

14ο Ειδικό Συνέδριο Ελληνικής Εταιρίας Επιχειρησιακών Ερευνών

11η Συνάντηση Πολυκριτήριας Ανάλυσης Αποφάσεων

Αγρίνιο, 12 – 14 Μαρτίου 2015

**«Αγροτική ανάπτυξη και οικονομία υπαίθρου: Διαχείριση
με πολυκριτήρια ανάλυση αποφάσεων»**



Το συνέδριο τελεί υπό την αιγίδα της Περιφέρειας Δυτικής Ελλάδος και του Δήμου Αγρινίου.

Υποστηρίζεται με χορηγίες από το Πανεπιστήμιο Πατρών καθώς και πολλές τοπικές επιχειρήσεις και φορείς όπως: Αγρινιώτικο - Κουτέρης Α.Ε.Β.Ε., Αΰφαντής Α.Β.Ε.Ε., Αφοί Στέφου & ΣΙΑ Ε.Ε, ΓΑΙΑ Τρόφιμα Α.Β.Ε.Ε, Επιμελητήριο Αιτωλοακαρνανίας, Κολιός Α.Β.Ε.Ε, ΚΤΕΛ Αιτωλοακαρνανίας Α.Ε., Οινοποιείο Σωτηρίου, Παπαθανασίου Α.Β.Ε.Ε, Πασιόπουλος Α.Ε.Β.Ε, Πέτρινο χωριό, Ποτοποιία Αποσταγματοποιία Δυτικής Ελλάδος ΜΕΠΕ, Agrino Α.Ε, ALFA – Αβασκαντήρας Ιωάννης, GRIVASWINES.

Χορηγός επικοινωνίας είναι ο Αχελώος media.

Αγρίνιο 2015

Επιτροπές Συνεδρίου

Πρόεδρος επιστημονικής επιτροπής: Σκούρας Δημήτριος, Πανεπιστήμιο Πάτρας

Επιστημονική επιτροπή:

Αλεξόπουλος Σπυρίδων, Τεχνικός Σύμβουλος Διοίκησης ΔΕΣΦΑ

Αναγνωστόπουλος Κώστας, Δημοκρίτειο Πανεπιστήμιο Θράκης

Αραμπατζής Γαρυφαλλος, Δημοκρίτειο Πανεπιστήμιο Θράκης

Ασκούνης Δημήτρης, Εθνικό Μετσόβιο Πολυτεχνείο

Βλαχοπούλου Μάρω, Πανεπιστήμιο Μακεδονίας

Γεωργιάδης Χρήστος, Πανεπιστήμιο Μακεδονίας

Γιαννακόπουλος Διονύσης, ΤΕΙ Πειραιά

Γιαννίκος Γιάννης, Πανεπιστήμιο Πάτρας

Γρηγορούδης Ευάγγελος, Πολυτεχνείο Κρήτης

Δελιάς, Παύλος, ΤΕΙ Καβάλας

Δημητράς Αυγουστίνος, Ελληνικό Ανοικτό Πανεπιστήμιο

Διακουλάκη Δανάη, Εθνικό Μετσόβιο Πολυτεχνείο

Δούκας Χάρης, Εθνικό Μετσόβιο Πολυτεχνείο

Δούμπος Μιχάλης, Πολυτεχνείο Κρήτης

Δρόσος Δημήτριος, ΤΕΙ Πειραιά

Ζερβόπουλος Παναγιώτης, Bursa Orhangazi University

Ζοπουνίδης Κωνσταντίνος, Πολυτεχνείο Κρήτης

Θεοδωρίδης Προκόπιος, Πανεπιστήμιο Πάτρας

Κοντογεώργος Αχιλλέας, Πανεπιστήμιο Πάτρας

Κώστογλου Βασίλης, Αλεξάνδρειο ΤΕΙ Θεσσαλονίκης

Μανωλιτζάς Παναγιώτης, Πολυτεχνείο Κρήτης

Μάνος Βασίλης, Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης

Ματσατσίνης Νικόλαος, Πολυτεχνείο Κρήτης

Μαυρωτάς Γιώργος, Εθνικό Μετσόβιο Πολυτεχνείο

Μητρόπουλος Ιωάννης, ΤΕΙ Πάτρας

Μπεληγιάννης Γρηγόριος, Πανεπιστήμιο Πάτρας

Μπουραντά Αθανασία , Πανεπιστήμιο Πάτρας
Παντουβάκης Άγγελος, Πανεπιστήμιο Πειραιώς
Παπαθανασίου Ιάσων, Πανεπιστήμιο Μακεδονίας
Πατάκας Άγγελος, Πανεπιστήμιο Πάτρας
Πενταράκη Κωνσταντίνα, Πανεπιστήμιο Πάτρας
Σαμαράς Γεώργιος, ΤΕΙ Λάρισας
Σαμαράς Νίκος, Πανεπιστήμιο Μακεδονίας
Σίσκος Ιωάννης, Πανεπιστήμιο Πειραιά
Σπυριδάκος Αθανάσιος, ΤΕΙ Πειραιά
Τσάμπρα Μαρία, Πανεπιστήμιο Πάτρας
Τσότσολας Νίκος, Δρ. Μηχανικός Παραγωγής & Διοίκησης
Φίλιος Βασίλειος , Πανεπιστήμιο Πάτρας
Ψαρράς Ιωάννης, Εθνικό Μετσόβιο Πολυτεχνείο
Χελά Δήμητρα, Πανεπιστήμιο Πάτρας
Ψωμάς Ευάγγελος , Πανεπιστήμιο Πάτρας

Πρόεδρος οργανωτικής επιτροπής: Αθανασία Μπουραντά, Πανεπιστήμιο Πάτρας

Οργανωτική επιτροπή:

Θεοδωρίδης Προκόπιος, Πανεπιστήμιο Πάτρας
Κοντογεώργος Αχιλλέας, Πανεπιστήμιο Πάτρας
Μπεληγιάννης Γρηγόριος, Πανεπιστήμιο Πάτρας
Πενταράκη Κωνσταντίνα, Πανεπιστήμιο Πάτρας
Τσάμπρα Μαρία, Πανεπιστήμιο Πάτρας
Ψωμάς Ευάγγελος, Πανεπιστήμιο Πάτρας

Πρόγραμμα Συνεδρίου

Πέμπτη 12 Μαρτίου 2015

13.30 - 14.00: Εγγραφή συνέδρων

14.00 - 15.00: Χαιρετισμοί

Χριστίνα Σταρακά, Αντιπεριφερειάρχης Π.Ε. Αιτωλοακαρνανίας,
Γεώργιος Παπαναστασίου, Δήμαρχος Αγρινίου

Παρουσιάσεις από τις Εταιρείες-χορηγούς με ομιλητές τους κκ.:

- Χρήστο Κολιό, Μέλος ΔΣ ΣΕΒΕ και Πρόεδρο & Διευθύνων Σύμβουλο της ΚΟΛΙΟΣ ΑΕ.
- Δημήτριο Σκόνδρα, Διευθυντή εργοστασίου και διασφάλισης ποιότητας της ΓΑΙΑ Τρόφιμα Α.Β.Ε.
- Αλεξάνδρα Τόλη, Υπεύθυνη τμήματος ποιότητας της Παπαθανασίου ΑΒΕΕ και Τριαντάφυλλο Τατούλη, Ερευνητή στο Εργαστήριο Περιβαλλοντικών Συστημάτων, Τμήμα Διαχείρισης Περιβάλλοντος & Φυσικών Πόρων, Πανεπιστήμιο Πατρών.

Απονομή Ευφήμου Μνείας.

15.00-15.30: Διάλειμμα - Καφές

15.30 - 17.00: Συνεδρία 1η Πρόεδρος: Δημήτρα Χελά

- Determine collective criteria weights exploiting robustness analysis of the estimated individual preference models
Spyridakos, A. Siskos, Y., Tsotsolas, N. and Yannacopoulos, D.
- Mapping and comparative assessment of the supply chains of conventional and specialized products using the AHP method: The case of the gluten free bakery products
Xenou, E. and Papoutsis, K.
- The role of different decision making criteria in intensive arable farming
Mantziaris, S., Sintori, A. and Rozakis, S.
- Ambiguity and strong uncertainty: Bridging deterministic paths with behavioural and culture economics
Koutsobinas, Th.
- Risk assesment of pesticides in freshwater ecosystems using a simple scoring and ranking system
Hela D. and Konstantinou, I.

17.00 - 18.30: Συνεδρία 2η Πρόεδρος: Δημήτριος Σκούρας

- A trade-off analysis between socio-economic indicators and environmental performance of irrigated agriculture
Vasileiou, K., Mitropoulos, V. and Mitropoulos, I.
- Rationalizing direct payments to farmers in the frame of Common Agricultural Policy's Reform via a synergy of multicriteria methods
Valiakos, A. and Siskos, Y.
- Isolation of autochthones bacteria strains (LAB-Probiotics) and study of their antimicrobial profile
Vassos, D.

20:30: Δείπνο στο Πιθάρι Restaurant (επί της οδού Ηρακλείτου, στο Γιαννούζι Αγρινίου)

Παρασκευή 13 Μαρτίου 2015

09.00 - 10.30: Συνεδρία 3η Πρόεδρος: Άγγελος Παντουβάκης

- Exploring the ways to achieve competitive advantage in the Greek food sector
Pantounakis, A. Patsiouras, C. and Krasanakis, S.
- Agricultural development under the Municipality of Agrinio

Karapapa, V.

- The performance of cheese industry in Greece during the financial crisis
Kontogeorgos, A. and Pendaraki, K.
- Critical success factors and difficulties in implementing Six Sigma. The Greek case
Psomas, E.
- Multicriteria satisfaction analysis and six sigma approach
Grigoroudis, E.
- Accepting flexible work by choice or necessity: the effect of personality traits
Bouranta, N. and Tsampra, M.

10.30-11.00: Διάλειμμα - Καφές

11.00 - 12.30: Συνεδρία 4η Πρόεδρος: Βασίλειος Φίλιος

- Bipolar robustness control methodology in disaggregation MCDA approaches: Application to European e-government evaluation
Siskos, E. and Psarras, J.
- Monitoring the ranking of the IT departments of the Greek Technological Educational Institutes over time
Kostoglou, V., Ploskas, N., Papathanasiou, J. and Charitakis, G.
- Using Online Ratings to define Hotels' Improvement Priorities
Zisos, I., Grigoroudis, E., Matsatsinis, N. and Spyridakos, A.
- A software tool for supporting robustness analysis of estimated criteria weights using visual techniques
Tsotsolas, N., Siskos, Y., Spyridakos A. and Yannacopoulos, D.
- Customer Satisfaction Barometer: The Case of Banking Services in Greece
Drosos, D., Tsotsolas, N., Siskos Y. and Chalikias, M.

12.30 - 13.30: Συνεδρία 5η Πρόεδρος: Κωνσταντίνα Πενταράκη

- Towards a non-compensatory approach for trace clustering
Delias, P., Doumpos, M., Grigoroudis, E., Manolitzas, P. and Matsatsinis, N.
- A comparative study of population based algorithms on the school timetabling problem
Katsaragakis, I.V., Tassopoulos I.X. and Beligiannis, G.N.
- Solving efficiently the nurse rostering problem using variable neighborhood search algorithms
Solos, I.P., Tassopoulos I.X. and Beligiannis, G.N.
- Robust portfolio optimization: A categorized literature review
Xidonas, P., Doukas, H., Mavrotas, G. and Psarras, J.
- Meta-Analysis as a decision-making tool: The case of Benefit Transfer
Tyllianakis, E.

14.00-15.00: Διάλειμμα – Ελαφρύ δείπνο

15.00 - 16.30: Συνεδρία 6η Πρόεδρος: Προκόπης Θεοδωρίδης

- Talos system: A DSS dealing with MCDA problems under uncertainty
Christodoulakis, N. and Tsotsolas, N.
- The role of investment risks in renewable energy projects: The case of Greece
Angelopoulos, D., Doukas, H. and Psarras, J.
- Re - designing the Bus Route Network for the City of Heraklion using an Evolutionary approach
Kepaptsoglou, K., Kalohristianakis, M., Kosmopoulos, D. and Papadourakis, G.
- Choosing location for Ship-to-Ship (STS) transfer operation with Multi-Criteria Decision Analysis (MCDA): A case study
Stavrou, D. and Ventikos, N.
- E-commerce trend in protected areas development: A multi-criteria analysis
Koliouka, Ch., Andreopoulou, Z., Zopounidis C. and Lemonakis, Ch.
- Primary health care planning using DEA and location analysis
Mitropoulos, P., Giannikos, I. and Mitropoulos, I.

16.30-17.00: Διάλειμμα - Καφές

17.00 - 19.00: Συνεδρία 7η Πρόεδρος: Γρηγόρης Μπεληγιάννης

- Total Quality Management practices and results in Greek local authorities
Tasiou M. and Psomas, E.
- Διοίκηση Μονάδων Υγείας: Ο ρόλος των Λογιστών & των Εσωτερικών Ελεγκτών
Φίλος, Γ.
- A diagnostic instrument for performance evaluation of food safety management systems
Kafetzopoulos, D. and Psomas, E.

17.00 - 19.00: Επίσκεψη σε έκθεση ζωγραφικής

Επίσκεψη στους χώρους της παλαιάς Δημοτικής Αγοράς (Σκαλτσοδήμου 9) όπου εκτίθεται η τελευταία ζωγραφική ενότητα του Χρήστου Μποκόρου με τίτλο "τα στοιχειώδη".

Σάββατο 14 Μαρτίου 2015

9.00 - 10.30: Στρογγυλό Τραπέζι: Εφαρμογές της πολυκριτήριας ανάλυσης αποφάσεων στην αγροτική οικονομία και ανάπτυξη

Προεδρείο: Ι. Σίσκος, Ι. Ψαρράς, Ν. Ματσατσίνης

10.30 - 14.00: Κοινωνικό Πρόγραμμα: Εκδρομή στην λίμνη Τριχωνίδα

Determine collective criteria weights exploiting robustness analysis of the estimated individual preference models

<i>AthanasiosSpyridakos</i>	<i>YannisSiskos</i>	<i>Nikos Tsotsolas</i>	<i>Dennis Yannacopoulos</i>
<i>University of Piraeus of Applied Sciences Department of Business Administration</i>	<i>University of Piraeus Department of Information Sciences</i>	<i>University of Piraeus of Applied Sciences Department of Business Administration</i>	<i>University of Piraeus of Applied Sciences Department of Business Administration</i>

Abstract

Disaggregation - aggregation approaches for discrete alternative actions aims to the estimation of additive value preference models, through interactive procedures based on DMs' global preferences on a subset of alternative actions. The utilisation of multicriteria disaggregation - aggregation approaches for collective decision making situations aims to the estimation of collective preference value systems melding the individual preferences. Consensus of the estimated collective criteria weights, estimated by disaggregation - aggregation methods, is considered crucial for the compromising and the negotiation processes, which usually accompanying the collective decisions.

Frequently, the estimated preference models include low robustness, while infinite vectors of weights are estimated, bounded into a hyper-polyhedron. This research work presents a methodological frame, which is based on the robustness analysis of the estimated individual preference models in collective decision making for small groups of Decision Makers. Special indices and visual facilities were designed and developed in order to identify common acceptable areas of criteria weights or points of disagreement and differentiation among the individual preference models. The exploitation of the robustness analysis outcomes, as well as the analysis of the initially estimated preference models, can trigger a set of interactive dialogues with the individuals stakeholders. So, a collection of additional preference information from the decision stakeholders can be acquired. These new additional preference information enrich the linear programming model of UTA methods, leading to the estimation of new, more strict and consensus ranges of criteria weights. The capabilities of RAVI (Robustness Analysis with Visual and Interactive approaches) subsystem and RACES (Rankings Aggregation for Committees and Elections System) are utilised for the implementation of the proposed methodological frame.

This approach is illustrated through a real world decision problem concerning a collective decision for a location problem of the fire detection system of forests in a large municipality.

Keywords: Multicriteria Decision Aid, Collective Decision Making, Robustness Analysis

Mapping and comparative assessment of the supply chains of conventional and specialized products using the AHP method: The case of the gluten free bakery products.

XenouElpida

Research Associate
Center of Research and
Technology Hellas (CERTH) /
Hellenic Institute of Transport
6th km Charilaou- Thermi
Rd.,57001Thessaloniki, Greece

Konstantinos Papoutsis

Research Associate
Center of Research and Technology Hellas (CERTH) / Hellenic
Institute of Transport
6th km Charilaou- Thermi Rd.,57001Thessaloniki, Greece
PhD candidate
University of Thessaly-Transportation Engineering Laboratory
PedionAreos, 38334, Volos, Greece

Abstract

The market of gluten-free products encountered significant attention over the past few years, promoted as the main dietary products of a large portion of the population, suffering from certain health problems. Stating as a necessity for the above mentioned population group and strongly promoted as a healthy nutritional trend worldwide the gluten free products market has encountered an important increase in consumer demand, trend that is expected to continue also in the coming years. The management of the gluten free products supply chain is a complex and rather demanding task, resulting from a variety of constraints and special requirements related to the significantly shorter – compared to the typical products-lifetime, the specific conditions required in the stage of their preparation which lead to a significant increase of the final price and also the need for very well organized SC network with important capacity and available resources.

This paper focuses on the examination of the supply chain of two specific gluten-free products namely bakery flour and bread. The analysis aims to capture the key particularities and to identify potential differences in the supply chains between conventional and GF products facilitating the determination of the critical parameters and criteria used for the supply chain management and finally the prioritization of the supply chain management components of the specialized products.

In this direction an analysis of the main product characteristics and the particular market trends is implemented at the initial phase. The main output of this activity is the identification of the critical parameters of the SC that are used in the next phase to formulate the evaluation matrix to be used for the comparative evaluation of the examined supply chains versus the respective SC of the typical products. The analysis takes into consideration 4 main evaluation criteria namely: supplies, distribution, life cycle and predictability of demand. The criteria further cascade into a number of sub-criteria such as reliability supplier, cost, time and reliability of delivery. The evaluation was based on the Analytical Hierarchical Process because it is a simple and understandable method which is widely used in many research areas.

In the particular analysis, three real cases are examined, namely three companies, active in the field of conventional and specialized bakery in Central Macedonia, Greece. For the evaluation of each case a dedicated questionnaire was developed by the author with the cooperation of three researchers with extensive experience in the field of logistics and agro-food.

The representatives of each company were asked firstly to fill out the questionnaires and finally to evaluate the SCs of conventional and GF products based on the abovementioned evaluation matrix. The final phase includes the analysis of the results of the evaluation of both the supply chains and the prioritization of the supply chain components.

Finally the implementation of the abovementioned methodology has revealed that the SCM of the GF products is considerably more difficult to manage with the most significant problems to be located in the inventory management and the predictability of demand.

Keywords: GF products, SCM, AHP, logistics

The role of different decision making criteria in intensive arable farming

Stamatis Mantziaris
Postgraduate program in
Agribusiness Management,
Agricultural University of Athens
Tel.: 6976596636,
sta.athens@hotmail.com

Alexandra Sintori
Agricultural Economics and
Sociology Institute, ELGO-DEMETER
Alkmanos dead end, Ilisia, 115 28,
Athens, Email: al_sintori@yahoo.gr

Stelios Rozakis
Department of Agricultural
Economics & Rural Development,
Agricultural University of Athens
Ieraodos 75, 18855, Athens,
Email: rozakis@aua.gr

Abstract

This paper examines the role of different decision making criteria in the predictive capacity of farm-based linear programming model and consequently the distribution of decision making criteria among farms is estimated.

Firstly, the literature review is presented as regards the applied methodologies of single and multi-criteria mathematical programming for the purpose of simulation models construction which are intended for policy analysis.

Next is described the agricultural production infrastructure and the techno-economic data of the surveyed farms. The specific farms are located in the plain of Regional unit of Karditsa and are characterized by large farm size, high percentage of irrigated land and significant agricultural investments in machinery.

Then the architecture of single criterion linear programming model as well as the agronomic, policy and resources availability constraints are analyzed. Also, the specific model contains the benefits and constraints of the agri-environment measures of Second Pillar of Common Agricultural Policy.

As regards the decision making criteria which are studied in this paper, these correspond to the maximization of gross margin, to the maximization of family labor and to the minimization of working capital. Also, it must be underlined that in literature review an additional criterion which corresponds to the minimization of risk is observed. However, the specific criterion is not studied in this paper because the expectations of the specific farms about unknown values of parameters (e.g. prices of non-contracted crops) are based in the most recent experience.

The model is optimized for each criterion and then is validated on farm level according to Finger-Kreinin index. More specifically, the efficiency of each farm for each criterion is compared and then the criterion for which is observed the highest efficiency according to Finger-Kreinin index is selected.

For a 77% of farms, the highest efficiency is observed for the criterion of gross margin maximization, for another 4% of farms the highest efficiency is observed for the criterion of family labor maximization and for a 19% of farms is observed the same efficiency among decision making criteria.

Finally, is produced a multi-criteria linear programming model which is optimized in parallel for different criteria and for each farm. So, the value of Finger-Kreinin index in area level corresponds to 95%.

As a conclusion, it can be considered that the main decision making criterion which is observed in intensive arable farming corresponds to gross margin maximization. However, the application of multi-criteria mathematical programming methods could provide more detailed information about decision making criteria of intensive arable farming.

Keywords: Multi-criteria linear programming, Predictive capacity, Policy analysis, Arable farming, Regional unit of Karditsa

Ambiguity and Strong Uncertainty: Bridging Deterministic Paths with Behavioural and Culture Economics

TheodorosKoutsobinas

Department of Management of Culture

Environment and New Technologies

University of Patras

Agrinion, Greece

Athens, Greece 16674

koutsobinast@upatras.gr

Abstract

The role of signalling in the application of economic theory has become important in the past two decades. The present paper assesses the effectiveness of signalling for long term interest rates within a discussion of the impact of strong uncertainty on the public's expectations about central bank policy. This discussion is developed by using the state of ambiguity as a benchmark for strong uncertainty. A deterministic framework is developed to compare ambiguity and strong uncertainty which compares to behavioural non-deterministic explanations and has implications for different culture environments. We develop fuzzy measures of the Analytic Hierarchy Process (AHP), which is a structured technique for organizing and analyzing complex decisions in order to identify more precisely the deterministic paths that describe processes of strong uncertainty and ambiguity. Among other results, we conclude in this methodological inquiry that when agents assign greater weights on the input of evidence rather than on the input of risk, the impact of strong uncertainty prove to be more intense than the effect of ambiguity. We discuss this result for the purpose of assessing the impact of strong uncertainty and ambiguity in different behavioural and cultural environments.

JEL Classification: B22, E41, E43, D81, E52, E58, E64, Z11

Risk assesment of pesticides in freshwater ecosystems using a simple scoring and ranking system

DimitraHela

*Dept. of Business Administration of Agricultural
Products and Food Enterprises, University of
Patras*

IoannisKonstantinou

*Dept. of Environmental and Natural
Resources Management, University of Patras*

Abstract

A simple Scoring and Risk Ranking System (ScoRRS) was developed for freshwater contaminants (i.e. pesticides) in order to provide a rapid ecological risk assessment of their presence in freshwater ecosystems. The ScoRRS is based on certain parameters of pesticides both environmental and ecotoxicological such as application rate, the environmental fate properties, that is persistence and water, bioaccumulation, run-off potential and the toxicity data (LC50 or EC50) of pesticides. Initially, the pesticides are classified into different ranks for each of their main properties that control the exposure module and then a relative score is attributed to each descriptive rank. In follow, the exposure scores are combined with the categories of pesticide toxicity classification. The derived combinations provide an ecological risk classification, which is characterized by different degrees of potential risk and is illustrated by a color-code indicating also the priority for monitoring surveys and management actions.

A trade-off analysis between socio-economic indicators and environmental performance of irrigated agriculture

Konstantinos Vasileiou
*Department of Business
Administration, TEI of Western
Greece
Megalou Aleksandrou 1,
Koukouli Patra 263 34
vasileiou@teiwest.gr*

Panagiotis Mitropoulos
*Department of Business
Administration, TEI of Western
Greece
Megalou Aleksandrou 1,
Koukouli Patra 263 34
pmitro@teiwest.gr*

Ioannis Mitropoulos
*Department of Business
Administration, TEI of Western
Greece
Megalou Aleksandrou 1,
Koukouli Patra 263 34
mitro@teiwest.gr*

Abstract

Regulation is one of the key levers governments can use to promote sustainable agriculture, including rules governing land and water use, chemical inputs, food safety and quality. Irrigated agriculture in Europe have directly influenced by changes in the regulatory context by various EU policies based upon the price of water.

This study aims to assess the multiple impacts of the Common Agricultural Policies (CAP) on social sustainability in rural areas. The consequences of policy change were evaluated, using a bi-objective linear programming model that simulates farmers' preferred behaviour. The model was used to evaluate the impact on irrigation performance of intervention measures, namely i) volumetric pricing and ii) abstraction quota restrictions that might be used to ration water and/or increase water use efficiency. The approach is illustrated using a case study on irrigated agriculture in England, UK.

The comparison between the price and license mechanism when applied for water irrigation restriction revealed that net margins and value added are considerably less by increasing water fees. Subsidies are the same for both intervention mechanisms. Moreover, increasing the water fees results to higher net losses (public revenues – net margins reduction) than license quotas. For example, water consumption could be reduced by 10% using license quotas incurring £10/ha net losses, while with the price mechanism there would be a net loss of £35/ha. Thus, restrictions on abstraction licenses may be a more effective and equitable mechanism to achieve beneficial change, although their enforcement may imply some additional costs. Some increase in abstraction charges, however, could help fund water resource management initiatives by the regulatory agency.

From an environmental perspective, restriction to water availability would cause reduction to soil cover index and genetic diversity. Moreover, pollution risks are lower with irrigated cropping regarding nitrate leaching, but the contrary is the case for pesticide leaching, given that fruits usually require higher application rates of pesticides than combinable crops. Energy consumption does not change almost at all, however, energy output increases by when combinable crops substitute soft fruits, which also results to increase in energy balance.

The analysis revealed the fragility of the fruit farming systems and the trade-off between socio-economic indicators and environmental performance. This trade-off can also be seen to a significant degree in the case of water as well. This highlights the need for a more careful balance of water conservation and rural development objectives.

Keywords: Bi-objective model; Agricultural planning; Sustainability; Irrigation; Licensing; Water Pricing

Rationalizing direct payments to farmers in the frame of Common Agricultural Policy's Reform via a synergy of multicriteria methods

AthanasiosValiakos

*University of Piraeus, 80,
Karaoli&Dimitriou Street, GR-18534
Piraeus, Greece
avaliakos@unipi.gr*

YannisSiskos

*University of Piraeus, 80,
Karaoli&Dimitriou Street, GR-
18534 Piraeus, Greece
ysiskos@unipi.gr*

Abstract

Under the Common Agricultural Policy's reform, governments take action to distribute correctly the direct payments to farmers. A framework is proposed based on the evaluation of agricultural units by means of robust ordinal regression (ROR) methods. The synergy of two methods, additive evaluation model and goal programming regression model is proposed to measure the final financial aid. In addition post-optimality analyses are applied by computing complementary robustness measures. Entropy measures are also used as indices to determine the stability of the results in all units. This approach is applied to direct payments estimation of agricultural units in the industry of the juicing citrus.

Keywords: Multicriteria decision analysis; Common Agricultural Policy; Data Envelopment Analysis; Ordinal regression; Robustness.

Isolation of autochthones bacteria strains (LAB-Probiotics) and study of their antimicrobial profile

Dimitrios Vassos

*DVM, M.Sc., Ph.D. Department of Agricultural
Economy and Veterinary Services Prefectural
Authority of Arta - Prefecture of Epirus
(GR) 471 00 Arta
dim.vass@yahoo.gr*

Abstract

The present research focuses on a study, in the Regional area of Epirus (Greece), of autochthones bacteria originated from various sources as, dairy products, unpasteurized milk, traditional “renner” and finally feces from infants aged 1 to years old.

Furthermore, their antimicrobial activity was evaluated against classic food pathogens of the genus *Salmonella* sp.: *S.ancona*, *S.entetidis*, *S.typhimurium* and *S.typhi*, which are usually involve in gastrointestinal infections. From a total of 120 samples, 206 strains of lactic acid bacteria belonging to 14 different species were recovered. By grouping them, 49 strains belonging to the following species, *L.plantarum* (14 strains), *L.paracasei* subsp. *paracasei* (9 strains), *E.faecium* (15 strains), *E.faecalis* (11 strains) were entered on detailed study.

The following conclusions were obtained:

1. All strains showed typical characteristics of lactic acid bacteria.
2. The strains have the ability to transit or colonize the gastrointestinal tube, as they are reported to be resistant to the presence of phenol, proteolytic enzymes, bile salts and extreme pH values.
3. Most of the wild strains showed considerable resistance to antimicrobial drugs given therapeutically in gastrointestinal infections.
4. Most of the strains showed considerable antimicrobial activity against classic food pathogens of the genus *Salmonella* sp.: *S.ancona*, *S.entetidis*, *S.typhimurium* and *S.typhi*, which are usually implicated in gut infections.
5. All wild strains presented higher antimicrobial activity against the tested pathogens, when compared to the reference strains.
6. Antimicrobial activity of these strains seems to be associated to various factors as, the microbial cell itself, production of different metabolites. Moreover, this activity seems to be strongly correlated with the presence of bacteriocins producing lactic acid during glucose fermentation.
7. However, from all the studied factors the first one (microbial cell itself) seems to be essential for the antimicrobial establishing profile of wild lactic acid strains.

Exploring the ways to achieve competitive advantage in the Greek food sector

Pantouvakis Angelos
Associate Professor
angelos@pantouvakis.eu
University of Piraeus
21, Gr. Lampraki&Distomou Str.
Piraeus

Patsiouras Christos
Ph. D. Candidate
chris_patsiouras@yahoo.gr
University of Piraeus
21, Gr. Lampraki&Distomou Str.
Piraeus

Krasanakis Stylianos
M.Sc.
krasanakis_st@hotmail.gr
University of Piraeus
21, Gr. Lampraki&Distomou Str.
Piraeus

Abstract

Purpose: The purpose of this paper is to highlight the importance of S.W.O.T. analysis in the food sector. S.W.O.T. analysis is a key for all enterprises in order to comprehend the competition and find possible alternatives as to achieve advantage and enhance their position in the market.

Theoretical background: The concepts of internal and external business environment are to lead and highlight the role of SWOT analysis in enterprises' planning as to build competitive advantage. S.W.O.T. analysis approach is a tool for companies to get knowledge of the operating environment and its target is to show the importance of all factors related to this in the Greek food sector (Clardy, 2013).

In the external environment, the factor that appears to play a more important role, compared to others is the political environment and more specifically political instability. Political instability is positioned as a Threat of Competitive Advantage of the Food Sector companies (Holburn, Guy LF, and Bennet A. Zelner, 2010). Technological progress in accordance with assumptions of the literature is a source of many achievements and its product productive reforms. It was also clearly stated that a supporting factor for implementing cost leadership strategies is technology (Ghazinoorya, 2011).

A really important and influential part arising from the internal environment of enterprises in the food sector is innovation (Kühne, 2010). This specific factor seems to influence the extremely competitive position of each company within the industry and therefore contributes significantly to the creation of competitive advantage. After an extended literature review we realized that a common weak point for the majority of enterprises is centralized organizational structure which in combination with roles' ambiguity can be communication gaps and can cause loss of important information (Panagiotou, 2003).

Design/methodology/approach: Both qualitative and quantitative analysis was employed and a special survey instrument was developed in order to measure the four basic constructs of SWOT Analysis named Instability, Technological Environment, Innovation and Centralization. Data was collected from 32 food companies operating in Greece and data was tested with the use of Exploratory Factor and Regression analyses.

Findings: The results of the research confirmed that if a company admires to achieve competitive advantage two are the key factors named: Technological Environment and Education. The factors Instability and Centralization – according to the literature- are inhibiting factors. Innovation was the factor that occupies the leading role for a company to succeed.

Implications: Both academics and practitioners may be interested in find out that the survey's results highlighted the importance of the exports of the Greek products something which seems to be a way of development of the whole industry and the Greek economy.

Keywords: S.W.O.T. Analysis, competitive advantage, food marketing

Agricultural development under the Municipality of Agrinio

KarapapaVassiliki

*Department of Agricultural Production, Municipality
of Agrinio, Tsitsimeli and EthnikiOdos,
301 00 Agrinio, Greece
vkarapapa@agrinio.gr*

Abstract

The agriculture sector is the most dominant sector in the Municipality of Agrinio with the cultivation of olive trees constituting approximately 50% of all crops (13.044 ha). Almost 2/3 of the area (8.245 ha) is covered with table olives while the rest is used for oil production (3,639 ha). The varieties cultivated for table olives are mainly Agriniou and Kalamon while varieties cultivated for oil production are mainly Koroneiki and Koutsourelia. The economic, social and environmental impact of the production system, the processing and marketing of olives and olive oil, the current requirements of the market and the huge potential that exists in our Municipality are of immense importance. For this reason collaborations have been established with: (a) the Institute of Olive Tree and Subtropical Plants of Chania, (b) the Ministry of Reconstruction of Production, Environment and Energy and Rural Development (c) the University of Patras and (d) the International Olive Council, in order to improve the production of high quality olive oil and table olives and to facilitate innovative techniques in the cultivation (pruning-irrigation-fertilization-plant protection), processing and marketing of olives and olive oil. Taking into account local conditions and requirements through dialogue and cooperation of all partners involved in the production process of olive products we identified methods for improvement. Thus we have organized and implemented: (a) technical seminars promoting application of good agricultural practice in olive tree cultivation and pilot projects providing free technical assistance on fertilization treatment and plant protection (b) a strategic plan for sustainable development of the olive sector and (c) actions for the promotion of olive products relating to quality, health, and gastronomy.

The performance of cheese industry in Greece during the financial crisis

AchilleasKontogeorgos

*Department of Business Administration of Food and
Agricultural Enterprises,
University of Patras
2 George Seferis str., GR-301 00, Agrinio, Greece
tel: 0030.26410.74123
akontoge@upatras.gr*

KonstantinaPendaraki

*Department of Business Administration of Food and
Agricultural Enterprises,
University of Patras
2 George Seferis str., GR-301 00, Agrinio, Greece
tel: 0030.26410.74128
dpendara@upatras.gr*

Abstract

Cheese industries in Greece constitute a traditional economic sector and at the same time a dynamic part of the food sector. A key feature of the industry is the large number of small, in size and capacity, businesses. Nevertheless, small and medium sized cheese businesses can play a critical role in creating rural income and employment opportunities, through the demand they create for raw material supplies, such as milk. In addition, cheese sector includes a large number of import and commercial enterprises, which have a significant market share and role in the domestic market of the wider sector of dairy industry.

The main purpose of this paper is to explore both at bibliographic and empirical level the impact of the economic crisis on the economic performance of cheese enterprises. It is also equally important to understand the characteristics of the cheese sector that lead businesses to profitability and to examine whether and how the economic crisis has affected the profitability of the Greek cheese sector. In order to complete this study and fulfill the aforementioned purposes we have used published data that come from balance sheets and income statements of almost 100 companies (productive, commercial and agricultural cooperatives) operating in the cheese sector. The published data formed a panel data set (a combination of cross-section data and time series data) for a 6 - year period from 2006 to 2011.

Based on Structure - Conduct – Performance (SCP) paradigm of the industrial theory, an econometric model was estimated in order to identify the factors contributing to the profitability of cheese businesses. In order to acquire more reliable estimators, the assessment of the examined profitability model was conducted using the generalized error structure model. This model examines panel data without separating the error term. The biggest advantage using this model is the fact that there are estimation approaches able to make robust estimates of the coefficients correcting heteroscedasticity and autocorrelation, both in general and for each individual business. More specific an estimation based on Driscoll and Kraay standard errors was used in this study in order to obtain robust estimators. Our profitability model uses as dependent variable the economic performance of cheese businesses and as independent variables, those one that describe the businesses' size, their liquidity, their capital structure and variables describing the type of cheese businesses (manufacturing, commercial or cooperatives). Moreover, a dummy variable was used to determine the period of the pre-crisis era (2006 -2008) and the period during crisis (2009-2011).

The first results show that during the crisis period, the profitability of cheese businesses has been affected adversely. Moreover, the smaller sized businesses are presenting the most significant efficiency and profitability losses. Last but not least it is worth mentioning that commercial businesses and agricultural cooperatives, in our study, appear to be more resilient enterprises during the Greek economic crisis.

Keywords: Greece, Cheese industry, firm performance, economic crisis

Critical success factors and difficulties in implementing Six Sigma. The Greek case

Evangelos L. Psomas

Lecturer

*Department of Business Administration of Food and
Agricultural Enterprises*

University of Patras

*Postal address: George Seferis str., GR-301 00, Agrinio,
Greece*

tel: 0030.26410.74192 / fax: 0030.26410.74179

e-mail: epsomas@upatras.gr

Corresponding and presenting author

Abstract

Purpose: The purpose of the study is to determine the underlying structure (latent constructs) of the difficulties and Critical Success Factors (CSFs) of Six Sigma implementation in manufacturing companies. Determining the significance Greek manufacturing companies give to the Six Sigma difficulties and CSFs is also an aim of the present study.

Design/methodology/approach: A research study was carried out in 91 ISO 9001 certified Greek manufacturing companies through a structured questionnaire. Exploratory Factor Analyses (EFA) are applied to determine the underlying structure (latent constructs) of the Six sigma difficulties and CSFs, while their significance is determined through descriptive statistics.

Findings: The majority of the responding companies belongs to the food sector. Three latent constructs of Six Sigma difficulties are extracted, namely "implementation patterns of Six Sigma methodology", "absence of human interest and support", and "low quality management level". These difficulties are not considered very significant by the sample companies. Three latent constructs of Six Sigma CSFs are also extracted, namely "understanding the implementation patterns of Six Sigma and its interface with the company", "company culture and organization", and "prioritizing Six Sigma projects based on stakeholders and company performance". The role of these critical factors for the success of Six Sigma is very significant, according to the sample companies.

Research limitations/implications: The small sample of the responding manufacturing companies, the diversity of the business sectors represented in the sample, and the subjective business evidence obtained from the company quality manager are the main limitations of the present study. Based on these limitations future research studies are suggested.

Practical implications: By eliminating the negative influence of the difficulties and simultaneously by enhancing the positive influence of the CSFs, a robust internal business environment can be created for the successful implementation of Six Sigma.

Originality/value: This study fills the literature gap and contributes to the literature by determining the underlying factorial structure and the significance of the Six Sigma difficulties and CSFs. This is the first research study in the field of Six Sigma that is carried out in ISO 9001 certified manufacturing companies operating in the Greek business environment.

Keywords: Six Sigma, difficulties, critical success factors, manufacturing companies.

Paper type – Research paper

Multicriteria Satisfaction Analysis and Six Sigma Approach

Evangelos Grigoroudis

School of Production Engineering and Management,
Technical University of Crete
University Campus, Kounoupidiana, GR73100 Chania,
Greece
vangelis@ergasya.tuc.gr

Abstract

Six sigma has been well recognized as an important tool for continuous improvement and business excellence. The concept of six sigma was introduced in mid-80s and focused on reducing defect rate in processes through the effective utilization of powerful and practical statistical tools and techniques. Six sigma is a statistical concept that measures a process in terms of defects. Achieving six sigma means that a process is delivering only 3.4 defects per million opportunities (DPMO). The main results of applying a six sigma philosophy in a manufacturing/business process is the improved productivity, the improved customer satisfaction, the enhanced quality of service, the reduced cost of operations or costs of poor quality, etc. However, six sigma studies are mainly focused on product manufacturing process, while applications in the service sector are still limited. In addition, the six sigma approach has not been integrated in the customer satisfaction measurement approach. The main aim of this study is to adopt the six sigma approach in the Multicriteria Satisfaction Analysis (MUSA) method. The MUSA method is a collective preference disaggregation approach following the main principles of ordinal regression analysis. The method is a multicriteria approach that has been developed in order to measure and analyze customer satisfaction. The six sigma approach is incorporated in the MUSA method by enriching its current results by providing two additional set of indicators. The first one refers to the average gap index, which is the normalized difference between the importance and the performance of satisfaction criteria. Since, the aforementioned gap is mainly the difference between “what customer wants” and “what customer needs”, these additional indices may be considered as a proxy of service defects, and thus help the adoption of a six sigma approach. The second proposed approach refers to the calculation of the six sigma level (globally or for every satisfaction criterion). Based on a predefined satisfaction threshold, the six sigma level may give an alternative performance index. Also, these six sigma indices may be combined with additional data (e.g., expectations) or results of the MUSA method (e.g., average satisfaction or demanding indices) in order to develop a set of improvement charts. The applicability of the proposed approach is illustrated by a small numerical example and the additional results may give a clearer view for the prioritization of potential improvement actions.

Keywords: Six-sigma, MUSA method, Customer satisfaction, Improvement, Gap analysis

Accepting flexible work by choice or necessity: the effect of personality traits

Nancy Bouranta
University of Patras
Department of Business Administration of
Food and Agricultural Enterprises
2 George Seferis Str., Agrinio, 30100, Greece
Lecturer
e-mail: nbouranta@upatras.gr

Maria Tsampra
University of Patras
Department of Business Administration
of Food and Agricultural Enterprises
2 George Seferis Str., Agrinio, 30100, Greece
Assistant Professor
e-mail: mtsampra@upatras.gr

Abstract

The use of flexible work is a practice widely acknowledged since the early-1980s economic crisis, especially in the literature on the shift to post-Fordism and flexible specialisation. It signifies the response of labour market regulations and employment arrangements to new accumulation regimes. Forms of flexible employment, defined as “atypical” in reference to “typical” long-life full-time employment, can be considered either as “employer-friendly” or “employee-friendly”. “Employer-friendly” work flexibility allows employers to: recruit or dispose of labour as required; alter labour costs in line with market needs; allocate labour efficiently within the firm; fix working hours to suit business requirements, etc. Researchers demonstrated that these practices are associated with workers’ exposure to negative job conditions such as: low-paid, low-skilled work; exclusion from health and pension benefits; limited training and career prospects; disproportionately long working hours, etc. Yet, “employee-friendly” work flexibility was successfully adopted in certain labour markets in the 1990s – notably, Denmark and the Netherlands – with the support of work security provision. On this ground, “flexicurity” - the combination of labour market flexibility and security for employees - has become the cornerstone of European pro-active labour market policies since the late 1990s. The ongoing financial and Eurozone crisis has however shaken the validity of flexicurity policy, as austerity and recession have increased labour flexibility but neglected security in all European countries.

This is clearly the case in Greece, where the economic downturn has resulted into dramatic employment decline and skyrocketing unemployment rates, in a context of already weak welfare and fragmented social security system. At the exigency of the crisis, flexible work practices are massively promoted by successive labour market reforms since 2010, allegedly to overcome rigidities and boost employability. In this light, our research explores the response of employees as regards flexible working conditions in the case they lost their job. Research has supported the idea that personality characteristics are related to career management strategies – thus, to decisions to accept or not flexible working terms. But it appears that no study has examined the impact of personality traits on the perceived attractiveness of flexible employment. The constraint in our case-study is that, under the threat of unemployment and the precariousness of atypical employment, work flexibility is not a choice but may rather be a necessity. Still, we assume that personality traits make some individuals more prone to accept flexible work than others. The empirical survey used a structured questionnaire administered to the general public, with the condition that the respondents had a dependent work at the time. A sample of 534 usable questionnaires was collected, allowing for the examination of the relationship between two key personality traits (self-esteem and risk propensity) and employee’s response to employer- or employee-friendly flexible working practices. The hypothesized relationships were tested using structural equation modeling, and were supported by the results. Evidence provides a basis for analysis of flexible employment forms in the agricultural sector.

Keywords: risk propensity, self-esteem, labour flexibility

Bipolar robustness control methodology in disaggregation MCDA approaches: Application to European e-government evaluation

Eleftherios Siskos

National Technical University of Athens
9, Iroon Polytechniou Str., 157 80, Athens,
Greece
Isiskos@epu.ntua.gr

John Psarras

National Technical University of Athens
9, Iroon Polytechniou Str., 157 80, Athens, Greece
john@epu.ntua.gr

Abstract

Robustness analyses, measurements and assessments are currently practiced by researchers and decision analysts in multicriteria decision-aid (MCDA) field, in order to face and control the resistance of their models against ignorance and instability phenomena, in a systematic or heuristic way. This paper comes to extend and regularize robustness analysis in disaggregation or ordinal regression approaches like UTA-type methods. It proposes a rigorous, systematic, and interactive bipolar procedure based on consecutive measurements and assessments of robustness. Specifically, the two poles of the algorithm, namely the disaggregation pole and aggregation pole, interact and provide feedback to each other. A set of robustness measures and assessments are proposed and integrated in both poles. These measures include the Average Stability Index (ASI), the Most Representative Model (MRM) concept, and Visualization measures to control the robustness of the decision model inferred through the disaggregation pole, and finally Extreme Ranking Analysis (ERA), Frequency of Ranking Positions (FRP), and Visualization procedures to control the robustness of the model's results through the aggregation pole. The whole procedure stops when satisfactory and acceptable outcomes are obtained in both poles. The paper presents an original application of this methodology to the problem of evaluating e-government in Europe, in which the overall evaluation of the countries is obtained through additive value models, which are assessed by means of a synergy of MAUT and UTA II techniques.

Keywords: Robustness control, Multicriteria analysis, Ordinal regression, E-government benchmarking

Monitoring the ranking of the IT departments of the Greek Technological Educational Institutes over time

Vassilis Kostoglou Alexander TEI of Thessaloniki P.O. Box 141, 57400, Thessaloniki, Greece vkostogl@it.teithe.gr	Nikolaos Ploskas University of Macedonia Egnatias 156, 546 36, Thessaloniki, Greece ploskasn@gmail.com	Jason Papathanasiou University of Macedonia Egnatias 156, 546 36 Thessaloniki, Greece jason.papathanasiou@gmail.com	George Charitakis Alexander TEI of Thessaloniki P.O. Box 141, 574 00, Thessaloniki, Greece gcharita@it.teithe.gr
--	---	--	--

Abstract

This paper concerns the ranking of the Information Technology (IT) departments of the Greek Technological Educational Institutes (TEI) using Multiple Criteria Decision methodologies. The radical changes that occurred in the Greek academia and society in general during the last years have left their marks on Greek higher education. The aim of this work is to monitor the ranking of the 11 IT departments during the last five years, taking into account a number of diverse criteria. An effort was made to avoid controversial and subjective criteria keeping only quantitative and deterministic ones. This will help us to identify the most successful ones and find the critical factors that make them stand out from the rest. For better clarity of the final results we use a couple of Multiple Criteria Decision Making methods, namely the TOPSIS and PROMETHEE methods, based on different theoretical backgrounds but both well accepted and established in the international research community. This is a work on progress, yet initial results show trends in the ranking of the departments and seem promising to provide tangible results. The data was acquired from the webpage developed by the first two authors of this paper (diguipro.it.teithe.gr) mapping and analyzing thoroughly the previous and current status of all departments and specializations provided by the institutes belonging to Greek higher technological education.

Acknowledgement

This research is implemented through the Operational Program "Education and Lifelong Learning" and is co-financed by the European Union (European Social Fund) and Greek national funds. Project title: "Digital map of higher technological education professions"

Keywords: IT departments, Higher technological education, Multiple Criteria, TOPSIS, PROMETHEE

Using Online Ratings to define Hotels' Improvement Priorities

IoannisZisos PhD Candidate <i>Technical University of Crete</i> <i>izisos@isc.tuc.gr</i> <i>School of Production Engineering and Management, Technical University of Crete, 73100 Chania, Greece</i>	Dr. EvangelosGrigoroudis Associate Professor <i>Technical University of Crete</i> <i>vangelis@ergasya.tuc.gr</i> <i>School of Production Engineering and Management, Technical University of Crete,73100 Chania Greece</i>	Dr. NikolaosMatsatsinis Professor <i>Technical University of Crete</i> <i>nikos@ergasya.tuc.gr</i> <i>School of Production Engineering and Management, Technical University of Crete,73100,Chania, Greece</i>	Dr. AthanasiosSpyridakos Professor <i>Piraeus University of Applied Sciences</i> <i>tspyr@teipir.gr</i> <i>School of Business and Economics, Piraeus University of Applied Sciences 12244, Egaleo, Greece</i>
---	---	--	--

Abstract

Online ratings and reviews are currently considered as one of the most effective tools for tourism professionals to approach customers' needs. They are offered voluntarily by guests and research reveals that they affect, like no advertisement does, their vacation decisions. Current Tourism Research has concentrated on decoding and revealing messages that arise from guests' ratings and reviews. These messages can later be utilized by tourism professionals to adjust their strategic decisions based on customers' needs.

In this paper, we build on existing literature conducting large scale-survey on customers' ratings to explore the determinants of tourists' satisfaction in different hotel categories. Customer satisfaction constitutes crucial market information for a business organization, in order to evaluate its current position against competition, design its future plans, and identify potential market opportunities. Tourist satisfaction is the result of the interaction between the tourist's experience in the destination area and the expectations (s)he had about that destination.

This research work is not based on a typical survey, but on real online reviews given by hotel guests. The application of the MUSA (Multicriteria Satisfaction Analysis) method to real guests' judgments, extracted from a popular booking web platform, results in valuable conclusions concerning: a. the quality of provided services, b. the identification of crucial factors that influence customers' satisfaction, and c. the prioritization of strategic decisions that will improve customers' satisfaction levels.

The dataset used for the purposes of this research work is based on data crawled from the popular hotel booking website Hotels.com. Ratings and reviews have been published by hotel guests who booked their stay through this website. The rating criteria are the following: Overall Reviewer Score, Cleanliness, Service, Comfort, Condition, and Neighbourhood in an ordinal scale from 1 to 5 (1 being the worst and 5 the best rating). The crawling process took place in February of 2014 and the initial dataset constituted of 2029 tourist reviews for 268 hotels. The case study concerns hotels in Chania region of the Greek island Crete.

Special treatment has been carried, in order to face the missing data problem. In order to satisfy MUSA's fundamental property of Non-Redundancy for the existing criteria and produce clean data, we had either to dismiss reviews with missing data or to fill the missing values with some type of relevant data. Within this scope, Hot Deck Imputation was implemented in order to confront the missing data problem.

The final conclusions of the specific research, have been mainly based on the results provided by MUSA, namely: the estimated global and partial value functions, the weights of the criteria, and the average satisfaction, demanding, and improvement indices.

Keywords: Online-Ratings, Multicriteria Satisfaction Analysis, Hotels' Improvement Priorities

A Software Tool for Supporting Robustness Analysis of Estimated Criteria Weights Using Visual Techniques

N. Tsotsolas <i>University of Piraeus</i> 80, Karaoli&Dimitriou str., GR-18534 Piraeus, Greece ntsotsol@unipi.gr	Y. Siskos <i>University of Piraeus</i> 80, Karaoli&Dimitriou str., GR-18534 Piraeus, Greece ysiskos@unipi.gr	A. Spyridakos <i>Piraeus University of Applied Sciences, P. Ralli and Thivon 250, 12244 Aigaleo, Athens, Greece</i> tspyr@teipir.gr	D. Yannacopoulos <i>Piraeus University of Applied Sciences, P. Ralli and Thivon 250, 12244 Aigaleo, Athens, Greece</i> dgian@teipir.gr
---	---	--	---

Abstract

This research work presents a software tool under the name RAVI, which supports the robustness analysis of elicited criteria weights in multicriteria methods of value systems, such as in case of disaggregation - aggregation approach and the revised SIMOS technique. Such an assessment often results to preference models with low degree of robustness. RAVI tool, which operates as subsystem of MINORA and MIIDAS Decision Support Systems implements a methodological frame which aims to three issues: a) to explain the nature of the low robustness of the estimated preference model, to the degree that is efficient, b) to support the Decision Maker (DM) to understand deeper his/her preferential structures and c) to acquire additional preference information by the DM in order to estimate a more robust preference model, reflecting more precise preferential structures of the DM.

The proposed methodological approach involves three steps triggered by the estimation of initial estimated criteria weights with low robustness. The first step includes the analysis of the estimated preference model robustness, exploiting a set of tools including specific indices developed for the robustness analysis, visual representations of polyhedra, graphs and tomographical images of the estimated criteria weights' hyper-polyhedron.

Then a dialogue with the DM is triggered by the results of the robustness analysis in order to collect additional preference information by the DM concerning specific areas of the estimated preference model. The acquired additional information supports the enrichment of the multicriteria linear program and concludes with the assessment of a more robust preferences model, as the third step of this approach. This is achieved by utilising two additional feedbacks, a) by shrinking the initially estimated hyper-polyhedron or b) by the elimination of cases which the criteria priorities is inverted..

The interactivity of the MINORA and MIIDAS systems is enriched though these new feedbacks triggered by the robustness analysis using RAVI tool. This interactivity and effectiveness of the proposed approaches was tested by using real world case studies with positive results.

Keywords: MCDA, Robustness Analysis, Decision Support Systems.

Customer Satisfaction Barometer: The Case of Banking Services in Greece.

D. Drosos	N. Tsotsolas	Y. Siskos	M. Chalikias
<i>Technological Education Institute of Piraeus, Department of Business Administration 250,Thivon &PetrouRalli, 12244, Egaleo, Greece drososd@teipir.gr</i>	<i>Technological Education Institute of Piraeus, Department of Business Administration 250,Thivon &PetrouRalli, 12244, Egaleo, Greece ntsotsol@unipi.gr</i>	<i>University of Piraeus Department of Informatics 80, Karaoli&Dimitriou str.18534, Piraeus, Greece ysiskos@unipi.gr</i>	<i>Technological Education Institute of Piraeus, Department of Business Administration 250,Thivon &PetrouRalli, 12244, Egaleo, Greece mchalik@teipir.gr</i>

Abstract

A customer satisfaction barometer is a significant tool for an organisation because of emphasise on meeting the expectations and needs of customers. Customer satisfaction barometers are aggregated measures of customer satisfaction, which have the potential to provide broad-based benchmarks for business organisations. In addition, the generic satisfaction barometers provide the ability to correlate basic economical dimensions with customer satisfaction like productivity variations at a national level or changes in the general consumer price index. This paper presents an original study that measures the customer satisfaction of banking services in Greece. For the purpose of this paper, the findings of four consecutive six month long surveys will be presented, measuring the satisfaction levels of customers of four banks which operate in Greece. For the collection of the data, a web site questionnaires were used in order to better record the customers' views on the service overall as well as their satisfaction levels on particular aspects of the service. Final input data consist of 5.500 questionnaires. The analysis of the results has been based on the multicriteria MUSA method, which is part of the wider category of aggregation - disaggregation approach and is based on the principles of qualitative analysis regression. The most important results are focused on the determination of the weak and the strong points of the banking services in Greece And The Analysis Of Customers' Behavior.

Keywords: Customer Satisfaction Barometer, Service Quality, Evaluation, Multicriteria Analysis, Banking Services

Towards a non-Compensatory Approach for Trace Clustering

PavlosDelias	Michael Doumpos	EvangelosGrigorou	PanagiotisManolitzas	NikolaosMatsatsinis
<i>Department of Accounting and Finance, Eastern Macedonia and Thrace Institute of Technology, Kavala, Greece, pdelias@teikav.e du.gr</i>	<i>School of Production and Management Engineering, Technical University of Crete, Chania, Greece, mdoumposdpem.tu c.gr</i>	<i>dis School of Production and Management Engineering, Technical University of Crete, Chania, Greece,vangelis@d pem.tuc.gr</i>	<i>School of Production and Management Engineering, Technical University of Crete, Chania, Greece, pmanolitzas@dpem.t uc.gr</i>	<i>School of Production and Management Engineering, Technical University of Crete, Chania, Greece,nikos@dpem .tuc.gr</i>

Abstract

In flexible environments (like healthcare or customer service), the observed behavior is expected to considerably vary, namely there is no dominant flow path. Such a high variability obstructs the process discovery task since it regularly leads to 'spaghetti' process models. Trace clustering is about grouping behaviors, and discovering a distinct model per group, thus delivering more comprehensible results. In this work we propose a multiple criteria approach to create a similarity metric. The main problem that we try to respond to is how to summarize a Process Event Log, when a lot of variability exists, thus to facilitate knowledge discovery.

We suggest a more general construction using two types of settings. The one refers to the fact that a sufficient number of factors must be concordant with the similarity (concordance setting) and the other raises a veto logic, i.e., among the factors that are not concordant, none of them must be conflicting with the similarity (discordance setting). The key component of our work is that it allows for multiple criteria to be seamlessly incorporated into an overall metric, following a non-compensatory methodology inspired from the outranking approaches.

The method was applied to a real case study, a healthcare service, the Emergency Department of the General Hospital of Chania, Greece. After constructing the multiple criteria similarity metric and applying an agglomerative hierarchical clustering, we end up with three distinct groups of patients. The results indicate a pronounced group of patients that contains exclusively patients with minor sicknesses that follow short paths and stay for a short time in the emergency department. Considering the other two clusters, one contains mostly patients with medium severity of sickness that follow paths with many activities and stay for long times in the department. Last, the remaining cluster contains yellow and red triage patients who stay for significantly less time in the department.

Acknowledgement

This research has been co-financed by the European Union (European Social Fund) and Greek national funds through the Operational Program "Education and Lifelong Learning"

A Comparative Study of Population Based Algorithms on the School Timetabling Problem

I.V. Katsaragakis

*Department of Business
Administration of Food and
Agricultural Enterprises,
University of Patras
G. Seferi 2, 30100 Agrinio*

I.X. Tassopoulos

*Department of Business
Administration of Food and
Agricultural Enterprises,
University of Patras
G. Seferi 2, 30100 Agrinio**

G.N. Beligiannis

*Department of Business
Administration of Food and
Agricultural Enterprises,
University of Patras
G. Seferi 2, 30100 Agrinio**

Abstract

In this contribution the application of three population based algorithms on the high school timetabling problem is presented. All three algorithms proposed manage to create feasible and efficient high school timetables. In order to demonstrate their efficiency and performance, experiments with real-world input data have been performed. Computational results demonstrate that all three algorithms manage to reach efficient solutions, most of the times better than existing approaches applied to the same school timetabling input instances using the same evaluation criteria.

Keywords: school timetabling, evolutionary algorithm, particle swarm optimization, artificial fish swarm

In this contribution, the application of three population based algorithms on the Greek school timetabling problem, namely Evolutionary Algorithm (EA) [1], Particle Swarm Optimization (PSO) [2] and Artificial Fish Swarm (AFS) [3], is presented. All three algorithms manage to reach feasible and effective solutions when applied to real-world input data coming from different Greek high schools. More precisely, the specific input instances used, in order to evaluate and compare their performance, is the well-established Beligiannis problem set which has been used as benchmark by many scientists in the respective literature [4-7]. Except for that, three instances of this particular set have been used as test instances in Round 3 of the International School Timetabling Competition 2011 [8].

The EA used was firstly introduced in [9] while the PSO based algorithm was firstly presented in [10]. However, the AFS algorithm presented in current contribution is a novel approach since, although there are plenty of population based algorithms applied to timetabling problems in the literature, there is no specific AFS based approach, to the best of our knowledge, applied to the high school timetabling problem. All three algorithms presented in current contribution use the same formalism for modeling the timetabling problem, try to minimize the same fitness function and use the same performance criteria in order to evaluate the quality of each resulted timetable. So, a straightforward comparison of their experimental results is fair.

All timetables created by the proposed algorithms are compared on the basis of three criteria which are well-established school timetabling performance criteria in the respective literature. The first criterion, which investigates how evenly each teacher's hours are distributed among the days she/he is available at school, is the teachers' teaching hours' distribution. The second criterion, which presents how uniformly distributed are the hours of the same lesson for each class among its teaching days, is the lessons' hours' distribution. Finally, the third criterion, which checks whether there are idle hours between teaching hours of each teacher, is the teachers' gaps.

Experimental results show that all three proposed algorithms achieve very satisfactory results and demonstrate that population based algorithms constitute a very useful family of algorithms to cope effectively with this kind of problems. Moreover, one major advantage of the proposed algorithms lies in their inherent adaptive behavior. More specifically, all three algorithms, by assigning weights, that can be defined by the user, to each specific constraint that should be satisfied, provide teacher's with the ability to lead the algorithms in solutions that will better fulfill their specific needs. So, all three algorithms can be used, each time, to result in timetables satisfying different specific constraints, thus meeting the different needs that each school may have.

References

[1] T. Back (Editor), D. B. Fogel (Editor), Z. Michalewicz (Editor), Handbook of Evolutionary Computation, Oxford University Press, 1997.

- [2] J. Kennedy, R.C. Eberhart, *Swarm Intelligence*, Morgan Kaufmann, 2001.
- [3] M. Neshat, G. Sepidnam, S. Mehdi και A. N. Toosi, Artificial fish swarm algorithm: a survey of the state of-the-art, hybridization, combinatorial and indicative applications, *Artificial Intelligence Review* (2014) 42:965–997.
- [4] N. Pillay, A survey of school timetabling research, *Annals of Operations Research* (2014) 218:261–293.
- [5] R. Raghavjee, N. Pillay, A Study of Genetic Algorithms to Solve the School Timetabling Problem, In F. Castro, A. Gelbukh, M.G. Mendoza (Eds.): *MICAI 2013, Part II*, LNAI 8266, pp. 64–80, 2013, Springer-Verlag Berlin Heidelberg.
- [6] S. Kristiansen, T.R. Stidsen, A Comprehensive Study of Educational Timetabling, a Survey, Report 8.2013, DTU Management Engineering, Department of Management Engineering, November 2013.
- [7] D. Zhang, Y. Liu, R. M'Hallah, C.H.S. Leung, A simulated annealing with a new neighborhood structure based algorithm for high school timetabling problems, *European Journal of Operational Research* 203 (3) (2010) 550–558.
- [8] <http://www.utwente.nl/ctit/hstt/itc2011/results/round3/> (last accessed: 20/02/2015).
- [9] G.N. Beligiannis, C.N. Moschopoulos, G.P. Kaperonis, S.D. Likothanassis, Applying evolutionary computation to the school timetabling problem: the Greek case, *Computers and Operations Research* 35 (4) (2008) 1265–1280.
- [10] I.X. Tassopoulos, G.N. Beligiannis, A hybrid particle swarm optimization based algorithm for high school timetabling problems, *Applied Soft Computing* 12 (2012) 3472–3489.

Solving Efficiently the Nurse Rostering Problem Using Variable Neighborhood Search Algorithm

I.P. Solos

*Department of Business
Administration of Food and
Agricultural Enterprises,
University of Patras
G. Seferi 2, 30100 Agrinio*

I.X. Tassopoulos

*Department of Business
Administration of Food and
Agricultural Enterprises,
University of Patras
G. Seferi 2, 30100 Agrinio*

G.N. Beligiannis

*Department of Business
Administration of Food and
Agricultural Enterprises,
University of Patras
G. Seferi 2, 30100 Agrinio**

Abstract

In this contribution the application of two variable neighborhood search algorithms on the nurse rostering problem is presented. Both algorithms proposed manage to create feasible and efficient nurse rosters. In order to demonstrate their efficiency and performance, experiments with the instances of the First International Nurse Rostering Competition (INRC-2010) have been performed. Experimental results show that both proposed algorithms achieve very satisfactory results and demonstrate that variable neighborhood search algorithms constitute a very useful family of algorithms to cope effectively with this kind of problems.

Keywords: nurse rostering, variable neighborhood search, heuristic algorithm, first nurse rostering competition

The problem faced in this contribution is nurse rostering. It belongs to a class of timetabling problems which refer to constructing the schedule of the personnel's shift in a hospital. According to this problem, one has to generate weekly schedules for nurses by assigning a number of weekly demanding shifts to nurses with different skills in order to satisfy certain predefined hard and soft constraints. In real world problems, nurse rostering has to satisfy a large number of constraints and requirements and is affected by many parameters. As a consequence, it constitutes a difficult and hard to solve problem and a great challenge not only for personnel managers in hospitals but also for researchers. The main entities involved in constructing a feasible and effective roster are the nurses, the shift types and the time periods. More precisely, nurses have to make some specific shift types in specific time periods considering many different issues like coverage demand, workload of nurses, consecutive assignments of shifts, weekend-related requirements, day-off/on requirements, etc. [1].

Both algorithms presented in this contribution comprise heuristic methods to solve the nurse rostering problem. They are both two-phase stochastic variable neighborhood search (VNS) approaches, which use a variety of swap mechanisms. Some of them are innovative while others are well established swap mechanisms in the respective literature [2-4] which are applied in a total different way compared to other known VNS approaches. The use of each different swap operator enriches the search capability of the proposed algorithms since it enables them to search in different neighborhoods of the problem's search space. In order to demonstrate both algorithms' efficiency and performance, experiments with the instances of the First International Nurse Rostering Competition (INRC-2010) have been performed. The way these different swap operators are applied in order to construct effective solutions for the INRC-2010 test instances is the main innovation of the proposed approach and demonstrates that the nurse rostering problem can be effectively solved using VNS algorithms.

The INRC-2010 competition aimed to further develop interest in nurse rostering by presenting more challenging problems with an increased number of real world constraints [1]. The proposed VNS algorithms managed to solve effectively all instances of the INRC-2010 competition, most of the times achieving the best solutions ever found till now. More precisely, the first VNS algorithm used, which was firstly introduced in [5], managed to find the best solution in 27/60 (45%) instances [6], while the second VNS algorithm used, manages to find the best till now result in 50/60 (83.3%) instances [6]. As a result, the second VNS algorithm proposed is the best ever reported algorithm, in the respective literature, concerning its performance on the INRC-2010 instances.

References

[1] Haspeslagh S, De Causmaecker P, Stølevik M, Schaerf A. The first international nurse rostering competition 2010. In: Proceedings of the 8th International Conference on the Practice and Theory of Automated Timetabling (PATAT 2010), 2010.

- [2] Burke EK, De Causmaecker P, Petrovic S, VandenBerghe G. Variable neighborhood search for nurse rostering problems. In: Resende MCG, Pinho de Sousa J, editors. *Metaheuristics: Computer Decision-Making*, Norwell, MA, USA: Kluwer Academic Publishers; 2003, Chapter 7, p. 153–72.
- [3] Lü Z, Hao J-K, Glover F. Neighborhood analysis: A case study on curriculum-based course timetabling. *J. Heuristics* 2011; 17(2):97–118.
- [4] Burke EK, Curtois T, Qu R and VandenBerghe G. A Time Predefined Variable Depth Search for Nurse Rostering. *INFORMS Journal on Computing*; 2013; 25(3): 411–9.
- [5] Solos IP, Tassopoulos IX, Beligiannis GN. A generic two-phase stochastic variable neighborhood approach for effectively solving the nurse rostering problem. *Algorithms* 2013; 6(2):278–308.
- [6] <https://www.kuleuven-kulak.be/nrpcompetition/instances-results>(last accessed: 20/02/2015).

Robust portfolio optimization: A categorized literature review

<i>PanosXidonas</i> <i>National Technical University of Athens IroonPolytechniou str., 15780, Zografou, Athens, Greece</i>	<i>HarisDoukas</i> <i>National Technical University of Athens IroonPolytechniou str., 15780, Zografou, Athens, Greece</i>	<i>George Mavrotas</i> <i>National Technical University of Athens IroonPolytechniou str., 15780, Zografou, Athens, Greece</i>	<i>John Psarras</i> <i>National Technical University of Athens IroonPolytechniou str., 15780, Zografou, Athens, Greece</i>
--	---	---	--

Abstract

It is our purpose in this article to provide an elaborate bibliographic taxonomy of the various contributions appear in the literature, with regard to robust portfolio optimization. Through the underlying survey, an attempt is being made for capturing the whole relevant research activity which exists, concerning the application of robustness optimization techniques in modern portfolio selection. A large number of studies, both from the operational research and the finance field, have been compiled and carefully classified, according to the various methodological approaches that are used. Except the exhaustive collection of the research pieces, the outmost aim of this paper is to stress the unarguable necessity of a robustness analysis, in all contemporary portfolio optimization empirical applications.

Keywords: Portfolio optimization; Robustness analysis; Literature review.

Meta-Analysis as a decision-making tool: The case of Benefit Transfer

Emmanuel Tyllianakis

*Ph.D Candidate, Department of
Economics, University of Patras*

Abstract

The Water Framework Directive (WFD) commands all country members to comply with a series of policies that guarantee the “Good ecological status” of all water bodies (inland and coastal waters). This has direct implications on agricultural activity which is one of the major water users and water pollutants in the EU. Water consumption through irrigation, pollution and emissions from the use of chemical plant protection substances, abatement of nutrients through fertilization and stock raising, threaten citizens’ use and non-use values of water bodies. The WFD makes explicit reference to agriculture, rural water management, pollution levels, concentration of chemicals in the water bodies as well as a timeframe for its implementation. Member states had to respond with country-specific strategies and studies that identify the problems, specify the actions and the obstacles and take into account the public’s preferences for the foreseen changes.

Several studies have taken place in a number of member states in order to identify and measure the costs and benefits of these strategies. Benefits to the local population are measured in the form of Willingness to Pay (WTP) for water quality improvements. Very frequently, due to the high cost involved in carrying out primary valuation surveys for estimating WTP, the Benefit (value) Transfer method is used. Benefit Transfer is a process by which the economic value of a public good from a site where a primary valuation survey has been carried out is used to another site. Due to lack of time and resources for conducting primary studies, Benefit Transfers are increasingly used, based on estimates from the studies that have been already conducted. Benefit Transfers are based on a few studies that are similar but often conducted very uncritically. Meta-analysis of many studies with different scope and conducted in different socio-economic environments offer a more robust and coherent criterion for Benefit Transfer.

Meta-analysis is the method where similar studies are grouped together in order to examine results in a much wider scale. With continuous data such as WTP estimates, means and standard deviations can be used as effect sizes. For continuous data, fixed effects or random effects models can be employed and among study heterogeneity is identified and quantified. Meta-analysis provides the tools to understand the results of a study in the context of all other relevant studies. This synthesis assists to examining whether the results have been consistent across all studies, if they are robust and if there is variance between the studies, to quantify its extent and implications. In addition, a meta-analysis is very useful when handling rather small sample sizes that make more difficult to reveal an effect and/or have large variances. For every meta-analysis an effect size is computed and the respective variance and also a weighted mean of these effect sizes. In this study the effect size is average WTP per person or household for water quality improvements. Studies that presented different sample sizes with separate estimates for each sample size were considered as separate studies that yielded different estimates. Some 150 studies were considered initially and the deduction exercise focused on whether the studies provided sufficient information on the exact time that the initial survey took place, estimates of standard errors and/or standard deviation that were subsequently used in the meta-analysis.

The Results Show That Meta-Analysis Is A Valuable Decision Making Tool Concerning The Benefit Transfer Credibility Measures And The Disproportionality Analyses Based On Benefit Transfers. The Decrease In Household Income After The 2008 Financial Crisis Has Affected Some Regions And Countries More Than Others, Rendering Benefit Transfer Methods And/Or Disproportionality Analyses Inaccurate Or Misleading. Consequently, Policy And Project Proposals Should Be Reconsidered.

Talos system: A DSS dealing with MCDA problems under uncertainty

N. Christodoulakis

University of Piraeus
80, Karaoli & Dimitriou str., GR-18534
Piraeus, Greece
nikosunipi@gmail.com

N. Tsotsolas

University of Piraeus
80, Karaoli & Dimitriou str., GR-18534 Piraeus,
Greece
ntsotsol@unipi.gr

Abstract

Talos is a Decision Support System (DSS) which provides the analysts and the decision makers with the necessary tools to deal with MCDA problems under uncertainty. Four MCDA methods, namely UTA, SMAA, UTA^{GMS} and Extreme Ranking have been implemented and adopted to be applied with probabilistic multicriteria evaluation data. As far as the need for robustness analysis is concerned four heuristic and one analytical approach are supported. The system is consisted of five discrete steps which “guide” the user through the whole process from data input to visualisation of the results. These five steps are the following:

1. Definition of criteria: Defining the criteria of the problem. Each criterion is described by its name, its unit, its type, its direction, its values interval, the number of the characteristic point of the values interval and the titles of values in cases of qualitative criteria.
2. Definition of actions: Defining the alternative actions of the problem. For each action the estimated values and the corresponding probability distributions should be defined.
3. Method selection: The selection of the main algorithm (Stochastic UTA, SMAA, UTA GMS, Extreme Ranking) and the robustness analysis method (Max UTA, Max-Min UTA, Max W, Max-Min W, Manas-Nedoma).
4. Ranking the Actions: The user is asked to provide a complete preorder on a subset of reference alternatives
5. Decision model elicitation: Through the visualisation of the results (value functions, weights, etc) the user is supported in selecting the most representative or/and robust decision model

Throughout the decision problem solution process a number of automated checks to ensure the proper input of data and selection of the appropriate parameters per method/algorithm.

Visual C# was used for the programming of the DSS and it runs in Windows environment. In general we tried to create a system which could provide an efficient support to analysts and decision makers while at the same time requires low computing resources.

Keywords: DSS, MCDA, Decisions under Uncertainty.

The role of investment risks in renewable energy projects: The case of Greece

Dimitrios Angelopoulos

*National Technical University of
Athens*

*IroonPolytechniou str., 15780,
Zografou, Athens, Greece*

HarisDoukas

*National Technical University of
Athens*

*IroonPolytechniou str., 15780,
Zografou, Athens, Greece*

John Psarras

*National Technical University of
Athens*

*IroonPolytechniou str., 15780,
Zografou, Athens, Greece*

**E-mail address of the corresponding author: dangel@epu.ntua.gr*

Abstract

Aim of this paper is the identification and assessment of the most critical risk components that influence investments in the Renewable Energy sector in Greece. The Weighted Average Cost of Capital (WACC) has been utilized as an appropriate model to quantify the overall cost of capital, consisting of three main components: cost of equity, cost of debt and debt to equity ratio.

Based on this approach, these elements have been elaborated, taking into consideration available data and the international literature, for onshore wind and photovoltaic technologies in Greece. Especially, as concerns the cost of equity, an additional decomposition was made into 9 different risk categories. This could support fruitful investment decision analysis and policy making, since related policies can be identified to de-risk the investment cost.

In this respect, through this study, the extracted model's data are presented, the importance of every risk category is analyzed and final conclusions of the general methodology adopted are provided.

Keywords: Investment Risks, WACC, Cost of Equity, Renewable Energy, Greece.

Re - designing the Bus Route Network for the City of Heraklion using an Evolutionary approach

K. Kepaptsoglou <i>Lecturer, School of Rural and Surveying Engineering, National Technical University of Athens, 15770, Athens, Greece, kkepap@central.ntua.gr</i>	M. Kalohristianakis <i>Research Associate, TEI of Crete, Department of Informatics Engineering, 71004, Heraklion, Greece, kalohr@ie.teicrete.gr</i>	D. Kosmopoulos <i>Assistant Professor, University of Patras, Department of Cultural Heritage Management and New Technologies, 35100, Agrinio, Greece dkosmo@upatras.gr</i>	G. Papadourakis <i>Professor, TEI of Crete, Department of Informatics Engineering, 71004, Heraklion, Greece, papadour@cs.teicrete.gr</i>
--	---	--	--

Abstract

We introduce the project DIANA, which deals with the development of innovative algorithms and decision support systems for the design of public transport network systems with application to the city of Heraklion - Crete. The project aims to design transportation networks, with the objectives of maximizing total welfare, considering multiple contradicting criteria. Evolutional algorithms are being developed for solving the associated transit route network design problem.

Public transportation is a sustainable option for transportation in urban areas, offering advantages such as mobility enhancement, traffic congestion and air pollution reduction, and energy conservation while still preserving social equity considerations. The design of such a public transportation network is a complex optimization problem, which involves a variety of design parameters (route structure, frequencies, vehicle types, etc) and assumptions on demand patterns, travel behavior and so on. Indeed, the associated Transit Route Network Design Problem (TRNDP) has been a topic of interest for over 40 years.

Following prediction of flows, our mathematical model attempts to design a bus network operated by two vehicle types (conventional and electric) by taking into account operator, user and external (environmental) costs. Three design variables are considered: route structures, frequencies and vehicle types. Major assumptions are the following: (i) vehicles for each type are of the same, constant capacity, (ii) demand patterns are assumed fixed according to the solution of the TAP problem, as extracted previously (iii) demand follows a “many-to-many” pattern, as the network is expected to connect multiple origins and destinations and (iv) a limited number of transfers between routes is acceptable, while direct connections are preferred.

A generic representation of the proposed model is the following:

Minimize (Passenger cost + Operator cost + External cost) = $f(\text{demand satisfaction, average travel time, pollutants emitted, charging stations required, vehicle types})$

under the constraints of

Resource availability (available vehicles per type)

Operating constraints (minimum and maximum frequencies, capacity constraints, possible charging stations)

Line structure constraints (meaningful shape, minimum and maximum length)

A Genetic Algorithm (GA) is used for solving the model. Therefore we use a graph $G(V;E)$ whose set of nodes V corresponds to bus stops and set of edges E represents the road sections between each pair of nodes.

The objective function aims at minimizing the weighted sum of user, operator and external costs; it consists of six components: unsatisfied demand and average travel time (proxies of user cost), pollutant mass (external costs), charging stations, conventional vehicles and electric vehicles required (proxies for operator cost). Unsatisfied demand refers to the demand that cannot be satisfied neither directly nor through a single transfer. The average travel time per passenger includes both in-vehicle travel time and waiting time, while emissions refer to air pollutants emitted exclusively by conventional vehicles.

We define a set of constraints in the following way:

- A charging station is required in at least one terminal stop of a route for electrical vehicles.

- A set of nodes with adequate space for the deployment of charging stations.
- We set route length limits upper bounds for preventing delays and for minimizing the risk of energy depletion in case of delayed arrivals to charging stations.
- We set the minimum and maximum route frequency values
- We set resource availability constraints, referring to the maximum number of conventional and electric vehicles.
- We control the structure and directness of a route by preventing the omission of neighboring bus stops, as well as route backtracks and U-turns.

The approach has been applied for the city of Heraklion - Crete. We used 50-80 nodes to represent the bus stops and 10-15 different bus routes. A solution gives a route combination, which is sub optimal. The system converges in 5-10 hours running on a 3GHz i7 PC. The visualization is supported via integration with Google maps (see Figure 1).

Acknowledgment

The DIANA project is implemented through the Operational Program "Education and Lifelong Learning" action Archimedes III and is co-financed by the European Union (European Social Fund) and Greek national funds (National Strategic Reference Framework 2007 - 2013).

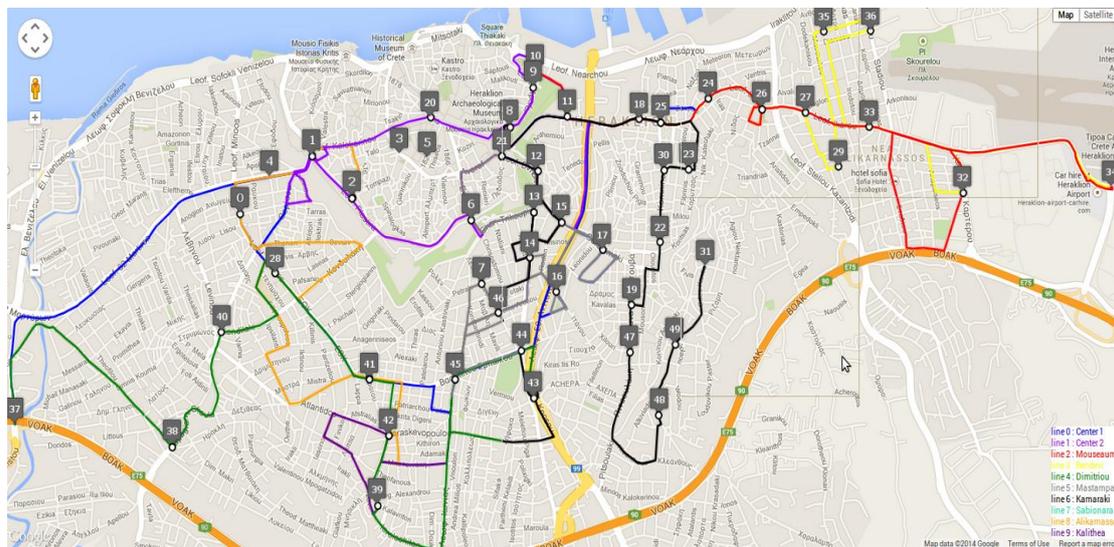


Figure 1: A solution for bus route assignment for the city of Heraklion

Choosing location for Ship-to-Ship (STS) transfer operation with Multi-Criteria Decision Analysis (MCDA): A case study

Dimitrios I. Stavrou

*National Technical University of Athens,
School of Naval Architecture and Marine
Engineering , Laboratory for Maritime
Transport, 9 IroonPolytechniou str.
Zografou 15773, Greece,
dstavrou@gmail.com*

Nikolaos P. Ventikos

*National Technical University of Athens,
School of Naval Architecture and Marine
Engineering , Laboratory for Maritime
Transport, 9 IroonPolytechniou str.
Zografou 15773, Greece,
niven@deslab.ntua.gr*

Abstract

Ship-to-Ship (STS) transfers was initially used in the decade of '60 in the Gulf of Mexico due to the limitations of oil terminals and refineries to accommodate ships (VLCCs and ULCCs) with increased draft dimensions. Although the initial use was for transferring oil, however the contemporary STS operations have been extended to the transfer of cargoes other than oil, such as liquefied gases (LPG, LNG) or even for bulk or dry cargoes. Currently, STS transfers has become common practice. However, it remains a difficult procedure and the success of the operation depends on many different factors.

A significant factor of special importance is the decision to select the location to conduct the transfer of cargo. This decision embodies factors such as the prevailing environmental conditions (currents, weather conditions, etc) and other characteristics of the area such as the traffic density or the logical support or even potential security or safety threats. In the light of the above, the success of an STS transfer operation primarily depends on the proper selection of the location to conduct the transfer. An inadequate area may lead to the suspension of the operation, with adverse economic effects to the stakeholders. Moreover, a wrong decision in combination with inappropriate environmental conditions, may lead to an accident with adverse effects to human life or the environment in combination with the property loss (especially for the involved ships and cargoes).

In the light of the above, the choice of the STS transfer location can be considered as a strategic decision and it should be taken after careful and detailed examination of the alternatives with regard to the criteria that affect the operation. Thus, risk assessment needs to be done for the vessels involved, as well as for the location. Traditional approaches of risk assessment techniques usually suffer from uncertainty caused from inaccurate historical data or weak expert's judgment. Hence, new techniques of risk assessment are applied as a remedy. To this end, a feasible way to tackle with uncertainty is through the use of Multi Criteria Decision Aid (MCDA) methodologies.

The aim of this study is to develop a framework for the evaluation of different STS transfer locations based on an ELECTRE methodology borrowed from the Multi Criteria Decision Aid (MCDA) discipline. With respect to the α -problematic, which refers to the choice of the best alternative among different actions, ELECTRE I methodology support decision makers to choose the optimal solution among a group of alternatives with regard to true value criteria. ELECTRE methods use the pairwise comparison of actions, in terms of outranking, which is based on the concordance condition and the veto effect of each criterion (discordance). Moreover, the relative importance (weights) of the selected criteria is determined by means of applying a mathematical programming process. The proposed model is properly developed and thoroughly analyzed to support operators to choose the best STS location. Furthermore, a case study is presented to testify the effectiveness and to verify the strength of the suggested approach. In particular, four different locations within the Mediterranean Sea, which represent the set of alternative actions, were evaluated according to four different groups of criteria, with view to select the most appropriate location to conduct the transfer operation. Different operational, economic environmental and safety-security criteria regarding each location are assessed and evaluated from a team of experts designated from the stakeholders (decision makers) of a shipping company. In addition, a robustness analysis is performed to verify the stability of the proposed model. The objective is to develop an MCDA model to select the most appropriate location according to its eligibility for the operation commence. The paper concludes with interesting insights.

Keywords: Risk assessment; ship-to-ship (STS) transfer; STS location; MCDA; ELECTRE I.

E-Commerce Trend in Protected Areas Development: A Multi-criteria Analysis

<i>Christiana Koliouka</i> <i>Laboratory of Forest Informatics, School of Forestry and Natural Environment, Aristotle University of Thessaloniki</i> <i>Box 247, 54124, Greece</i>	<i>Zacharoula Andreopoulou</i> <i>Laboratory of Forest Informatics, School of Forestry and Natural Environment, Aristotle University of Thessaloniki</i> <i>Box 247, 54124, Greece</i>	<i>Constantin Zopounidis</i> <i>Audencia Nantes School of Management, France</i> <i>School of Management & Economics, Technological Educational Institute of Crete, Agios Nikolaos Branch, Greece</i>	<i>Christos Lemonakis</i> <i>School of Production Engineering and Management</i> <i>Technical University of Crete, Greece</i>
---	---	--	--

Abstract

Protected areas are cornerstones in national and international nature conservation policies. Protected areas are subject to national and international environment legislation, yet, their biological and environmental values provide economic prospects. The ecosystem of Prespa, shared by three countries, Greece, FYROM and Albania, constitutes a model of local growth, environmental conservation, joint management and international cooperation. Internet services are well appreciated by the society and e-commerce is an imperative within the viability of an enterprise. E-commerce is a new business concept that incorporates all previous business management and economic concepts. The aim of the paper is to study the e-commerce trend in a Greek protected area, the Prespa basin, member of NATURA2000 network, for local development. For this purpose e-commerce websites are ranked in respect to their content and features, as attributed to 30 variables. Following, the multicriteria method of PROMETHEE II is applied in order to perform evaluation and ranking tasks. Moreover, the optimum e-commerce units are identified aiming to benchmark further e-commerce adoption in local enterprises. The findings are useful in improving e-commerce adoption through the improved websites design and the accomplishment of certain e-commerce features. The results of this research can be an efficient tool for manager/web designers while designing e-commerce websites for private enterprises of similar interest.

Keywords: Protected areas, E-commerce, Development, Economic aspects, Multicriteria method, Internet

Primary Health Care Planning Using DEA and Location Analysis

Panagiotis Mitropoulos
*Department of Business
Administration, TEI of Western
Greece
MegalouAleksandrou 1,
Koukoulipatra 263 34
pmitro@teiwest.gr*

Ioannis Giannikos
*Department of Business
Administration, University of Patras
University campus,
Rio 26500
I.Giannikos@upatras.gr*

Ioannis Mitropoulos
*Department of Business
Administration, TEI of Western
Greece
MegalouAleksandrou 1,
Koukoulipatra 263 34
mitro@teiwest.gr*

Abstract

In order to tightly manage the increasing healthcare expenses, consolidation plans have been formulated in Greece, in an attempt to close local health providers and to locate larger regional centres. However, before minimizing the number of centres open, policy makers have to evaluate the consequences of new distributions of patient among health providers and to take into account providers' capacities and services. In order to quantify the effect of changes, we combine two widely used linear programming methods, namely DEA and location-allocation models. First, we use a DEA model to evaluate the performance of these 32 HCs and yield some meaningful results about HCs performance in relation to environmental factors. Then we formulate a location analysis model in order to select the appropriate number and locations of HCs that will; (a) expand and upgrade their services, (b) provide basic vital services, or (c) must close in a given network that also includes the general hospitals. The location analysis model makes use of the DEA scores as multivariate functions that capture users' behavior and the performance of each provider and takes also into account accessibility and utilization. The model developed is a multiobjective integer optimization model aiming to maximize accessibility, utilization and mean efficiency of HCs. Once the consolidated network is produced, the efficiencies of the HCs under the new system are estimated again, in order to set targets and verify the overall improvement. The application of the model in the region of the Peloponnese increases the system efficiency and at the same time significantly reduces the number of HCs while putting forward value judgments about the operational characteristics of the remaining providers.

Keywords: Multiobjective model; Location-Allocation, Data Envelopment Analysis, OR in Health

Total Quality Management practices and results in Greek local authorities

Tasiou Mary, MSc

*Region of Epirus-Regional Unit of Arta
Director of Accounting Department
Postal address: EthnikisAntistaseos square ,
GR-471 00, Arta,
tel: 0030.26813.61059 / fax:
0030.26810.72285
logistikartas@peartas.gov.gr*

DrEvangelosPsomas

*Department of Business Administration of Food and
Agricultural Enterprises
University of Patras
Postal address: George Seferis str., GR-301 00,
Agrinio,
tel: 0030.26410.74192 / fax: 0030.26410.74179
epsomas@upatras.gr*

Abstract

Purpose – The purpose of the study is to determine the main Total Quality Management (TQM) practices implemented and the respective results achieved by Greek local authorities (city level administration).

Design/methodology/approach – A research study was designed in Greek local authorities. Fifty local authorities were approached through interviews based on a structured questionnaire. The TQM practices and results identified in the literature were used as the measured variables of the questionnaire. Descriptive statistics were applied to determine the TQM practices mostly implemented and the results achieved by the sample local authorities.

Findings – According to the findings, the TQM practices mostly implemented by the Greek local authorities concern the following factors: citizen focus, strategic quality planning, leadership, process management and human resource development. On the other hand, the most significant results achieved by the local authorities concern quality performance, employee satisfaction, operational performance and society benefits.

Research limitations/implications – The subjective data was collected from managers of a small sample of local authorities operating in a European Union country. Thus, no advanced statistical methods can be applied. Based on these limitations, future research studies are recommended.

Practical implications – By focusing on specific TQM practices, a Greek local authority can develop a robust TQM model, which can help it derive benefits, approach business excellence and apply for the respective quality awards. In doing so, a local authority can lay the foundations for deriving significant benefits in the current scenario that is characterized by an economic downturn.

Originality/value – This paper contributes to the literature by determining the TQM practices mostly implemented by Greek local authorities as well as the respective results achieved. This is the first research study in the field of TQM implementation in the city level administration that has been carried out in Greece.

Key words – Total Quality Management, local authority, Greece.

Papertype: Researchpaper

Διοίκηση Μονάδων Υγείας: Ο Ρόλος των Λογιστών & των Εσωτερικών Ελεγκτών

Γιάννης Α. Φίλος

Αν. Καθ., Πάντειο Πανεπιστήμιο

Περίληψη

Η λογιστική είναι μια επιστήμη, που έχει θεωρητικό/ επιστημονικό υπόβαθρο αλλά και πρακτικές εφαρμογές με παραδοχές, αρχές και κανόνες που πρέπει να ακολουθούνται από τις επιχειρήσεις και τους οργανισμούς, ώστε να ικανοποιούνται οι ανάγκες των ενδιαφερομένων μερών/χρηστών (stakeholders) μέσω των εκδιδόμενων οικονομικών καταστάσεων (ισολογισμός, αποτελέσματα χρήσης, ταμειακές ροές κλπ). Περαιτέρω δεν πρέπει να παραβλέπονται οι αναφορές που υπάρχουν στην έκθεση (πιστοποιητικό) των ορκωτών ελεγκτών, δεδομένου ότι πιθανόν να τροποποιούν σημαντικά την εικόνα που παρέχεται από τα αριθμητικά μεγέθη που εμφανίζονται στον Ισολογισμό και στην Κατάσταση Αποτελεσμάτων Χρήσης. Εφικτή είναι (αν και δεν είναι υποχρεωτική παρά μόνο για τις εισηγμένες εταιρίες) και η κατάρτιση Κατάστασης Ταμειακών Ροών, αλλά και αναγκαία σε περιόδους προβλημάτων ρευστότητας. Συνήθης μεθοδολογία απόκτησης εικόνας από τον ενδιαφερόμενο αναγνώστη οικονομικών καταστάσεων είναι μέσω της χρησιμοποίησης αριθμοδεικτών (ρευστότητας, αποδοτικότητα, κεφαλαιακή διάρθρωση κλπ) όπου μπορεί να γίνει σύγκριση προβλεπόμενων στοιχείων με πραγματικά, διαχρονική εξέλιξη μεγεθών, σύγκριση με άλλες επιχειρήσεις του κλάδου κλπ.

Στον ορισμό της Λογιστικής περιλαμβάνεται και η Διοικητική Λογιστική/Κοστολόγηση. Δηλαδή απαιτείται επεξεργασία δεδομένων προκειμένου αφενός να καταρτιστούν ορθά οι οικονομικές καταστάσεις για ικανοποίηση των εξωτερικών χρηστών και αφετέρου για την υποβοήθηση της διοίκησης στη λήψη αποφάσεων. Πολλά στοιχεία που χρησιμοποιούνται στη Διοικητική Λογιστική είναι εκτιμήσεις και προϋπολογιστικά στοιχεία (χρησιμότερη η ανάλυση των αποκλίσεων μεταξύ των προϋπολογιζόμενων και των πραγματικών μεγεθών). Τέτοια μεγέθη, σε μια μονάδα υγείας, μπορεί να είναι το κόστος ανά ασθενή, ανά κλινική, ανά ημέρα, ανά θεραπεία (υλικά, ανθρώπινο δυναμικό, λοιπά στοιχεία κόστους), η μέση χρήση/ πληρότητα ανά κλίνη κλπ.

Ο εσωτερικός ελεγκτής σε ένα νοσοκομείο, όπως και σε κάθε οργανισμό, έχει συγκεκριμένη μεθοδολογία για την εκτέλεση του ελεγκτικού έργου του, η οποία εν πολλοίς βασίζεται σε εκτίμηση κινδύνων και στο Σύστημα εσωτερικού ελέγχου που έχει ενσωματωθεί στον οργανισμό μέσω των διαδικασιών, της κουλτούρας του προσωπικού, της στάσης της διοίκησης κλπ.

Όσον αφορά τον έλεγχο των δημόσιων νοσοκομείων, υπάρχουν δύο τουλάχιστον σημαντικές πηγές εικόνας τους, συγκεκριμένα (α) οι ετήσιες εκθέσεις του Γενικού Επιθεωρητή Δημόσιας Διοίκησης και της Διεθνούς Διαφάνειας, όπου φαίνεται ότι υπάρχουν σημεία επαναλαμβανόμενων ατασθαλιών και αδυναμιών σε δημόσια νοσοκομεία είναι ο χώρος των προμηθειών υλικών, η περίπτωση 'φακελάκι' και η περίπτωση υπερκατανάλωσης φαρμάκων ή υλικών ('προκλητής' ζήτησης) και (β) οι παρατηρήσεις των ορκωτών λογιστών – ελεγκτών, οι οποίες συνήθως είναι αρκετές στις περιπτώσεις των δημόσιων νοσοκομείων.

Η συμβολή και ο ρόλος των μηχανογραφικών συστημάτων είναι πρώτιστης σημασίας τόσο για τη λογιστική παρακολούθηση μεγεθών (Γενικής και Διοικητικής Λογιστικής) όσο και για τη διευκόλυνση του εσωτερικού ελέγχου (αφενός αν έχουν ενσωματωθεί κατάλληλες δικλίδες ασφάλειας και αφετέρου διευκολύνοντας στην ανάπτυξη/ υπολογισμό μεγεθών που επιθυμεί ο εσωτερικός ελεγκτής προκειμένου να εκτελέσει επιβεβαιωτικές πράξεις). Σημειωτέον ότι η ανάπτυξη των μηχανογραφικών συστημάτων πρέπει να γίνεται/ διαμορφώνεται με τρόπο που να υποστηρίζει τον Κανονισμό Εσωτερικής Λειτουργίας. Σχετικά με τον Εσωτερικό έλεγχο των δημόσιων νοσοκομείων δεν είναι μόνο η επιβεβαίωση της τήρησης όσων αναφέρονται στον Κανονισμό Λειτουργίας (και η αναφορά τυχόν προτάσεων για βελτίωση των Κανονισμών αυτών) αλλά και η διενέργεια επιβεβαιωτικών πράξεων (χρησιμοποιώντας πολλές ειδικές τεχνικές, όπως πχ καθορίζοντας το επίπεδο σημαντικότητας /materiality) και η παροχή συμβουλευτικού έργου.

Στο παρόν άρθρο γίνεται αναφορά στη σημαντικότητα των δύο επαγγελματιών (λογιστή και εσωτερικού ελεγκτή) και στον καθοριστικό ρόλο που μπορεί να έχει η ποιότητα της εργασίας τους στην αξιοπιστία των οικονομικών καταστάσεων, αλλά και στη βιωσιμότητα των επιχειρήσεων όπου εργάζονται.

A Diagnostic Instrument for Performance Evaluation of Food Safety Management Systems

Dimitrios Kafetzopoulos

*Department of Business Administration of Food
and Agricultural Enterprises, University of Patras
2 George Seferis str., GR-301 00, Agrinio, Greece
tel: 0030.26410.74123 / fax: 0030.26410.74168
email: dimkafe@yahoo.gr*

Evangelos Psomas

*Department of Business Administration of Food
and Agricultural Enterprises, University of Patras
2 George Seferis str., GR-301 00, Agrinio, Greece
tel: 0030.26410.74123 / fax: 0030.26410.74168
email: epsomas@upatras.gr*

Abstract

The ISO 22000 standard is a Food Safety Management System (FSMS) that is recognized in the international food safety community as a worldwide guideline for controlling food borne safety hazards. Assessment of the ISO 22000 standard is a key element in assuring the effective management of food safety. However, the availability of a diagnostic instrument to assess the performance and effectiveness of the FSMS is rather restricted. There is no accepted approach or common methodology available to food safety practitioners, auditors or regulatory bodies. Therefore, the food sector needs an instrument to measure the effectiveness of FSMS. This paper proposes a model that investigates and evaluates the measurement variables that identify the effectiveness of a safety management system in the food supplement industry according to the ISO 22000 standard. This paper reviews various activities and previous reports that describe methods to select indicators that can be used for the purpose of identification of food hazards. The diagnostic instrument that propose this study provides a comprehensive checklist of crucial control and managerial activities. The basic assumption underlying this diagnostic instrument is that activities on a higher level are more predictable and better able to achieve a desired safety outcome. To achieve the above objectives, primary field data was collected through an empirical survey that was conducted among 175 food manufacturing companies in Greece, which were certified to ISO 22000 standard. After testing the assumptions of multivariate analysis, Exploratory Factor Analysis (EFA) and then Confirmatory Factor Analysis (CFA) were applied. This study reveals four-dimensional nature of the ISO 22000 standard objectives namely hazard analysis, traceability, preventive measures and food safety documentation. The proposed measurement instrument can be used by a food company as a self-assessment tool and a benchmarking tool to have indication about the performance of a FSMS. Moreover, the diagnosis can be used in quantitative studies to get insight in the effect of interventions on sector or governmental level. The evidence provided in this study helps also managers to realize the importance of ISO 22000 effective implementation. In doing so, suitable strategies can be selected in order for a food company to provide the necessary resources and support and develop the necessary policies, practices and procedures.

Keywords: Food safety management system, ISO 22000, Diagnostic instrument

Ευετήριο

Andreopoulou Z.	.....	38
Angelopoulos D.	.....	34
Beligiannis G.	.....	27,29
Bouranta N.	.....	20
Chalikias M.	.....	25
Charitakis G.	.....	22
Christodoulakis N.	.....	33
Delias P.	.....	26
Doukas H.	.....	31,34
Doumpos M.	.....	26
Drosos D.	.....	25
Giannikos I.	.....	39
Grigoroudis E.	.....	19,23,26
Hela D.	.....	11
Kafetzopoulos D.	.....	42
Kalohristianakis M.	.....	35
Karapapa V.	.....	16
Katsaragakis I.	.....	27
Kepaptsoglou K.	.....	35
Koliouska C.	.....	38
Konstantinou I.	.....	11
Kontogeorgos A.	.....	17
Kosmopoulos D.	.....	35
Kostoglou V.	.....	22
Koutsobinas T.	.....	10
Krasanakis S.	.....	15
Lemonakis C.	.....	38
Manolitzas P.	.....	26
Mantziaris S.	.....	9
Matsatsinis N.	.....	23,26
Mavrotas G.	.....	31
Mitropoulos I.	.....	12,39
Mitropoulos P.	.....	12,39
Pantouvakis A.	.....	15
Papadourakis G.	.....	35
Papathanasiou J.	.....	22
Papoutsis K.	.....	8
Patsiouras C.	.....	15
Pendaraki K.	.....	17
Ploskas N.	.....	22
Psarras J.	.....	21,31,34
Psomas E.	.....	18,40,42
Rozakis S.	.....	9

14th Special Conference of the Hellenic Operational Research Society
11th Meeting of Multicriteria Decision Analysis
«Agricultural Development and Rural Economy using Multicriteria Decision Analysis»

Sintori A.	.....9
Siskos E.	.....21
Siskos Y.	.....7,13,24,25
Solos I.	.....29
Spyridakos A.	.....7,23,24
Stavrou D.	.....37
Tasiou M.	.....40
Tassopoulos I.	.....27,29
Tsampra M.	.....20
Tsotsolas N.	.....7,24,25,33
Tyllianakis E.	.....32
Valiakos A.	.....13
Vasileiou K.	.....12
Vassos D.	.....14
Ventikos N.	.....37
Xenou E.	.....8
Xidonas P.	.....31
Yannacopoulos D.	.....7,24
Zisos I.	.....23
Zopounidis C.	.....38
Φίλος Γ.	.....41