

© Sharif University of Technology

- Received 15 July 2020; received in revised form 5 January 2021; accepted 18 January 2021.

Abstract

Renewable Wind power plants are among the cleanest centers of electricity generation which have a special advantage over fossil power plants (nonrenewable) due to the replacement of wind with fossil fuels to generate electricity. Since in a wind farm 25 to 30 percent of the total cost is related to maintenance and repair costs, it will be possible to welcome wind turbine technology only by managing costs so that upon reducing these costs, the acceptance of this technology will grow. The failure rate of large turbines is much higher than the average and small ones; as a result, the cost of maintaining and repairing these turbines increases non-linearly with the increasing capacity of power plants; therefore, reducing maintenance costs in these power plants is of particular importance. Process equipment maintenance enables network services to be available when needed and to ensure that maintenance services retain their asset value as capital. Traditionally, maintenance activities are carried out in different ways by different people Van. Wind turbines are one of the growing sources of renewable energy production in today's world, which constantly needs to reduce operating and maintenance costs. In this paper, the Agent-based modelling approach is used to solve the problem of optimizing the potential (capacity) of maintenance services in a renewable wind power station. The results of the proposed model confirm that the founding approach provides a suitable platform for dealing with the complexities of the problem including system dynamics and system uncertainties such as parameters and pattern and wind time in the region. The development of different scenarios and the analysis of cost sensitivity in terms of the number of allocated service resources indicated that a 3-point increase in the capacity to provide maintenance services would lead to a minimum amount of costs and increase system efficiency.

Key Words: Multi-agent based modelling, wind power station, resource planning, maintenance planning.

PRESENTING A NOVEL VENDOR MANAGED INVENTORY MODEL FOR RETAILER SELECTION IN COMPETITIVE CONDITION

M. Karimi

karimim@st.u.yazd.ac.ir

H. Khademi Zare(corresponding author)

hkhademiz@yazd.ac.ir

Y. Zare Mehrjerdi

yzare@yazd.ac.ir

M.B. Fakhrazad

mfakhrazad@yazd.ac.ir

Dept. of Industrial Engineering

Faculty of Engineering, Yazd University

DOI:10.24200/J65.2021.56263.2142

Sharif Industrial Engineering and Management Journal

Volume 36, Issue 2.2, Page 103-115, Original Article

© Sharif University of Technology

- Received 7 September 2020; received in revised form 23 January 2021; accepted 8 March 2021.

Abstract

Vendor management inventory, as one of the inventory management methods, reduces the cost of inventory in the chain, quick response to customers, increased service level, customer satisfaction, and improves collaboration between the members of supply chain. In this study, a single-product bi-level supply chain model with one manufacturer and several retailers under a vendor management inventory system to select retailers under competitive conditions is investigated. In this study, the retailer selection problem formulated as a Stackelberg game model with consideration of manufacturing as a leader and retailers as followers to help the manufacturer and optimally select his retailers to form a VMI system. The manufacturer delivers the products to the selected retailer at the same time. Also, demand for the product in the retailers market is the decreasing function of price. Due to the prevailing policy and the agreement between the manufacturer and the retailer, the manufacturer is also responsible for managing the retailer's inventory. Therefore, the manufacturer will bear all the costs of maintaining the inventory, whether with himself or the retailer. In return, to accept the responsibility of inventory management by the manufacturer, the retailer pays the manufacturer a fee per unit as inventory costs. The objective of the model is to maximize manufacturing profits at the first level and maximize profits of any retailer at the second level. Model decisions are finding the optimal quantities of wholesale price decisions, product's replenishment cycle time, backorder, retailer selection, and determining whether or not to set up a production line for the manufacturer and retail price quantities for the retailer. In order to validate the proposed model, sensitivity analysis was performed on some parameters. As demonstrated by our numerical studies, the optimal retailer selection can increase the manufacturer's profit by 91% and the selected retailer's profits significantly compared to the non-selection strategy.

Key Words: Supply chain management, vendor managed inventory, retailer selection, stackelberg game theory, competitive condition.

of the first phase before calculating the control limits to achieve a suitable result is of great importance. Therefore, in this research, the proposed control diagram identifies outliers using hierarchical clustering method. The importance of this method is in determining the outliers using heterogeneity coefficient and a set of variable control limits. In this method, the heterogeneity coefficient and a set of control limits are determined using the parameters of sample size and number of variables (qualitative indicators). In fact, the distance between observations is modeled in clusters while the outliers are deleted by the recursive algorithm. Then, the mean and matrix of variance and covariance T_2 are determined based on the remaining data. In the last step, according to the obtained control limit, T_2 statistic is determined. To evaluate the performance of the proposed control chart and compare it with the classic T_2 hoteling chart in identifying outliers, the noncentrally index and the method of Alfaro et al. have been used based on the detection of outliers data. Two diagrams from the Hawkins and Phosphorus datasets have also been examined for further comparison. The importance and efficiency of the proposed method were observed despite a large number of outliers in the data set.

Key Words: Multivariate control chart, hoteling T^2 control chart, hierarchical cluster analysis.

RISK BASED MODELING FOR EVALUATION OF INSURANCE COMPANIES' INVESTMENT IN PUBLIC-PRIVATE PARTNERSHIP IN ROAD CONSTRUCTION

M. Taheri

taheri.milad1@gmail.com

Y. Javid(corresponding author)

Javid@khu.ac.ir

**Dept. of Industrial Engineering
Faculty of Engineering, Kharazmi University
DOI:10.24200/J65.2021.55187.2090**

Sharif Industrial Engineering and Management Journal
Volume 36, Issue 2.2, Page 83-92, Original Article

© Sharif University of Technology

- Received 1 July 2020; received in revised form 27 January 2021; accepted 8 March 2021.

Abstract

In this study, a model is presented to evaluate the risk of insurance companies' investment in eliminating Hot Spots by using the Bootstrap simulation method. According to the reports, the cost of fatalities and serious injuries is estimated to be \$ 1.8 trillion per year, with

an average of 3% of GDP per country. Besides, the enormous costs of accidents have caused governments to reduce their consequences and losses by investing in this area. Consequently, reducing the cost of crashes requires an effective strategy and one of the effective strategies is identifying and eliminating Hot Spots. However, they are often prioritized due to financial constraints and so, their immunization is delayed. Using the capacity of the private sector, especially insurance companies interested in this investment, can be very helpful in reducing the constraints. Today, insurance companies' cooperation in promoting road safety is well known in most developed and even developing countries. Roads condition play a key role in road safety and the geometrical features, road design, and infrastructure have a significant impact on accidents. As a result, one of the most important areas of cooperation between government and insurance companies can be defined in road safety projects. On the other hand, studies show that the design, construction and management of highways under PPP has a positive relationship with the results of road safety and the number of annual accidents and the number of fatalities in the Public-private partnerships is less. To this end, a model based on the Public-Private Partnership (PPP) approach is developed for the partnership of government and private sector in immunization projects and assessment of investment risk. This model helps in deciding on investment and risk assessment by calculating the value at risk of IRR for the insurance company and the public sector. In the end, the specifications and cost information of a Hot Spot is taken into account and the IRR for each party is calculated according to the level of confidence desired.

Key Words: Public-Private partnership (PPP), risk, crash costs, value at risk (VaR), the bootstrap simulation.

MODELING THE FOUNDATION AND PLANNING RESOURCES OF THE SERVICE UNIT IN THE RENEWABLE ENERGY POWER STATION OF BINALOOD

N. Neshat(corresponding author)

neshat@meybod.ac.ir

**Faculty of Industrial Engineering
Meybod University**

N. Baradaranfar

9628953@stu.yazd.ac.ir

**Faculty of Industrial Engineering
Yazd University**

DOI:10.24200/J65.2021.56015.2132

Sharif Industrial Engineering and Management Journal
Volume 36, Issue 2.2, Page 93-101, Original Article

respectively. The results showed that the lot size policy-based ordering system can reduce or completely remove the bullwhip effect. Besides, the bullwhip effect is appeared in both levels of the supply chain during utilizing the (q_0, Q_m) order-point policy-based ordering system.

Key Words: Supply chain, bullwhip effect, forecasting, markov-switching model, autoregressive model, moving average.

MULTI-STATE PREVENTIVE MAINTENANCE AND REPLACEMENT SCHEDULING FOR MULTI-COMPONENT SYSTEMS CONSIDERING NON-FAILURE STOPS

J. Taji

j.taji@eng.uok.ac.ir

H. Farughi(corresponding author)

h.farughi@uok.ac.ir

Dept. of Industrial Engineering
University of Kurdistan

DOI:10.24200/J65.2021.55245.2095

Sharif Industrial Engineering and Management Journal
Volume 36, Issue 2.2, Page 59-69, Original Article

© Sharif University of Technology

- Received 12 May 2020; received in revised form 16 February 2021; accepted 8 March 2021.

Abstract

In continuous operating units, lost production costs are high due to downtime. Economic profitability of these industries is conditional on the implementation of a proper maintenance policy to increase reliability and reduce equipment operating costs. In these industries, all systems, from the simplest to the most complex ones, require scheduled maintenance to reduce the risk of failure. Maintenance scheduling is a branch of industrial engineering that reduces maintenance costs by controlling manufacturing equipment and machinery for repairs and replacement schedules and using statistical analysis. As far as our knowledge is concerned, all article papers in this area have assumed that devices will not stop until it is damaged or inspected. However, in the real world, failure or periodic inspections are not only causes of shutdowns but also non-failure interruptions such as the type and continuity of work, the furnace cycle, prototyping and testing, final evacuation, project execution, and corrections can stop machines. This provides a good opportunity for doing some maintenance activities at this time and prevents future system shutdowns for periodic

inspections which in turn increase system access and reduce maintenance costs. The duration of these stops is limited. With this new approach, a mathematical model is developed in order to optimally schedule preventive maintenance and repair activities in a multi-component system that can be maintained. The maintenance planning horizon is divided into discrete equal size periods and three possible types of activities are considered for each component. The optimal decision is searched for each component in each period to meet the desired reliability at the lowest cost. We also considered the duration of activities and the time-dependent cost of shutdowns. As a solution method, the genetic meta-heuristic algorithm is implemented in Visual Studio software and finally, to examine the efficiency of the proposed model, a numerical example is provided.

Key Words: Preventive scheduling, maintenance and replacement, non-failure stops, genetic algorithm.

DESIGNING A HOTELLING T^2 CONTROL CHART USING CLUSTERING

A.R. Pooya(corresponding author)

alirezapooya@um.ac.ir

Dept. of Management

Faculty of Economic and Administrative
Sciences, Ferdowsi University of Mashhad

A. Yeganeh

ali.yeganeh@mail.um.ac.ir

Faculty of Industrial Engineering

Faculty of Engineering

Ferdowsi University of Mashhad

S. Fadaei

somayehfadaei@mail.um.ac.ir

Dept. of Management

Faculty of Economic and Administrative
Sciences, Ferdowsi University of Mashhad

DOI:10.24200/J65.2021.55182.2089

Sharif Industrial Engineering and Management Journal
Volume 36, Issue 2.2, Page 71-82, Original Article

© Sharif University of Technology

- Received 26 May 2020; received in revised form 6 April 2021; accepted 17 May 2021.

Abstract

The main purpose of the researches in the field of multivariate statistical process control is to consider the correlation between several qualitative characteristics for a specific stage of the process. In Phase II, the multivariate process control procedure is investigated using the control limits obtained from Phase I and online observations of the process are controlled. Finding the outliers

Key Words: Ranking, dynamic, TOPSIS, time window, Yazd university.

INVESTIGATING THE IMPACT OF INFLUENTIAL CUSTOMER REVIEWS IN SOCIAL NETWORKS ON BUYING BEHAVIOR OF OTHER CUSTOMERS

M. Fathian(corresponding author)

fathian@iust.ac.ir

B. Amiri

babakamiri@iust.ac.ir

H.R. Heidari

hamid.production@gmail.com

**Dept. of Industrial Engineering
Iran University of Science and Technology
DOI:10.24200/J65.2021.54547.2057**

Sharif Industrial Engineering and Management Journal
Volume 36, Issue 2.2, Page 37-45, Original Article

© Sharif University of Technology

- Received 14 December 2019; received in revised form 1 February 2021; accepted 2 March 2021.

Abstract

One of the most commonly used words among product manufacturers or service providers is customer loyalty, which can be discussed in both traditional and electronic dimensions. The term, which has been popular since the 18th century, has been developed by commodity manufacturers and service providers with numerous models and tools. With the growth of Web 2 and the rise of websites and the growth of online shopping, however, the market size for manufacturers and service providers has increased, opening up the customer's hands and eliminating time and space constraints and ultimately increasing competition between manufacturers. With the advent of social networks, feelings and opinions about a product are quickly disseminated among consumers. On the other hand, service providers can communicate with their customers through low-cost social networks and use this tool to improve their brand status. The purpose of this study is to investigate the effect of influential customers' feelings and opinions in social networks on other customers in order to increase their sales and customer loyalty in electronic businesses. To this end, transactions data in an online store for 2017-2018 were collected from active customers on the store's social network site (Instagram), and then divided into 15-day identical time intervals and the effect of emotions sent by active customers on amount of other customers' purchases, the increase in the number of loyal customers and

the number of new customers are analyzed using statistical methods. In order to measure the emotions of active users, their opinions are examined at each interval. If the positive emotions are above 70%, the polarity is positive and if the negative emotions are above 70%, the polarity is negative. The number of loyal customers, trivial customers, and new entrants was also extracted by the RFM method. Customers are divided into 3 categories of loyal, indifferent, and unfaithful customers based on the number of purchases, the amount of purchases and the last time of purchases at different time intervals using the clustering algorithm and also, the feelings conveyed by the activists of the social network Instagram about this online store during the mentioned time periods were examined. The results of this study demonstrate the positive effect of active customer sentiment on increasing the number of other customers and increasing the number of loyal and new customers.

Key Words: Social networks, word of mouth advertising, loyalty, active users in social networks.

THE BULLWHIP EFFECT CALCULATION IN THE TWO-LEVEL SUPPLY CHAIN BY USING MARKOV-SWITCHING MODEL FOR DEMAND FORECASTING

M. Salehisarbijan

m.salehisarbijan@eng.basu.ac.ir

P. Samouei(corresponding author)

p.samouei@basu.ac.ir

Dept. of Industrial Engineering

Faculty of Engineering

Bu-Ali Sina University, Hamedan

DOI:10.24200/J65.2021.54638.2065

Sharif Industrial Engineering and Management Journal
Volume 36, Issue 2.2, Page 47-57, Original Article

© Sharif University of Technology

- Received 12 May 2020; received in revised form 5 April 2021; accepted 31 May 2021.

Abstract

The bullwhip effect in the supply chain could lead to fluctuations such as extra inventory and delayed order. In the meantime, proper demand forecasting can significantly resolve these fluctuations by eliminating the bullwhip effect. The present study considers forecasting of retailer demand, suppliers and calculates the bullwhip effect in the two-level supply chain. Markov switching model and autoregressive model along with moving average are used to predict retail demand and supplier,

WHEAT CROP USING THE VIKOR TECHNIQUE AND GEOGRAPHIC INFORMATION SYSTEM (THE CASE STUDY OF FARS PROVINCE)

M. Gobal

mehrdadgobal@yahoo.com

Dept. of Progress Engineering

Iran University of Science and Technology

M.S. Pishvae(corresponding author)

pishvae@iust.ac.ir

Dept. of Industrial Engineering

Iran University of Science and Technology

B. Mojaradi

mojaradi@iust.ac.ir

Dept. of Civil Engineering

Iran University of Science and Technology

DOI:10.24200/J65.2021.53730.2018

Sharif Industrial Engineering and Management Journal

Volume 36, Issue 2.2, Page 13-25, Original Article

© Sharif University of Technology

- Received 28 September 2019; received in revised form 28 April 2020; accepted 2 March 2021.

Abstract

Recently, climate change in Iran, such as rising temperature and reduced rainfall, has reduced at least 15% of agricultural production. Wheat is one of the most widely used agricultural strategic products and has significant importance in food security in Iran and many countries in the world, which has the ability to be cultivated in warm and dry climates. According to agricultural statistics of Fars province, about 10% of the agricultural sector of the country is supplied from this province and has the second rank of wheat production among the provinces of the country. This research aims to study the land-use planning as well as integrated wheat supply chain network from producer to consumer for the Fars province. The proposed mathematical model involves choices for producers, silos, flour mills, and consumers. In the first step, land suitability for wheat cultivation has been evaluated using rain fed method in Fars province and wheat producers are used as model inputs. This is done by checking the geographic layers of Fars province. These layers are studying climatic, soil and topographic data in the geographical area of Fars province. The addition of information layers in the GIS environment using multivariable decision analysis tools finally led to the preparation of a map showing suitable agricultural units for wheat production. These results are used as inputs in the supply chain. The introduction of information layers in the GIS environment using the VIKOR-based multi-criteria decision analysis tool leads to a map showing the proper agricultural units of wheat. The results of this study showed that about 32% of the

area of Fars province was in the first and second places of land suitability for wheat cultivation. It was also revealed that the most susceptible areas were scattered in the western and northwestern parts of Fars province.

Key Words: Agricultural supply chain network, land use, multi-criteria decision making, geographic information system (GIS).

DEVELOPMENT OF TOPSIS MODEL FOR DYNAMIC PERFORMANCE EVALUATION WITH A TIME WINDOW APPROACH (CASE STUDY: ENGINEERING DEPARTMENT OF YAZD UNIVERSITY)

ZH. Azadi

zhaleazadi@gmail.com

H. Khademizare(corresponding author)

hkhademiz@yazd.ac.ir

M.S. Owlia

owliams@yazd.ac.ir

Faculty of Industrial Engineering

Yazd University

10.24200/J65.2021.54240.2041

Sharif Industrial Engineering and Management Journal

Volume 36, Issue 2.2, Page 27-35, Original Article

© Sharif University of Technology

- Received 25 November 2019; received in revised form 13 February 2021; accepted 8 November 2021.

Abstract

Ranking is one of the important management issues in organizations and what method to use for evaluating performance of an organization is an important question in theory and practice. The most prominent feature of any dynamic organization is the evaluation and critique of its activities over time. The purpose of this paper is to provide a TOPSIS model with a time window to evaluate the dynamic performance of engineering and technical faculties of Yazd University. This method is able to examine the growth and reduction of the units in the planning horizon for each of the indicators and in general. In this research, 15 indicators were selected based on the frequency of articles and database data limitations, and the developed model was implemented for the 16-year period and finally, the model validation was performed. In addition to the high adaptability of the results of the TOPSIS Model window with other dynamic methods and existing conditions, this method goes through lower computation burden and has no limitation on the number of indices.

Abstracts of Papers in English

IMPROVING THE PERFORMANCE OF CLASSIC AUTO-REGRESSIVE INTEGRATED MOVING AVERAGE USING ENSEMBLE EMPIRICAL MODE DECOMPOSITION

P. Amini

pegah_14.amini@yahoo.com

M. Khashei (corresponding author)

khashei@cc.iut.ac.ir

Dept. of Industrial and Systems Engineering
Isfahan University of Technology

DOI:10.24200/J65.2021.53326.1993

Sharif Industrial Engineering and Management Journal
Volume 36, Issue 2.2, Page 3-12, Original Article

© Sharif University of Technology

- Received 2 June 2019; received in revised form 24 January 2021; accepted 2 March 2021.

Abstract

Prediction is one of the most important achievements of modeling science, which has a special place in management and decision making. In general, there is a direct relationship between the accuracy of predictions and the quality of made decisions. This is the most important reason why efforts for providing more precise methods of prediction in the subject literature have not stopped despite the existence of numerous methods. The classical Auto-Regressive Integrated Moving Average (ARIMA) models are one of the most important and well-known statistical methods that have been frequently used in various sciences. However, these methods, despite all their unique advantages, have some disadvantages, which sometimes reduce their acceptabil-

ity. One of the most important of these disadvantages is the limitation of the linearity, the limitation of certainty, the limitation of the number of required data, and the limitation of mixed and multiple structures. Many attempts have been made to address these shortcomings and limitations in the literature. In this paper, a method for overcoming the limitation of complex and multiple structures is presented using the Ensemble Empirical Mode Decomposition (EEMD) techniques. In the proposed method, at first, the under-study time series, which is essentially complex and involves several simultaneous structures, is decomposed into its constituent constituents, which are fundamentally less complicated and include fewer structures. Then, each of these simplified structures is predicted using an auto-regressive integrated moving average model. Ultimately, the prediction of each of the main components is combined to formulate final predictions. The results of applying the proposed method to predict the crude oil price, which is among the most complex time series in financial markets, indicate the effectiveness of the proposed method. Numerical results show that the proposed method can improve the performance of the classic auto-regressive integrated moving average of 65.57% and 53.85% in predicting Texas and Brent crude oil prices.

Key Words: Ensemble empirical mode decomposition (EEMD), multiple complex time series, financial markets forecasting, crude oil price.

A TWO-PHASE MODEL FOR LAND USE PLANNING AND SUPPLY CHAIN NETWORK DESIGN OF