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EDITORIAL

Special Issue

Applications of Reliability Models

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Guest Editor

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The special issue, Applications of Reliability Models, of International Journal of Operations Research (IJOR) has invited all participants of the 16th ISSAT International Conference on Reliability and Quality in Design held in Washington D.C., USA on August 5-7, 2010 to contribute their full papers. We are very grateful for the overwhelming responses received from the authors who submitted papers to this special issue and the tremendous help provided by a large number of referees in the review process. This special issue received several submissions which extend the original papers presented in ISSAT 2010 Conference. At least two blind referees are invited to review each submission for guaranteeing the rigorous review process. Finally, four papers are accepted for publication in this special issue entitled "Applications of Reliability Models". The accepted papers are summarized as follows.

The first paper entitled "OPTIMUM PROFIT MODEL FOR DETERMINING PURCHASER'S ORDER QUANTITY AND PRODUCER'S ORDER QUANTITY AND PRODUCER'S PROCESS MEAN AND WARRANTY PERIOD" is written by Dr. Chung-Ho Chen. The producer needs to determinate the optimum product quality and the purchaser needs to consider the order quantity of product. Hence, the market needs to solve the problem of "how to get a trade-off between them". Although the economic order quantity, process mean setting, and warranty period of product setting are three different problems that occur in the inventory management, quality control, and warranty policy. If they are combined into an integrated model, then one can obtain the optimum decision parameters with maximum expected total profit of the society. In this paper, the author proposes a modified Chen and Liu's (2007) model for determining the optimum order quantity, process mean, and warranty period of product between the producer and the purchaser. Assume that the demand quantity of the end of customer and the quality characteristic of product are independent normally distributed. Taguchi's symmetric quadratic quality loss function is applied in measuring the product quality. In this paper, the author has presented an integrated Ladany and Shore's (2007) model into the modified Chen and Liu's (2007) model with quality loss and warranty period of product. The warranty period of product, the expected lifetime of product, and the order quantity are simultaneously determined in the modified Chen and Liu's (2007) model.

The second paper entitled "Optimal Staffing for a SOA Company" is written by Dr. Shin-Guang Chen. Due to the IT advances in the Enterprise Resource Planning Systems (ERPS), more and more companies adapted the Service-Oriented Architecture (SOA) as the main infrastructure of their core business operations. So, process is the key identity of business activity to be monitored. However, how to evaluate the performance of as well as to staff such process, especially in a volatile environment, so that the business goal can be fulfilled is still unknown to most of the mangers. This paper proposes an analytic method to do optimal staffing for the companies facing people floating while keeping the capability to predict the performance of such process. Anderson (2001) proposed an elegant staffing method based on random walk, but his approach only applied for the solution of a long-term business cycle. For a daily operation, this may not be appropriate. Hence, how to evaluate the performance of as

well as to staff such process, especially in a volatile environment, so that the business goal can be fulfilled is still unknown to most of the managers. Chen (2009) extended it to cover the performance of a business process in case of system failures. Chen and Lin's model gave the excellent solution to evaluate the short-term performance for a daily process even in a volatile environment. To generate the optimal staff plan in a SOA company with absentees such that the required total cost for staffing is minimum and the performance of the process kept acceptable. So, the approach not only searches for the optimal staff plan but also calculates the derived performance simultaneously. In this paper, the calculation of system performance is based on the Minimal Path (MP) technique (Chen and Lin, 2008b). This paper proposes an algorithm to find the optimal staff plan in a SOA company such that the process is robust and the required staffing cost is minimal while the performance is predictable. Our approach can provide companies a helpful toolkit to manage such situation while keeping the ability to predict the performance of process.

The third paper entitled "Monotone Properties of Optimal Maintenance Policy for Two-State Partially Observable Markov Decision Process Model with Multiple Observations" is written by Dr. Nobuyuki Tamura, Ken-ichi Hayashi, Tetsushi Yuge, abd Shigeru Yanagi. Any system is generally operated under various environments and constraints. Hence, most systems cannot remain in good operational condition because of deterioration with elapse of time and thus eventually fail without maintenance. In this paper, we consider a system that is operated periodically and whose state is either good or bad. When the system stays in the good state, it moves to the bad state with a probability. However, the system in the bad state cannot return to the good state. At each time epoch, we may select one of the following five actions: operation with a monitor, operation without a monitor, inspection, repair, and replacement. After operation, the true state is inferred and we can determine the probability that the system is in the bad state. If we can determine the deterioration level of the system in some way or its failure is crucial, condition-based maintenance (CBM) would be adopted. Thus, it is important to decide when and how to perform maintenance action, such as inspection, repair, or replacement. For the analysis of the problem, partially observable Markov decision process (POMDP) models are suitable. We express the model as a partially observable Markov process and derive the total expected discounted cost for an unbounded horizon. We construct a two-state POMDP model with two types of observation, by which incomplete information can be obtained. For this model, in this paper, we investigate the structural properties of the optimal maintenance policy. By introducing the assumption that the outcome of monitoring follows a uniform distribution, we have shown that the optimal maintenance policy may be characterized by eight regions at most and it must be classified into one of the specific six structures. This seems to be complex because the optimal maintenance policy in the previous studies can be unique. However, the result would be very remarkable since the model assumes the two procedures for obtaining incomplete information differently from the past ones.

The fourth paper entitled "INTERGRATING AHP AND DELPHI METHODS TO CONSTRUCT A GREEN PRODUCT ASSESSMENT HIERARCHY FOR EARLY STAGES OF PRODUCT DESIGN AND DEVELOPMENT" is written by Dr. Chun-Ming Yang, Thu-Hua Liu, Ching-Han Kao, and Hsing-Tzu Wang. From the perspective of reducing the environmental impact, this study applies Analytic Hierarchy Process (AHP) and Delphi Method to construct a product assessment framework for early product planning and development stage to evaluate a product's impact and influence on the environment. This study firstly collects the environmental performance indicators through intensive literature review and employs them as the criteria. Together with Delphi questionnaire, AHP is used to model the hierarchy of the decision problem, which will be basis to develop green product assessment framework in the follow-up research. By completing the study, this well-designed green product assessment framework is intended to provide a systematic, comprehensive, and timely platform to assess the environmental impact of a product. And it aims to reflect the following factors: (1) The green product assessment framework can help design environmentally sound product that take the entire life-cycle into consideration. (2) The green product assessment framework is based on environmental and ecological impact. (3) The green product assessment framework can provide timely assessment results for design improvement. Through a series of Delphi questionnaire, the green assessment hierarchical model introduced here is mainly based on product's life cycle, applicable international environmental regulations, and environmentally related research. Considering all aspects of a product life cycle, this assessment hierarchy can also serve as an effective means to develop the environmentally sound solutions to achieve the sustainable product design that is attaining and maintaining regulatory compliance.

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