

**ABSTRACT****Identification of Factors Affecting the Privatization of Iran's Gas Refining Industry; An Integrated Approach Delphi-DEMATEL: Parsian Gas Refinery Co.****R. Eshgarf\*, S. Mirzamohammadi and S.J. Sadjadi**

School of Industrial Engineering, Iran University of Science and Technology, Tehran, I.R. Iran

\*Email: reza581430@yahoo.com

Tel: +98-9398174862

(Received: 16 February 2013; Revised: 26 April 2014; 28 June 2014)

In this article, the results of special effects of privatization of Iranian Gas refining industry with Delphi-DEMATEL integrative approach are presented. In Delphi technique base, all together, experts recognize 39 pivotal factors in privatization of the Gas refining companies. Then by the aids of DEMATEL technique, in previous step, according to experts view, effective abstract factors were prioritized by graph theory. So, the terms among factors the way and intensity impact on their mutual affect of results. According to the result of this research, coherence and concordance among all political sections have the most affection of privatization from legislation to execution and supervisor and reliance and rived participation of private section, by glassiness, justice and preparing equal chance for all, have the highest impression ability.

**Keywords:** Gas refining industries, Privatization, Delphi, DEMATEL.

**Analyzing the Relationship between Contractor's Qualification Measures and Project Quality in Research Projects: A Case Study****S. H. Iranmanesh\* and F. Sobhani**

School of Industrial Engineering, College of Engineering, University of Tehran, Tehran, I.R. Iran

**M. Shakhshi-Niaei**

Institute for International Energy Studies (IIES)

**M. Abdollahzade**

Dept. of Mechanical Engineering, Pardis Branch, Islamic Azad University, Pardis New City, Tehran, I.R. Iran

\*Email: hiranmanesh@ut.ac.ir

Tel: +98-21- 22021602

(Received: 23 February 2013; Revised: 1 June 2014; Accepted: 28 September 2014)

This paper proposes a neuro fuzzy model for analyzing the relationship between contractor's qualifications and project quality in research projects. The proposed model has been implemented in a research-based organization, IIES. Cross validation method has been used in order to generate some set of data being used for different evaluations. The proposed neuro fuzzy model has dominated the linear regression model not only in average, but also in each data set. Moreover, the results showed a confident relationship between project quality and three criteria used for evaluating the contractor's qualifications.

**Keywords:** Project quality management, Project-based organization, Contractor's qualifications, Neuro-fuzzy modeling.

**Designing a Residential Valuation Model through Analytic Hierarchy Process****K. Behdad, M.T. Isaai\* and M. Farzaneh**

School of Management and Economics, Sharif University of Technology, Tehran, I.R. Iran

\*Email: Isaai@sharif.edu

Tel: +98-21- 66165122

(Received: 16 March 2012; Revised: 25 January 2014; Accepted: 28 June 2014)

The decision to buy, sell, design and construct residential apartments is a complex process due to a combination of multiple qualitative and quantitative factors. It thus requires a great deal of costs and time for decision makers in this market. Identifying these factors and determining the priority of them are importance for selecting an apartment. The aim of current research is to identify the affecting factors of the desirability of a residential apartment by utilizing the knowledge and experience of experts in the housing market and then determine the priority of each factor through AHP method. In this case, certain experts in Mashhad city were chosen in order to specify the influential factors from

the customers view point and rank them through paired comparison. In the last step, qualitative and quantitative factors are combined and the assessment model for determining the value of residential apartment is presented.

**Keywords:** Residential apartment, Valuation, Utility, Decision making, Analytic hierarchy process.

**Developing a New Approach for Product Performance Evaluation based on Balanced Scorecard: An empirical study of a Dairy Company**

**J. Razmi\*, H. Mina and M. Nasrollahi**

School of Industrial Engineering, College of Engineering, University of Tehran, Tehran, I.R. Iran

\*Email: jrazmi@ut.ac.ir

Tel: +98- 21- 88021067

(Received: 7 June 2014, Revised: 29 September 29;  
Accepted: 20 October 2014)

To survive in today's competitive environment, companies need continuous improvement to achieve goals such as increasing the accuracy of targeting, improving product or service. However, there is no improvement guaranty without performance evaluation. An organization must assess current performance before embarking on any improvement. If it does not, it will have no baseline from which to determine if its efforts have yielded any improvement. Product development team must evaluate the product performance to enhance existing products so that they continue to meet changing customer requirements. Product performance evaluates the company to maintain market share and leadership. Innovation and new product development are important to build market breakthroughs. Product performance evaluation is necessary before making any change because new product development requires high levels of investment and involve significant risk of product failure. One of the proper evaluation methods is Balance Scorecard. In the Balanced Scorecard approach actual performance is measured, the measured value is compared

to an expected value. Based on the difference between, two corrective interventions are made as required. Such measurement requires three things to be effective: I) a choice of data to measure, II) the setting of an expected value for the data, and III) the ability to make a corrective intervention. However, this approach cannot consider the combination of measurement factors. In order to overcome this problem, in this paper a novel approach has been developed for performance evaluation based on balanced scorecard and fuzzy analytic network process (F-ANP). Considering the interdependency of measurement factors, the proposed method increases the efficiency of performance evaluation process. The proposed method is implemented in product development department of a dairy company. Measurement factors are defined based on literature and also expert's opinions. Then, the weights are calculated by F-ANP. Finally, the performance of 4 new products is evaluated by the proposed approach. Results obtained, shows the efficiency of proposed method as a practical approach for product evaluation process.

**Keywords:** Performance evaluation, Analytic network process, Fuzzy logic, Balance scorecard.

**A Bi-objective Model for a Flowshop Scheduling Problem with Availability Constraint of Machines**

**M. Rezaei-Malek, R. Tavakkoli-Moghaddam\* and F. Evazabadian**

School of Industrial Engineering, College of Engineering, University of Tehran, Tehran, I.R. Iran

\*Email: tavakoli@ut.ac.ir

Tel: +98- 21- 82084183

(Received: 20 July 2013; Revised: 10 May 2014; Accepted: 14 June 2014)

This paper presents a new bi-objective mathematical model for a permutation flowshop scheduling problem with availability constraint in case of preventive maintenance operations on machines. In this paper, preventive maintenance is

flexible and there is not a certain time for the maintenance operation; however, time between two consecutive maintenance operations for each machine should not be greater than a given time. The model has two objectives; 1. Minimizing the makespan (i.e.,  $C_{max}$ ), and 2. Minimizing the sum of earliness and tardiness simultaneously. This study reports the results obtained by the Reservation Level Tchebycheff Procedure (RLTP) and the  $\varepsilon$ -constraint method for solving a case study problem. The results show high quality of reached solutions from RLTP in comparison with the  $\varepsilon$ -constraint method.

**Keywords:** Permutation flowshop scheduling, Preventive maintenance, Earliness and tardiness,  $C_{max}$ , Bi-objective optimization.

#### **Performance Evaluation of Mazandaran Water and Wastewater by Data Envelopment Analysis and Artificial Neural Network**

**J. Rezaeian\***

Faculty member of Mazandaran University of Science and Technology, I.R. Iran

**A. Asgarinezhad**

Msc student of Industrial Management Institute, I.R. Iran

\*Email: j\_rezaeian@ustmb.ac.ir

Phone: +98- 1132191209

(Received: 16 February 2013; Revised: 20 January 2014;  
Accepted: 15 September 2014)

In this study, Mazandaran Water and Wastewater Company' performance is evaluated by using an input-oriented data envelopment analysis. As a principle, the performance of each organizational unit or organization should be measured as far as possible and what can not be evaluated can not be well governed. One method of evaluating the performance of units is data envelopment analysis method. One of the main problems of using data envelopment analysis is its low-resolution which it is due to the low number of decision making units to compare with the number of inputs and outputs. Given to the calculated efficiency by the DEA model (CCR input-oriented) for 16 decision making unit for years 2010

and 2011, there is the problem of existence of several efficient areas, which in the first step was used from Anderson and Peterson (AP) technique to cover this weaknesses. Since, the AP technique involves solving a linear programming model for each of the DMUs. Therefore, by increasing the dimension of issue, efficiency assessment will be time consuming process. So, the idea of using a neural network with efficiency data of data envelopment analysis is proposed as an alternative approach. Analytical results of calculated efficiencies of DMUs by the combination method of Neuro-DEA indicate the high power of neural network in resolution of decision-making areas in terms of efficiency.

**Keywords:** Input-oriented CCR model, Anderson and Peterson model (AP), Data envelopment analysis, Artificial Neural Networks (ANNs).

#### **Particle Swarm Optimization Algorithm for Integrated Lot-sizing and Scheduling in Flowshop Production Environment**

**R. Ramezani\***

Department of Industrial Engineering, K.N. Toosi University of Technology, Tehran, I.R. Iran

**M. Shafiei Nikabadi and S. Fallah**

Department of Economic and Management, University of Semnan, Semnan, I.R. Iran

\*Email: Ramezani@kntu.ac.ir

Tel: +98- 21- 84063365

(Received: 28 October 2012; Revised: 17 February 2014;  
Accepted: 28 June 2014)

Production planning and scheduling are the most important issues of the production industries which have a considerable influence on the productivity of the production systems. Although, production planning and scheduling are in two different medium-term and short-term decision making levels, there are a very close relationship between them. Ignoring this important feature in production planning aggravates costs and reduces productivity of system. Accordingly, in this paper, scheduling constraints have been considered in production planning in order

to take into account the interconnection between these two levels. The purpose of this paper is to study the multi-product and multi-period production systems in the flowshop environment so that the production and scheduling constraints are considered integrated. A more efficient mixed integer programming model with big bucket time approach is proposed to formulate the problem, which can simultaneously achieve a production plan and schedule and that is one of the main novelties of the paper. The objective function includes the cost of production, inventory, shortage and setups. Due to the high computational complexity, particle swarm optimization algorithm is proposed to solve the problem. To evaluate the efficiency of the algorithm, two mixed integer programming-based approaches with rolling horizon framework are proposed and the results are compared with each other. In addition, Taguchi method is used for tuning the parameters of implemented meta-heuristic. The presented algorithms explore the solution space for both lot-sizing and scheduling and find a combination of production plan and sequence that is feasible and close to optimum. Computational experiments are performed on randomly generated instances to show the efficiency of the solution methods. Computational experiments demonstrate that the performed methods have good-quality results for the test problems. Computational experiences show that the proposed algorithms can find a good quality solution for the problem in a reasonable time. Also, the computational experiences confirm the efficiency of meta-heuristic against exact and heuristic methods. The average of objective value for PSO, heuristic 1 and heuristic 2 are 98.21, 104.20 and 108.29 ( $\times 10^3$ ), respectively.

**Keywords:** Multi-stage production system, Integrated lot-sizing and scheduling, Mathematical model, Mixed-integer programming based algorithm, Particle swarm optimization.

### **Robust Economic-Statistical Design of Control Charts (Case Study: Automotive Industry)**

**A.S. Safaei**

Department of Industrial Engineering, Babol University of Technology, Babol, I.R. Iran

**R. Baradaran Kazemzadeh\* and M. Agdasi**

Department of Industrial Engineering, Tarbiat Modares University, I.R. Iran

\*Email: rkazem@modares.ac.ir

Tel: +98- 21- 82883537

(Received: 28 July 2012; Revised: 10 May 2014; Accepted: 13 July 2014)

One of the most important problems of the designs proposed by traditional economic-statistical approaches of control charts is inefficiency in the face of uncertainty. Uncertainty in the parameters of economic-statistical models may lead to failure in rapidly detecting changes in processes and impose greater costs to the organization. Monitoring the machining process in an automotive industry explains the necessity of considering the robust approach to the control charts. This research intends the control charts design for monitoring process quality characteristics in conditions of uncertainty in cost and process parameters. The robust design ensures that the proposed control chart alarms the process changes earlier than the time set by the user, despite the uncertainty in model parameters. The resulted robust optimal solutions not only ensure the efficiency of solutions in any realization of parameters, but also facilitate the practical implementation of control charts and reduce organization costs through improving the quality of process outgoings.

**Keywords:** Economic-statistical design, Robust optimization, Genetic algorithm, Statistical process control.

### **A Bender's Decomposition Algorithm for Multi-objective Hub Location Problem Considering Stochastic Characteristics**

**S. Abbasi Parizi and M. Aminnaveri\***

School of Industrial Engineering, Amirkabir University of Technology (Tehran Polytechnic), Tehran, I.R. Iran

**M. Bashiri**

Department of Industrial Engineering, Shahed University, Tehran, I.R. Iran

\*Email: mjnayeri@aut.ac.ir

Tel: +98-21- 64545300

(Received: 15 June 2013; Revised: 26 April 2014; Accepted: 18 October 2014)

In this paper, a multi-objective hub location problem considering stochastic links and candidate nodes characteristics is modeled. The first objective is to minimize total costs, including setup and transportation costs. The second one is to minimize network risks. Characteristics such as weather conditions, safety, exchange rate and crisis are defined as uncertainty parameters and considered as different scenarios. Due to the size of the numbers of scenarios, it is assumed that the distribution of their risks is considered to be normal. Also, reliability levels associated to candidate hub nodes and links are considered as chance constraints. Moreover, a Bender's decomposition algorithm is utilized to solve the proposed model. In order to evaluate the performance of the proposed model, the results of this algorithm are compared to those of Cplex solver. The comparison shows that Cplex solver can solve small size problems but the Bender's decomposition algorithm is capable of solving problems of large scale as well as small ones.

**Keywords:** Multi-objective hub location problem, Two-stage stochastic programming, Chance constraint, Bender's decomposition algorithm.

**Developing a Product Recommender System: Designing a Hybrid Model Using Data Mining Techniques****A. Keramati and R. Khaleghi\***

School of Industrial Engineering, College of Engineering, University of Tehran, Tehran, I.R. Iran

\*Email: Khaleghi.roshanak@yahoo.com

Tel: +98-21-82084194

(Received: 29 September 2012; Revised: 20 July 2014; Accepted: 2 August 2014)

The rapid growth of World Wide Web has affected the nature of interactions between customers and companies enormously. One significant consequence of this phenomenon is definitely the emergence and development of e-commerce websites and online stores in all over the web. In spite of its great benefits, online shopping could turn into a complicated procedure from the customer point of view. In most cases, online shoppers are faced with overload of information related different products and services. As a result, deciding which products or services is best fit their needs may become a difficult or even a time consuming process. Recommender systems help online shoppers handle the information overload problem by offering products or services in accordance with their preferences. The application of recommender systems, as a part of one-to-one marketing campaigns, would facilitate the product selection process, providing more customer satisfaction and could eventually increase the sales of e-commerce websites. This paper develops a product recommender system for the users of an online retail store by using data mining techniques. First, customers are clustered according to their "RFM" values considering their relative preferences over different product categories by means of "k-means" algorithm. Then, by applying a two-phase recommendation methodology which is based on a hybrid of "association rule mining" and "collaborative filtering" techniques, the system offers the list of recommendations to target customers at two different levels of product taxonomy, respectively "product categories" and "product items". The experimental results show that by alleviating data Sparsity and scalability limitations, the proposed recommender model has a better performance compared to some other similar models such as models which are developed based on the conventional collaborative filtering technique. The results of this research could be effectively used to accomplish the objectives of one-to-one marketing campaigns and develop personalized product recommendation

strategies for different customer segments of E-commerce websites regarding their lifetime value.

**Keywords:** Clustering, Collaborative Filtering (CF), Association Rule Mining (ARM), Customer Lifetime Value (CLV), Data mining.

### **Designing an Expert System for Management of Crowding and Overcrowding in Emergency Departments**

**S. Hashemi and A. Shokri**

Department of Information Technology, Tarbiat Modares University, Tehran, I.R. Iran

**M.R. Amin-Naseri\* and H. Akbaripour**

Department of Industrial Engineering, Tarbiat Modares University, Tehran, I.R. Iran

\*Email: amin\_nas@modares.ac.ir

Tel: +98- 21- 828223344

(Received: 22 December 2012; Revised: 26 January 2014; Accepted: 29 September 2014)

Providing service for patients in a rapid and efficient manner is one of the main issues in concerning to Emergency Department (ED). Due to the imbalance between needs and the capacity of providing service, ED faces an emergency situation. In this paper, through the use of information gathered from related literature, an Expert System (ES) has been designed in order to detect ED crowding and overcrowding and provide appropriate solutions in order to return to a normal situation. In relation to this matter, National Emergency Department Overcrowding Scale (NEDOCS) has been used as an indicator. According to the value of NEDOCS, the status of ED can be categorized in five groups consisting of normal, crowded, overcrowded, dangerous and disastrous classes. Furthermore, based on the situation of ED and in according to the related literature, proper solutions are provided by the proposed ES in order to overcome the adverse status. Developed ES consisting of 30 rules provides the mentioned solutions based on interactions with users, referral to knowledge base and necessary inferences via user interface. Results of applying the proposed ES indicate 81 percent compatibility between

solutions provided by the ES and those proposed by ED's experts.

**Keywords:** Emergency department, Crowding and overcrowding, NEDOCS, Solutions, Expert system.