Management Theories and Strategic Practices for Decision Making

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Section 1
Strategic Decision Support Systems and Data Management

Chapter 1
A Decision Support Architecture for Maritime Operations Exploiting Multiple METOC Centres and Uncertainty ................................................................. 1

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Maritime operations are affected significantly by meteorological and oceanographic (METOC) conditions. The availability of multiple METOC centres able to deliver more accurate forecasts in the near future (2/3 days) is a promising resource toward better operational planning. However, how a specific maritime operation can benefit from such forecasts is not straightforward. A decision support architecture is required to combine METOC forecasts and human knowledge and select the best action from a set of pre-defined actions for the maritime operation. This paper describes a decision support architecture developed at the NATO Undersea Research Centre that is an improvement over a previous version in two ways: (1) it exploits forecasts coming from more than one METOC centre, and (2) it exploits uncertainty associated with METOC forecasts. The former allows for the exploitation of different abilities of METOC centres at different conditions. The latter allows for the propagation of input uncertainty on output products (the risks related to each action), thus allowing operators to assess if risks related to different actions are statistically different. Both features increase the robustness of the previous decision support architecture. The effectiveness of the new architecture is demonstrated on an underwater glider surfacing experiment carried out on data collected during a cruise in the Adriatic Sea in 2006.

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Decision-making analysts are generally familiar with the maximin and minimax criteria used in the selection of alternative courses of action when payoffs depend on different states of nature. This paper applies these criteria to the collaborative negotiation problem in which two parties negotiate the resolu-
tion of several issues each with defined payoffs, and where the alternative choices for each party are qualitative attributes or non-differentiable variables. The proposed method assumes that the negotiators do not know each other's payoffs and are generally unwilling to disclose information about their preferences. The search procedure for Pareto-optimal settlements and the role of the mediator in assisting the parties to achieve an improved negotiated agreement are analyzed and illustrated through an example.

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This paper bridges the existing gap between the empirical consumer choice literature and the theoretical structures built to account for information manipulation between a sender and a decision maker. The authors define a theoretical structure that allows for the analysis of preference manipulation in multiattribute environments via information multifunctions when the information transmitted is verifiable. A series of examples are provided that illustrate numerically the behaviour and validity of this theoretical structure. A concrete application of this theoretical framework is the possibility for an information sender to induce any predetermined preference relation on a decision maker, and, in particular, how lexicographic preferences can be induced starting from non-lexicographic additive ones.

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The accuracy of "stopping rules" for determining the number of clusters in a data set is examined as a function of the underlying clustering algorithm being used. Using a Monte Carlo study, various stopping rules, used in conjunction with six clustering algorithms, are compared to determine which rule/algorithm combinations best recover the true number of clusters. The rules and algorithms are tested using disparately sized, artificially generated data sets that contained multiple numbers and levels of clusters, variables, noise, outliers, and elongated and unequally sized clusters. The results indicate that stopping rule accuracy depends on the underlying clustering algorithm being used. The cubic clustering criterion (CCC), when used in conjunction with mixture models or Ward's method, recovers the true number of clusters more accurately than other rules and algorithms. However, the CCC was more likely than other stopping rules to report more clusters than are actually present. Implications are discussed.

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This paper reports on a case study applying data mining techniques to large Medicare claims databases to discover insights related to the comparative cost effectiveness of two alternative treatment modalities for treating brain tumors in the elderly. The authors evaluate the cost effectiveness of open surgery, radiosurgery, or a combination of the two. The study applies data mining algorithms including data preparation, classification, association, and predictive modeling techniques to reveal insights into the
costs of alternative health care practice patterns. The results suggest radiosurgery appears to be less costly compared to surgical resection in the Medicare-eligible population. The authors also identified the fact that African Americans comprised a smaller percentage of patients receiving radiosurgery. The study demonstrates that data mining methods can be applied to large complex Medicare claims files to identify and extract undiscovered knowledge to guide medical decision making and public policy.

Section 2
Applied Strategic Decision Support Systems

Chapter 6
Third Party Logistics: Key Success Factors and Growth Strategies

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Third party logistics (3PL) has been gaining importance in most places in the world. In India the implementation of 3PL practices has made its beginning and it is emerging as one of the fastest growing sectors. It is still a relatively new concept and not well understood among industry or academic professionals in India. This paper examines the Indian 3PL Supply Chain Management and practices with respect to the key success factors and growth strategies. After identifying the critical success factors SERVQUAL is applied to reveal the gap between their achievement and expectation. Respondents to the survey are categorized based on their rating of the key growth strategies on the basis of AHP.

Chapter 7
Maintenance Strategy Evaluation Using ANP and Goal Programming

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An optimal maintenance strategy mix is necessary for increasing availability and reliability levels of production facilities without significantly increasing operational costs. The selection of maintenance strategies is a typical Multiple Criteria Decision-Making (MCDM) problem with conflicting goals. Consideration of interdependence among the criteria and alternative policies for maintenance strategy provides valuable cost savings and greater benefits for any hybrid flow systems. For any decision maker, it is convenient to prioritize the criteria of MCDM problems and goals of goal programming problems in fuzzy terms. This paper presents an integrated approach for maintenance policy selection, using fuzzy Analytic Network Process (ANP) within a Goal Programming, based on fuzzy preemptive priority where goal hierarchies are specified in different levels of fuzzy importance. To overcome the criticism of inconsistency, unbalanced scale of judgments and uncertainty in the pair-wise comparison process, criteria weights are determined using modified fuzzy LLSM method.
Chapter 8
Backward and Forward Linkages in Chinese Steel Industry Using Input Output Analysis

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This paper measures the direct and indirect contribution made by iron and steel industry in the economy of China and assess the differences between China and other steel producing countries. With this aim in view, the input-output modelling is used to detect the industrial linkages known as backward and forward linkages of eight iron and steel producing countries, including China, USA, Japan, Germany, Italy, Brazil, Korea, and India. The induction effect of export demand on steel industry in China is shown to be less than several OECD countries, such as Japan.

Chapter 9
Technical Note – The South Eastern and Chatham Railways Managing Committee: A Case for Vertically-Integrated Regional Duopolies?

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In 1898, two railways serving the south-east of England agreed to be managed by a joint committee. This paper finds clear statistical evidence of the negative impact this had on total economic costs, including opportunity costs of capital, as well as working expenditure. Thus, additional support was provided for the then British railway policy already strongly suspicious of railway mergers on competition grounds. At the same time the findings could reopen the discussion on the wisdom of today’s British rail privatisation philosophy. In particular, one could argue that, instead of separating infrastructure and train operations, the creation of vertically-integrated regional duopolies along the pre-1899 networks might lead to genuine competition, require less regulation, reduce costs, and thus increase economic surplus.

Section 3
Strategic Inventory Management

Chapter 10
Pricing and Replenishment Policies for Imperfect Quality Deteriorating Items under Inflation and Permissible Delay in Payments

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Usually it is assumed that all items in a lot are of good quality, but in reality this assumption may not always be pertinent. Thus, the inspection of lots becomes essential in almost all organizations. Moreover, its role becomes more vital when the items are deteriorating in nature. Owing to this fact, this paper investigates the impact of initial inspection on retailer’s pricing and ordering policy for deteriorating items under inflation and permissible delay in payments using discounted cash flow approach over a finite planning horizon. Demand rate is assumed to be a function of selling price. The proposed model jointly optimizes the number of replenishments and price by maximizing the retailer's total profit. Results have been demonstrated with the help of a numerical example, and sensitivity analyses are also presented to provide managerial insights into practice.
Chapter 11
Optimal Ordering Strategy of a Replenishment Policy for Deteriorating Items under Retailer's Partial Trade Credit Policy

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This paper investigates the economic order quantity inventory model for a retailer under two levels of trade credit to reflect the supply chain management situation. It is assumed that the retailer maintains a powerful position and can obtain full trade credit offered by supplier, yet the retailer just offers the partial trade credit to customers. Under these conditions, the retailer can obtain the most benefits. This study also investigates the retailer's inventory policy for deteriorating items in a supply chain management situation as a cost minimization problem. The present study shows that the annual total variable cost for the retailer is convex, that is, a unique solution exists. Mathematical theorems and algorithms are developed to efficiently determine the optimal inventory policy for the retailer. The results in this paper generalize some already published results. Finally, numerical examples are given to illustrate the theorems and obtain managerial phenomena.

Chapter 12
Explaining Involuntary Spinoffs from Teams

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A firm consists of different teams with each of them producing a separate product (which may be related to other products of the firm). In turn, each team has individuals of different talents (though some talents may be substitutable across products) who work together to achieve synergies. Some team members may find it advantageous to induct new talents into an existing team and/or introduce new products based on their experience. The firm will efficiently integrate a new product by forming a new team if it (a) has the organizational capabilities to translate potential synergies to reality, (b) can accommodate the strategic bargaining power of the existing team members in resource allocation across talents, and (c) can attract and coordinate the efficient combination of talents. A Spinoff, i.e., the production of the new product in a separate firm, will occur if any one, or more, of these conditions is not satisfied. A variant of the CES function can be shown to provide the most efficient analytical device to examine the stability of teams and spinoffs when teams cannot maintain such cohesion.

Chapter 13
Fuzzy Economic Production Quantity Model for Weibull Deteriorating Items with Ramp Type of Demand

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This paper discusses an Economic Production Quantity model for Weibull deteriorating items over an infinite time horizon under fuzzy environment. Fuzziness is introduced by allowing the cost components such as setup cost, production cost, holding cost, shortage cost and opportunity cost due to lost sales to certain extent. Triangular fuzzy numbers are used to represent the mentioned costs. Optimum policies of the described models under fuzzy costs are derived. The proposed model can be extended in several ways. For instance, the deterministic demand function to stochastic fluctuating demand patterns could be considered. The model could also be generalized to allow for quantity discounts, as well as permissible delay in payments.
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Trade credit is a well established promotional tool in the present competitive world and its impact on demand cannot be ignored. Businesses often use trade credit to increase their market share and, in turn, the profit. Undoubtedly, trade credit plays a great role in increasing the demand but it also involves a great risk of non-payment. In order to reduce the risk of non-payment, businessman at times use a partial trade credit policy in which they demand a certain percentage of the total amount from the customer at the time of purchase and offers the credit for the remaining amount. Furthermore, it is also observed that the demand of FMCG is highly price sensitive. In order to see the effect of credit and price together, on demand, the retailer’s demand is taken as a function of price and credit period. Moreover it is assumed that the supplier offers the full credit to the retailer but the retailer passes a partial credit to customers. The inventory model, determines the optimal replenishment time, credit period, and price for the retailer that maximizes profit. Numerical examples have been provided to support the model followed by the comprehensive sensitivity analysis.

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This paper analyzes a discrete-time infinite-buffer Geo/Geo/2 queue, in which the number of servers can be adjusted depending on the number of customers in the system one at a time at arrival or at service completion epoch. Analytical closed-form solutions of the infinite-buffer Geo/Geo/2 queueing system operating under the triadic (0, Q N, M) policy are derived. The total expected cost function is developed to obtain the optimal operating (0, Q N, M) policy and the optimal service rate at minimum cost using direct search method. Some performance measures and sensitivity analysis have been presented.

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This paper analyzes a two-facility location problem under demand uncertainty. The maximum server for the ith facility is $M_i$ ($i = 1, 2$). It is assumed that primary service demand arrivals for the ith facility follow a Poisson process. Each customer chooses one of the facilities with a probability which depends on his or her distance to each facility. The service times are assumed to be exponential and there is no vacation or failure in the system. Both facilities are assumed to be substitutable which means that if a facility has no free server, the other facility is used to fulfill the demand. When there is no idle server in
both facilities, each arriving primary demand goes into an orbit of unlimited size. The orbiting demands retry to get service following an exponential distribution. In this paper, the authors give a stability condition of the demand satisfying process, and then obtain the steady-state distribution by applying matrix geometric method in order to calculation of some key performance indexes. By considering the fixed cost of opening a facility and the steady state service costs, the best locations for two facilities are derived. The result is illustrated by a numerical example.

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In a complex and extended system such as a government, the proper allocation of the budget to its sub-entities is always a major challenge. As such for cases like governments, a situation in which multiple budget sources with different concerns available to the sub-entities is common. This study develops an applicable model for large-scale cases in which identifying the flow of capital or budget from (multiple) sources to the sub-entities is sought. Since the influential factors to the allocation process may be mingled with some unknown parameters (as well as known factors) a logit model is developed from past panel data. The logit model is based on the concept of utility, which quantifies the advantage of approaching budget-sources for the sub-entities. Then the budget allocation problem of logit form is written as a mathematical programming formulation for which Successive Coordinate Descent (SCD) method is proposed as the solution algorithm. In this paper, the proposed methodology is tested numerically. The results of this study show there is strong evidence that some of the entities' properties can be altered in order to achieve a better budget allocation.

Section 5
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Supply Chain Integration is widely advocated as an important factor to attain superior supply chain performance. While firms are able to achieve integration, they find it hard to sustain integration. In this paper, the authors argue that to sustain integration partner firms must establish a formal system to evaluate supply chain-wide performance. The authors draw on theories from a number of management disciplines to map the critical links between supply chain evaluation capability and supply chain integration sustainability. The authors develop and test the research model by conducting an empirical study involving 102 firms. The results of the study show that supply chains can sustain integration by establishing a supply chain wide evaluation system.
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Organizations are often facing the problem of determining the degree of investment in building information links with their suppliers and buyers to reduce costs, lead times, and quality problems, improve timely customized delivery, increase asset utilization, and improve corporate profitability. One of the critical enablers for an efficient and effective supply chain is timely planning and information processing across the entire value-added chain. This paper presents an analytical model for selecting the right mix of analytical software and hardware alternatives at various planning and execution levels of an organization to remain competitive in a supply chain. Factors such as quality, reliability, flexibility, timeliness and organizational compatibility have been quantified into cost components that form the weighted cost function. The weights of the various cost components of software and hardware are derived from pair-wise comparison. These weights account for the relative importance of alternative supply chain strategies for an organization. A numerical example is presented to demonstrate the applicability of the proposed framework and exhibit the efficacy of the procedures and algorithms.

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Effectiveness of Inter-Organizational Systems in Global Manufacturing: Evidence from Industrial Cases in Taiwan ................................................................. 373
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Enterprise Information Systems, such as Enterprise Resource Planning (ERP) systems, have been applied to integrate business processes within a global manufacturing enterprise. Recently, the inter-organizational systems are applied to assist in business data sharing and collaboration among enterprises based on the ERP application. However, their resource requirements and failure rates are high, and many enterprises are concerned about the Business-to-Business (B2B) effectiveness. In this research, the authors study global manufacturing enterprises, which developed their B2B systems with Taiwanese government sponsorship successfully. B2B effectiveness is evaluated through operational efficiency and profitability, while the business scale, Electronic Data Interchange (EDI) induced supplier numbers, and application scope are considered influencing factors. After the evidence of multiple regression models and non-parametric statistic testing, the results show that only the application scope has a significant impact on profitability. The authors discuss these results from the perspective of enterprise integration as well as the system application scope and give suggestions to global manufacturing enterprises that want to apply inter-organizational systems.

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