



analysis method in this case is not an exception. On the other hand, contracting projects, especially in construction projects, due to economic conditions and unstable business environment, especially in Iran, the benchmark price is of particular importance. Due to the significant effects of the standard price in the determination of contractors, observed that the ANP method will not be able to apply all these effects at the result. The traditional method combined with the classical method, but with substantial changes. In fact, these changes are related to the defined bounds for the price and type of project owners to deal with contractors who have been out of bounds, returns. Assuming Minus and plus - Here Minus plus 20% lower and 40% higher than the price at which the item was defined - for these limitations, the solution

was extracted from the traditional approach. An interesting result was that there was a significant difference between the results of Analytic Network Process combined with the selected contractor. The advantages of this method over the traditional method, it can be easily understood and the acceptance of it. Limitations of this study include the use of this method in a limited geographical area, as well as certain type of organizations (Isfahan preparedness). Finally, the expression is important in this study to avoid calculation errors and to draw shapes and diagrams, using Excel software and Super Decision software.

**Key Words:** Contractor's selection, analytic network process, construction projects, heuristic method.

**Key Words:** Supplier selection, multi-product, fuzzy TOPSIS, risk, discount, meta-heuristic algorithms.

## A MODEL FOR MEASURING THE GAP IN ORGANIZATIONAL RESOURCES INVESTMENT, EMPIRICAL STUDY IN IRAN AUTOMOTIVE INDUSTRY

**A. Zakery**

zakery@aut.ac.ir

**A. Afraze**(corresponding author)

afraze@aut.ac.ir

**Dept. of Industrial Engineering and Systems Management**

**Amirkabir University of Technology**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 121-130, Research Note

© Sharif University of Technology

- Received 4 October 2014; received in revised form 25 April 2015; accepted 6 May 2015.

### Abstract

Strategic resources of organizations, as the most effective resources in fulfilling companies' strategies, require relevant attention and investment. In today's knowledge-based economy intangible resources are more important than traditional resources like land and capital and intellectual capital (IC) has devoted a special position in business strategy and management to itself. However do companies invest enough to preserve and improve this valuable resource? In this paper we aim to assess the actual and expected organizational investments in intellectual capital. So we need a conceptual model which enables studying resources' role in company's strategies and investments. This model should be based on a relevant firm view and takes an appropriate approach to identify and categorize organizational resources. Here we propose a conceptual model and related steps to collect required information for assessment of strategic importance of resources (as the expected level for investment) and also current investment level in different resources. Then the probable gap between these two levels is measured and analyzed. This model is applied via Iranian automotive companies. The results of applying the model shows there is a significant gap between strategic importance and current investment in all three groups of intellectual capital (human, structural and relational), while not in tangible (physical and financial) assets. The gap is bigger in human capital, structural capital and then relational capital respectively. Finally

the gap between strategic importance and current investment is investigated in different sub-categories of studied companies in order to get insights of resource management issues across automotive companies. Probable differences in terms of ownership, age of company, size and service or product-oriented activity of the companies has been compared and analyzed. The findings of the paper emphasize the necessity of changing managers' mental models from merely focusing on planning and investments in tangible and traditional assets towards intangibles assets.

**Key Words:** organizational resources, intangible resources, intellectual capital, strategic resources, investment.

## CONTRACTOR SELECTION MODEL USING THE COMBINATION OF ANP AND A HEURISTIC METHOD (CASE STUDY: MANUFACTURING PROJECTS)

**M. Karbasian**

mkarbasi@mut-es.ac.ir

**A. Eghbali babadi**

ali-eghbali@mut-es.ac.ir

**A. Gholami**(corresponding author)

a.gholami92@mut-es.ac.ir

**Dept. of industrial Engineering  
Malek-Ashtar University of Technology**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 131-138, Research Note

© Sharif University of Technology

- Received 5 January 2015; received in revised form 30 May 2015; accepted 19 September 2015.

### Abstract

The purpose of this study is to provide a reasonable and simple solution for the decision making process of choosing the contractor that will be used with a combination of experimental and theoretical approaches. The approach of this study was to review the literature regarding the selection of the contractor. According to the methods and techniques available in the literature, ANP method was chosen. In other words, according to simplicity, comprehensiveness and universality, and also spend less time and human resources in the contractor selection the methods available in the literature contractor selection, Analytic Network Process (ANP) of Multi-Criteria Decision Making (MCDM) method was chosen for use in this study. Given that each method has drawbacks and deficiencies are found, the network

## GROUP DECISION MAKING WITH HETEROGENEOUS INCOMPLETE UNCERTAIN PREFERENCE RELATION

**A. Mirfendereski**(corresponding author)

mirfendereski@ie.sharif.edu

**K. Eshghi**

eshghi@sharif.edu

**Dept. of Industrial Engineering  
Sharif University of Technology**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 99-111, Original Article

© Sharif University of Technology

- Received 24 November 2014; received in revised form 9 March 2015; accepted 12 April 2015.

### Abstract

In complex human social activities, practical problems involve more prominent uncertainty, and deterministic approaches of classical methods become powerless. Decision makers sometimes are distributed in different geographical regions and it may be difficult to reach an agreement on which unique preference relations format is used. On the other hand, decision makers usually do not have enough knowledge to express their preference relations completely.

In this research, a new method for human group decision making is presented by using heterogeneous incomplete uncertain preference relations. The uncertain multiplicative preference relations, uncertain fuzzy preference relations, uncertain linguistic preference relations, intuitionistic fuzzy preference relations and Interval preference sequence can be included in this method. Our new method consists of nine steps. In the first step, decision-makers preferences in the form of heterogeneous comparison matrixes are driven. In the second step, we change them to the homogeneous form. This homogeneous form is interval multiplicative preference relation. In the third step, a preprocessing approach using an optimization framework is presented to obtain a complete consistent interval comparison matrix respect to each decision-maker preferences. In the fourth step, flexible and simple forms are obtained to show the robustness of the final weights. In the fifth step, rank sequences for each decision maker is obtained. In the sixth step, the importance weights of decision makers are calculated. In the seventh step, importance weights of alternatives respect to each decision maker preferences are derived. In the eighth step, a multi-objective model is established and in the final step a bi-an optimization model which aims to maximize simultaneously the group consensus, the individual consistency and weights robustness of each decision maker is solved.

By solving the optimization model, the priority weights of alternatives can be obtained. Finally, an illustrative example is used to show the feasibility and effectiveness of the proposed method.

**Key Words:** Group decision making, heterogeneous incomplete uncertain preference relation, consensus, consistency, robustness.

## DEVELOPING A MODEL OF MULTI-OBJECTIVE FUZZY RANDOM SELECTION AND ALLOCATION OF ORDERS TO SUPPLIERS UNDER DISCOUNT AND RISK; TWO META-HEURISTIC ALGORITHMS

**B. Afshar Nadjafi**(corresponding author)

afsharnb@alum.sharif.edu

**F. Rahimi**

r.farnoosh 68@yahoo.com

**A. Kakaie**

ahmad.kakaie@yahoo.com

**Dept. of Mechanical and Industrial Engineering  
Islamic Azad University, Qazvin Branch**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 113-120, Research Note

© Sharif University of Technology

- Received 18 August 2014; received in revised form 8 February 2015; accepted 20 April 2015.

### Abstract

Supplier selection and assignment of orders to potential suppliers are among the most important functions of supply chain management. In this research, a multi-objective supplier selection and assignment of orders to the suppliers under uncertainty is presented. The first objective is minimizing the total cost including purchasing cost of products, shipping and ordering cost. The second objective aims to minimize the delay by the supplier due to the uncertainty, while the third objective tries to maximum the weighted risk of the selected suppliers. Suppliers' weights are obtained using Fuzzy TOPSIS method because of uncertainty involved. In the proposed model, products are purchased under quantity discounts where sign function is exercised to obtain an efficient formulation. Due to the complexity of the proposed model, two meta-heuristic algorithms i.e., NSGA-II and MOPSO are applied for solving it. Finally, efficiency of the algorithms are evaluated using quantitative measures.

the chain is able to convince to its partner to cover a portion of the cost of advertising. This action is named as vertical cooperative advertising also known as co-op advertising.

Generally speaking, there are two types of advertising in the relation manufacturer-retailer which are the global and local advertising. Manufacturer is responsible of the global advertising which his purpose is to create a brand image with a nationwide' scope. On the other hand, the retailer has under its hands the local advertising that treats on promotion and prices in order to stimulate the consumer demand. In the co-op advertising the costs for locally placing advertising among a retailer or wholesaler and a manufacturer are shared by all members of the chain.

Coordination of pricing and marketing policies is one of the main problems in business. An economical way to achieve marketing objectives is cooperation advertising. So the manufacturer undertakes a percentage of the advertising costs of retailer. On the other hand, market noise effects are effective in achieving these goals. Using game theory, we consider four strategies including Nash game, Stackelberg-manufacturer, Stackelberg-retailer and cooperative game to optimize the cooperative advertising and pricing problem where market noise effect is considered. In this regard, to obtain optimal values, in each case the convexities of objective functions are proved and a numerical example is presented for each state. Then sensitivity analyses are presented to assess changes and their impact on the decision variables. It is observed that although the noise effects of the market will increase advertising costs, but increase the profits of the chain members, and the entire system.

**Key Words:** Pricing, advertising, noise effect, bi- level supply chain, game theory.

## INTERVAL ESTIMATION OF $C_{pm}$ AND $C_{pmk}$ IN AR(1) PROCESS USING CIRCULAR BLOCK BOOTSTRAP METHOD

**S. Raissi**(corresponding author)  
raissi@azad.ac.ir

**S. Jafarian Namin**  
st\_s\_jafarian@azad.ac.ir

**Dept. of Industrial Engineering**  
**Islamic Azad University, South Tehran Branch**  
**A. Amiri**

amiri@shahed.ac.ir

**Dept. of Industrial Engineering**  
**Shahed University**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 89-98, Original Article

© Sharif University of Technology

- Received 22 November 2014; received in revised form 9 May 2015; accepted 28 June 2015.

### Abstract

Process capability indices (PCIs) as quantitative measures of process performance in satisfying the customers' expectations have been widely used in industry. as comparative ratios between voice of the customer and voice of the process. The independency of observations over time is one of the assumptions of the most PCIs developed. However, the development of sampling technology has led to increasing the number of sampling as well as decreasing the time interval between sampling. This leads to occurrence of autocorrelation between successive observations and violation of the independency between observations. There are different point estimators and confidence intervals for the process capability indices of autocorrelated data in the literature. In this paper for the first time, confidence intervals of  $C_{pm}$  and  $C_{pmk}$  are estimated using Circular Block Bootstrap resampling technique when the data are autocorrelated and modeled by an AR(1) process.

Estimating the PCIs sampling distribution through simulation studies showed that increasing autocorrelation coefficients leads to decreasing in sampling standard deviation and bias in the PCIs estimators. However, larger sample sizes have resulted in more accurate estimations and lower bias, skewness and kurtosis of estimators.

In addition, performance of the proposed interval estimators are compared through numerical examples. Simulations results of two different methods of confidence interval indicate that 95% standard bootstrap (SB) method often outperforms the Biased-Corrected and accelerated (BCa) Percentile Bootstrap method without considering the magnitude of autocorrelation coefficient. Moreover, the effects of various autocorrelation coefficients, sample sizes, mean values and standard deviations on the proposed confidence intervals have been appraised.

Finally, by comparing the results of the proposed method and existing methods in the literature, some advantages of the bootstrap have been mentioned. Generally, considerable volume of available data is brought about average coverage percentage (ACP) close to a nominal confidence level and lower average interval length (AIL) with more accuracy. In addition, the proposed methods have often lower AILs, and give acceptable ACPs particularly in weak autocorrelation coefficients.

**Key Words:** Process capability indices, AR(1) autocorrelated process, bootstrap confidence interval, circular block bootstrap.

the cost of 150 million riyals, 17 service quality characteristics considered for improving the quality of agency, and seven quality characteristics. Due to the quality constraints are not appropriate.

**Key Words:** Quality, service quality, optimizes, SERVQUAL model, quality function deployment (QFD), zero-one goal programming.

## ANALYSIS THE EFFECT OF MAIN CREDIT RISK VARIABLES ON DECISION OPTIMIZATION IN CREDIT PORTFOLIO (CASE STUDY: AYANDEH OF BANK BRANCHES)

**J. Razmi**

jrazmi@ut.ac.ir

**Dept. of Industrial Engineering  
University of Tehran**

**M. Shahbazi**(corresponding author)

Mr.Shahbazi@alumni.ut.ac.ir

**Dept. of Industrial Engineering  
Alborz Campus, University of Tehran**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 65-76, Original Article

© Sharif University of Technology

- Received 15 November 2014; received in revised form 2 March 2015; accepted 12 April 2015.

### Abstract

The revision banks are in appropriation and allocation of resources in areas of activity. The banks taking the credit risk of customers based on their requests facilities is covered, since one of the most important problems management of loan portfolio, are the failure of banks. Therefore, today one of the main techniques that have been considered in the financial sector and banking, is risk management techniques. This paper is the analysis of internal and external factors influencing credit risk of the "Ayandeh bank" from 136 corporate customers in the period during 2010 to 2012 years, the effective strategy reducing of the risk, and the its implementation improve decision making in bank helped. The main method of research to describe data accomplished by "Delphi" method. Then, descriptive statistics and inferential statistics, data analysis and hypothesis testing, including tests, correlation and regression, structural equation. The results obtained from the data of corporate customers with softwares "SSPS" and "Lisrel" at the end of the model will be presented. This model

show good credit risk at each of the bank's corporate customers and more exact estimation of the weaknesses identified by the customer and the bank, solutions for the improvement of decision-making provide. The results of this research show that great influence of the sales and customer credit risk is the same for debt and asset returns and asset sales, more than any other ratio bankruptcy of and chaos in predicting future situation are effective and the first ratio of debt to cash flow from operations in the important role, the second investment ratios, liquidity ratios after they are placed the results obtained in this research, the effect of credit risk activities at least shows that results also confirm the "Altman" model. This model will show one of the best ways to risk management in banks. The results shows that, of all the criteria affecting the credit risk of the sale, the bank loan, the liquidity and profitability of the direct relationship between positive and are based on credit risk.

**Key Words:** Banking system, risk management, corporate customers, "DELPHI" technique, structural equation modeling.

## STOCHASTIC PRICING AND COOPERATIVE ADVERTISING MODEL WITH MARKET NOISE EFFECT

**A. Taleizadeh**(corresponding author)

taleizadeh@ut.ac.ir

**Dept. of Industrial Engineering  
University of Tehran**

**Z. Cheraghi**

z.cheraghi@gmail.com

**Dept. of Industrial Engineering  
Islamic Azad University, South Tehran Branch**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 77-87, Original Article

© Sharif University of Technology

- Received 16 November 2014; received in revised form 20 June 2015; accepted 28 June 2015.

### Abstract

Emphasizing the importance of competition and cooperation in supply chains has caused the resurgence of the game theory as a useful tool for the analysis of interactions of the members within a supply chain. Any member of a supply chain can have its own promotion and advertising programs. However, an interactive relationship (i.e. win-win) occurs when any member of

**H. Yari gholi**

yari21110@yahoo.com

**A. Kazemi**(corresponding author)

abkaazemi@qiau.ac.ir

**Faculty of Industrial and Mechanical  
Engineering****Qazvin Branch, Azad University**

Sharif Industrial Engineering and Management Journal

Volume 32, Issue 2.2, Page 47-56, Original Article

© Sharif University of Technology

- Received 7 October 2014; received in revised form 6 June 2015; accepted 28 June 2015.

**Abstract**

Selecting a appropriate supplier is always a difficult task for most managers. This study is the first to research some of the most short path routing model, selection of suppliers in terms of discussion discount and delay payment on these models, multi-objective considered in with an algorithm, meta-heuristic is solved. In the proposed model, the three goals of minimizing the total cost of the purchase Allowing for fixed costs and delays in the payment of the buyers, minimizing the number of product return and minimizing the path to purchase, According routing of vehicles has been addressed.

The mathematical model discounted net present value of the overall amount of money due to delays in payments are considered. The problems of routing and shortest route will be calculated for a set of selected suppliers. All suppliers, their products with discounts and delayed payment offerings. According to the that the purchaser is responsible for collecting the goods purchased and all suppliers have not the same ratio to the non-specified intervals , Therefore, we reduce the distance traveled by the vehicle routing problem in order to find suppliers , and according to the real-world buyers usually have a delay in payment to suppliers , to attract attention due to the increasing willingness of buyers to buy them and use they. In our model, the net present value of the objective function value for purchaser is getting utilized. Because of the large size and complexity of the problem to be NP-Hard, to solve Non-dominated Sorting Genetic Algorithm (NSGA-II), Non-dominated Ranking Genetic Algorithm (NRGA) and Multi objective Particle Swarm Optimization (MOPSO) is proposed. In order to find the shortest path routing model, both Genetic Algorithm (GA) and Simulated Annealing algorithm (SA) to evaluate and select one of them According to the better performance of the algorithm in solved and is used in the multi objective model. Finally, one multi-objective algorithm and another one single objective is recommended to solve this model.

**Key Words:** Supply chain management, supplier selection, allocation, discounts, delay in payments, routing, multi objective meta-heuristic algorithms.

**OPTIMIZATION OF SERVICE  
QUALITY USING HYBRID  
SERVQUAL, QFD AND GOAL  
PROGRAMMING****N. Sayani**

noushinsayani@yahoo.com

**M. Saleh Owlia**(corresponding author)

owliams@yazd.ac.ir

**Dept. of Industrial Engineering  
Yazd University**

Sharif Industrial Engineering and Management Journal

Volume 32, Issue 2.2, Page 57-63, Original Article

© Sharif University of Technology

- Received 26 October 2014; received in revised form 7 March 2015; accepted 12 April 2015.

**Abstract**

Nowadays, Service organizations have found that the most important secret of their survival in their competitive market is attention to the customers and meet their wants. The Servqual method is a major and current methods of measuring customer satisfaction of service quality.

As service providers have their own limitations to meet the customers' needs, they should be looking for some ways in which communicate between the limitations of service providers company and the customer's demands. One of the most powerful ways to meet customers' requirements is Quality Function Development (QFD), but this method does not provide optimal solution to select service qualitative characteristic so It would seem that compilation the mathematical programming techniques with QFD is effective in this context. The purpose of this study is to identify the customers' demands according to SERVQUAL model and to find the optimal solution by use of QFD and zero-one goal programming.

The objective function includes: maximize the relationship between service quality characteristics and customers' demands, minimizing the cost of service quality characteristics, maximize the extensibility and creation potential of Service and This limits includes: the limitation of overall priorities of the service quality characteristics, limitation of resources allocated by the agency and limitations are extensibility and creation potential of Service quality.

The population in this study consisted of all clients is Geno Kish Travel Agency in Bandar Abbass. 135 of them were selected and questionnaires to assess the performance of quality of service and its importance and then check the qualitative characteristics and assemble QFD house. Lastly, the issue has been modeling and is solved by zero-one goal programming.

According to the obtained result from this model to improve the quality of service determined that by use of

an increasingly more important role than their manufacturing counterparts. This article presents a bi-objective non-linear integer mathematical model for reliable facility location problem with stochastic demand. The concentration of this article is to present a new mathematical model in reliable facility location problem with immobile servers with congested facilities. The goal is to determine the location of both inexpensive and reliable facilities. Therefore, a bi-objective mathematical programming model is presented in which total cost and reliability of system are simultaneously optimized. There are many real life applications of the proposed model such as: automated teller machines, communication networks, vending machines, local clinics, hospitals and medical centers, relief distribution centers and reconstruction center locations, kinds of education systems, police stations, truck terminals, hotels, city logistics terminals, parks, bus stops, press delivery networks, locating post boxes, and the like. Since the proposed model is NP-Hard, a multi-objective water flow-like algorithm (MOWFLA) is presented to solve the model. To demonstrate the performance of the proposed algorithm, different test problems are first generated. Then, multi-objective genetic algorithm as best-developed algorithm in the literature and GAMS software, integrating the objectives with LP-metric method, are applied to justify the performance of proposed MOWFLA. According to objective function value (OFV) and computational time (CPUT) metrics, the results show that the proposed algorithm are capable to solve proposed congested facility location problem in large size problems.

**Key Words:** Reliability, network location, queuing theory, water flow-like algorithm.

## PROJECT RESOURCE LEVELING WITH AN EFFICIENT SIMULATED ANNEALING ALGORITHM

**F. Jolai**(corresponding author)

fjolai@ut.ac.ir

School of Industrial Engineering  
University of Tehran

**M. Bagheri**

m.bagheri@sadjad.ac.ir

Dept. of Industrial Engineering  
Sadjad University of Technology

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 35-45, Original Article

© Sharif University of Technology

- Received 27 September 2014; received in revised form 15 March 2015; accepted 1 July 2015.

## Abstract

Resource leveling problem considers resource usage pattern in the project plan during the project execution time and attempts to create a levelled baseline schedule. In this problem one aims at completing the project within its deadline with a resource usage which is as level as possible over the entire project horizon. Mostly no explicit resource considerations - like resource constrained property- are taking into account when this problem is considered.

This problem is one of the most well-known and classical problems for which one can hardly find an efficient solution procedure in the literature. Most procedures in the literature are based on repetitive time consuming forward/backward methods in which the performance are rarely studied through various comprehensive test problems.

We use Simulated Annealing meta heuristic algorithm to solve the resource leveling problem. The solution representation and neighborhood generation method in this algorithm is based on a theorem which has been proved in this article. Using our theorem and Floyd- Warshall longest path algorithm together with distance matrix with temporary precedence relations leads to an efficient new way of solution representation and neighborhood generation method.

We study the efficiency of this algorithm by comparing with the results of two other heuristic methods and also with a zero-one non-linear mathematical programming model solved with Lingo. Numerous test problems with a vast variability in parameters are generated to compare these methods. To produce the test problems we have used the Rangen software which is well-known in literature to generate project networks with resources.

The performance of different procedures are compared through different performance and computational time indicators. The results show that this algorithm outperforms the other heuristics and obtains highly competitive results in comparison with mathematical programming approach. more over the suggested meta heuristic completely outruns the mathematical programming approach considering computational time.

**Key Words:** Project scheduling, resource leveling, meta-heuristics, simulated annealing.

## PRESENTING A MULTI OBJECTIVE MODEL FOR SUPPLIER SELECTION WITH CONSIDERING DISCOUNT, DELAY PAYMENT AND MINIMUM DISTANCE



function. In the first approach, the aggregation of estimates in the sample level is done by averaging while the second approach employs a second M-estimate to aggregate parameter estimates. Extensive simulation studies are conducted to investigate and compare the performance of the proposed estimators in terms of robustness and efficiency. The results show that in the absence of outliers or for small amount of contamination, the robust methods perform as well as the classical method, while for medium and large amounts of contamination the proposed estimators perform considerably better than the classical ones.

**Key Words:** Statistical process control; multivariate simple linear profile; M-estimates; Bi-square function.

## SUPPLY CHAIN CONFIGURATION DESIGN( CASE STUDY IN PRODUCTION COMPANY)

**S.M. Mostafavi**

mostafavi@modares.ac.ir

**A. Albadvi**(corresponding author)

albadvi@modares.ac.ir

**A. Hossien Zadeh Kashan**

a.kashan@modares.ac.ir

**Dept. of industrial engineering  
Tarbiat Modares University**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 15-25, Original Article

© Sharif University of Technology

- Received 10 September 2014; received in revised form 6 April 2015; accepted 10 April 2015.

### Abstract

With the competition in market demand and customers' requirements fluctuations, companies have to supply productions in accordance with demand and supply time and less cost in order to be able to maintain their competitive advantages. To achieve these goals, producers must simultaneously design supply chain in the early stages of new product design. To do this according to the BOM, the structure of supply chain is designed and in every node of the chain network, suppliers, the level of safety stock as well as the place of inventory accumulation is determined so that the total cost and also the provision time of the final product interacting with each other minimized.

In this article, the mathematical model for new product supply chain design and selection of appropriate material checklist and also the suitable suppliers in every

node of network, according to the considered criteria, has been developed that is perfectly proportional with critical conditions. This is a multi-objective model that consists of 4 objective functions. The first objective is minimization of end product cost. The second minimizes supply and inventory holding cost. Third objective minimize likely to lack of materials by choosing multiple suppliers in each node of the chain. In the last objective it plans buying of materials in uniform time intervals and so that the suppliers can recognize us as a reliable purchaser. Then, the proposed model has been implemented in actual conditions and analyses are presented base on it and to improve conditions, suggestions are presented. The results show that unlike literature, the efficient supply chain that the minimization of cost in that is the goal, is not always suitable for functional products and there is some other parameters should be considered in critical situations like that suppliers confidence, minimization of likely to lack of materials and minimization of supply costs.

**Key Words:** Supply chain, new product development, alignment, supplier selection, mathematical modeling, bill of material.

## A BI-OBJECTIVE CONGESTED NETWORK LOCATION PROBLEM TO OPTIMIZE RELIABILITY AND COST OF SYSTEM

**P. Fattahi**(corresponding author)

p.fattahi@alzahra.ac.ir

**Dept. of Industrial Engineering  
Alzahra University**

**V. Hajipour**

v.hajipour@basu.ac.ir

**Dept. of Industrial Engineering  
Bu-Ali Sina University, Hamedan**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 27-33, Original Article

© Sharif University of Technology

- Received 22 June 2014; received in revised form 1 February 2015; accepted 25 April 2015.

### Abstract

One of the most important strategic decisions that affects the success of an organization, is to locate the facility in an appropriate place. Facilities are characterized on a continuum spectrum from manufacturing facilities at one end and service facilities at the other end. In terms of trends in enterprise turn-over and gross domestic products (GDP) of nations, service industries play

# Abstracts of Papers in English

## MONITORING MULTIVARIATE SIMPLE LINEAR PROFILES USING ROBUST REGRESSION M-ESTIMATORS

**M. Kordestani**(corresponding author)

mkordestani@mail.kntu.ac.ir

**Y. Samimi**

y\_samimi@kntu.ac.ir

**Dept. of Industrial Engineering  
KN Toosi University of Technology**

Sharif Industrial Engineering and Management Journal  
Volume 32, Issue 2.2, Page 3-13, Original Article

© Sharif University of Technology

- Received 22 June 2014; received in revised form 1 February 2015; accepted 25 April 2015.

### Abstract

In some quality control applications, quality of a product or process can be characterized by a relationship between two or more variables that is typically referred

to as profile. Research on profile monitoring commenced with studying simple linear profiles nearly fifteen years ago and then was pursued by investigating other types of profiles including multiple linear profiles, polynomial profiles, generalized linear profiles, and recently multivariate linear profiles. This paper has focused on the last case where several correlated quality characteristics can be modeled as a set of linear functions of one or more explanatory variables. Since, for the sake of simplicity, the model structure of our study consists of only one predictor, this type of profile has been referred to as multivariate simple linear profile. This paper deals with statistical process control in phase one where parameters of the model are to be estimated in order to develop a control chart for process monitoring. While outliers may hamper the expected performance of the classical regression estimators leading to erroneous interpretation of the process, this study resorts to robust regression estimators as the remedy of the estimation problem in the presence of outliers. Two robust approaches are proposed in our study to estimate parameters of multivariate simple linear profiles on the basis of robust regression M-estimates with bi-square weight