of supply chain automotive parts manufacturer?

The most important collaboration strategies are Vendor Managed Inventory and Collaborative Planning, Forecasting and Replenishment strategies lead to an improved performance in the supply chain. The strategies were examined based on four indicators: fill rates, inventory levels, response time, and profitability. The structure of strategies are modeled in crystal ball and Excel software. For modeling strategies, first, forecasting and planning demand and orders are done at different levels of the supply chain to determine the amount of supply. Then, demand is determined by running simulations. Finally, we will evaluate Collaborative Planning, Forecasting and Replenishment and Vendor-Managed Inventory strategies with the values obtained from the indices. The results of running the simulation and analysis of variance show that both of strategies improve traditional supply chain performance, but the performance of Collaborative Planning, Forecasting and Replenishment strategy based on the four determined criteria is better than that of Vendor Managed Inventory strategy in high risk situation. In situations where the risk is low, performance of Collaborative Planning, Forecasting and Replenishment system based on indicators of inventory levels, response time, and the fill rate is better than the performance of Vendor Managed Inventory strategy. But, the two strategies are not sufficiently different in terms of profitability indicators.

A MODIFIED BALANCED SCORECARD MODEL WITH THE USE OF AHP AND DEMATEL

CONSIDERATION OF WAREHOUSE LOCATION

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Abstract

In recent years, increased use of internet to conduct business electronically and globalization of business have forced producers of goods to re-examine the production and distribution of their products. Cellular manufacturing (CM) is an innovative manufacturing strategy, which is derived from a group technology (GT) concept. This approach can be used to improve both flexibility and efficiency in today's modern competitive manufacturing environments, such as flexible manufacturing systems (FMS). Some benefits of CM performance are reduction of setup time, reduction of work-in-process inventory, reduction of material handling cost, machine utilization improvement, and quality improvement. In a dynamic environment, we require the development of organizations and facilities to be more flexible. This work directed us to combine the dynamic model of cellular manufacturing system and supply chain, taking into account different issues such as the existence of multi plants, multi markets, several warehouse, different suppliers, multi periods, and reconfigurations. In this paper, an integrated dynamic cellular manufacturing system model is proposed, which takes into account both production planning and supply chain design. The objective of this model is to reduce costs such as inter-cell movement cost, intra-cell movement cost; to keep parts in stock, outsourced parts, establishment of warehouse, replacement of parts are shipped from the plant to the warehouse, from warehouse to markets, from plant to market, and so on. In addition, considering the candidate sites for the construction of warehouse, locating the warehouses outside the factory is discussed, which has not been considered in previous papers. Furthermore, with adding the phrase of machine splitting in the objective function and constraints, it is attempted to improve the dynamic cellular manufacturing system. This term prevents the excessive split of one type of machine in the several cells and optimizes the placement of existing machines. Finally, computational results are investigated and solved through GAMS software to show the validity and importance of the presented model.

Key Words: Dynamic cellular manufacturing system; production planning; supply chain design; facility location; network design.

INTEGRATED TRANSPORTATION AND INVENTORY PLANNING IN A SUPPLY CHAIN WITH CARBON EMISSION CONSIDERATION

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Abstract

This paper develops a model that aims to plan transportation and inventory in a multi-product multi-period supply chain, in which one supplier meets the needs of a group of retailers. The developed model attempts to coordinate the different members of the supply chain whilst taking carbon emissions into consideration. Vehicles used for transportation are considered to be heterogeneous. With regard to the retailer's demands in every period, the supplier makes decisions about the weight

model. This paper deals with an inventory system under continuous review with multiple items and budget constraint. This budget is consumed to purchase items. The budget constraint is considered as a soft constraint that is included in the objective function. If the budget consumption becomes greater than the available budget, resource shortage cost is incurred. Customer demand has discrete Poisson distribution and the ordered quantities are received after a fixed lead time. The purpose of this paper is to determine the order quantity and re-order point, such that the total system cost, including ordering cost, holding cost, penalty cost for customer backorders, and resource shortage cost, is minimized. A heuristic method has been presented to determine (r,Q) policy. This method consists of two stages. In the first stage, the relaxed version of the problem is solved; if the obtained solution does not meet the budget constraint, the inventory position of each item is reduced from an upper bound of optimal inventory position for the relaxed version of the problem. If the optimal inventory position is not found in the first stage, a local search is used in the second stage to obtain a near-optimal solution. The presented solution approach is compared with other existing methods via experimental tests. Numerical results demonstrate that the presented method reduces total cost more than other methods.

IDENTIFICATION, QUALITATIVE ANALYSIS, RANKING, AND CLUSTERING OF RISKS OF OVERHEAD POWER LINES PROJECTS BASED ON PMBOK STANDARD

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Abstract

In the electric power industry, as one of the key energy industries, the electrical energy generated in power plants is transmitted to distribution substation via electric power transmission lines. Finally, it is delivering to consumers. The purpose of construction of the transmission lines and distribution substations is to meet the needs of customers, increase stability and reliability of the system, and exchange with neighboring countries. Iran's overhead lines projects (transmission and sub-distribution) are monitored by regional electric companies of the country with the aim of supplying electricity to different provinces in order to meet energy requirements and customer satisfaction. The main phases of the projects are Initial phase, Design and Engineering phase, Procurement phase, Implementation phase, and the Final phase. In each phase, projects can be faced with specific and effective risks that can affect their aims. These risks caused the majority of the mentioned projects to face with events that each of them can increase the amount of time, cost, and decrease the quality in turn. Perhaps, if risk management is done effectively, the success of these projects, at least in terms of time and cost, will increase. However, with project managers that act only on the basis of their taste and knowledge, the risk management will not have the proper output.

Risk identification of these projects on one hand and their ranking on the other hand as parts of complex process of risk management are the major steps of a proper evaluation and timely and appropriate response to these risks. Therefore, in this study, risks are identified based on the librarian studies, semi-structured interviews with experts, and work breakdown structure (WBS). List of identified risks contains 385 risks. Then, according to developed methodology based on PMBOK standard, flexible qualitative analysis was performed, and risk scores in each of areas of "Time", "Cost", "Quality", "Time-Cost", "Time-Quality", "Quality-Cost", and "Time-Cost-Quality" were accomplished. After analyzing, the 84 key risks are identified. At the end, the key risks are ranked using "Time-Cost-Quality" score and clustered using K-Means method. The results showed Execution and Contractor Management category include the most number of risks.

A NEW INTEGRATED MODEL OF DYNAMIC CELLULAR MANUFACTURING AND SUPPLY CHAIN SYSTEM WITH

model is proved. For the large-sized problem, because of the complexity, problem is solved with Multi-Objective particle swarm optimization, and then numerical result is presented in the research. The results show that by changing the value of holding cost, the fleet and routes will be changed, and MOPSO finds good answers in short time.

MODELING AND SOLVING THE DYNAMIC GRADUAL COVERING LOCATION PROBLEM

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Abstract
In traditional covering problems, it does not depend on the distance of the demand nodes from the facility services for the level of coverage to receive the services. In a gradual cover location problem (GCLP), the covering objective depends on the distance of customers from the service centers. So, as distance from the facilities increases, the coverage level decreases. The gradual covering location problem, which tries to maximize all covered demand points, is one of the practical problems in facility location scope. In this study, facilities are considered as hierarchical modes with different capacities, nested, non-coherent, and multi-flow. In the real world, since the number of facilities and covering radii is different (due to societal issues such as traffic, weather, etc.) within time periods, a new dynamic backup hierarchical gradual covering mathematical model is proposed in this study to improve the system's distribution efficiency such as delays, covering, and general satisfaction of the system performance. In the proposed model, demand nodes which are not in the coverage radius of hierarchical facilities can be covered by intermediate facilities to increase the total coverage. Moreover, the proposed model considers the dynamic aspects of the problem such as dynamic locations and allocations in different periods. Based on the experimental results, the developed model can cover higher values of demands in comparison with the existing models in the literature. The application of the proposed model is in emergency management system which tries to rescue human life. Moreover, in order to solve the large-sized problems optimally, a simulated annealing Algorithm (SA) is proposed. To check the accuracy of presented heuristic method, some illustrative examples are given and solved by both exact and proposed metaheuristics approaches for classic gradual covering problems. The comparison of the obtained results verifies the efficiency of the proposed model and the algorithms in both optimality and computational time aspects.

AN EFFICIENT APPROACH FOR DETERMINATION OF THE ORDERING POLICY IN A MULTI-ITEM CONTINUOUS REVIEW INVENTORY SYSTEM WITH STOCHASTIC DEMAND AND BUDGET CONSTRAINT

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Abstract
One of the major responsibilities of the industrial units is inventory planning and control. Inventory system design has an important effect on cost reduction of firms in order to determine optimal or near-optimal value of order quantity and reorder point. Inventory systems have constraints as many other systems do. While the constraints make a model more practical, they increase the complexity of the model and limit the solution approaches of the

Abstracts of Papers in English

SOLVING ROUTING PROBLEM WITH HETEROGENEOUS FLEET BY MULTI-OBJECTIVE PARTICLE SWARM OPTIMIZATION

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Abstract

In vehicle routing problem (VRP), the objective is to find the optimum routes for a fleet of vehicles in order to serve a set of customers. These routes should have minimum costs including distance and time, and they should simultaneously satisfy some restrictions such as the maximum capacity of each vehicle, the maximum distance for each vehicle to travel, the time window to visit the specific customer, and so forth. Most enterprises own a heterogeneous fleet of vehicles or hire different types of vehicles to serve their customers. The heterogeneous fleet VRP (HFVRP) addresses the VRP with a heterogeneous fleet of vehicles which have various capacities: fixed costs and variable costs. To the best of our knowledge, all researches in this field have studied the minimization of total traveling time and traveling cost as objectives, while one of the important subjects in the real word is tardiness. In studying tardiness, we assign a due time as an upper bound; if the vehicle reaches the customer after the due time, tardiness will occur. The other important object in HFVRP is the holding cost. In order to have a balance between holding cost and traveling time, we have considered holding cost to solve the problem when a vehicle is selected. So, in this research, we will solve a bi-objective HFVRP with respect to minimizing total traveling time, tardiness, and total holding cost as an objective function. Many algorithms have developed to solve vehicle routing problems, such as genetic algorithm, ant colony optimization, and simulated annealing. For small problem with three vehicles, problem is solved through GAMS and validity of