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Multicriteria Decision Aid (1)

Minimizing Subjectivity Noise at Sea (Seafarers’ Axiology)

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Abstract: Evaluation process is widely used to assign values for the objects of a given attribute set. Attributes may be quality, performance, knowledge or efficiency and objects may be human resources, processes, suppliers or products. Value assignment is not enough. Measure is required. Measure is the isomorphic transformation of value in an axiology, ranking system (value and ordering). The proper crew axiology in shipping industry is a typical multi-attribute decision making tool and axiomatically is considered as one of the most significant key success factors. In this respect Shipping applies more or less sophisticated appraisal systems and based on them, attempts to find the proper officer for a specific activity among hundreds eventual alternatives. In this work we present the SEA (Seafarer Axiology) artificial intelligent appraisal system. The main novelties are: the incorporation of homo complexus non-linear thinking, the system transformation from one (attributes per seafarer) to two dimensions (and seafarer per attribute), the best fitted normalization method suggestion, and the utilization of group evaluation consensus degree. This innovative approach minimizes the subjectivity noise. The system is trained and recalibrated by extracting decision maker’s expertize using multi-attribute group preference techniques. The results of the implemented formal SEA two dimensional measurement model is presented and the concept of the traditional in use ranking systems withdrawal is proven

Keywords: Artificial intelligence, measurement theory, MADM (Multi-attribute decision making, TOPSIS: Technique of Ordered preference by similarity to Ideal Solution) Normalization

A Positive Mathematical Programming Model for Planning the Agricultural Production

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Abstract: The Positive Mathematical Programming (PMP) is used widely for the analysis of the social, economic and environmental effects of the Common Agricultural Policy (CAP). In this research, a PMP model was developed for the optimization of the agricultural production. The model applied to a sample of agricultural holdings that participated in the 121 measure "Modernization of agricultural holdings" of the Greek RDP 2007-2013 in the region of Central Macedonia. The PMP model achieved the optimum production plan and the main goal of the farmers, which was the gross margin maximization. The optimum production plan of the PMP model is also compared with the existing production plan.
Keywords: Positive Mathematical Programming, Optimum production plan, Agricultural production

Decision Support Systems in Marketing: A Literature Review

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Abstract: The Marketing Decision Support Systems (MkDSS), developed in parallel with the advances in computer technology, offer a variety of services such as to collect internal and external information and use them as input data in marketing models in order to support marketing decision makers or marketers. This paper explores the DSS in marketing by giving an emphasis on the integrated algorithms, methods or techniques, the technological capabilities and different uses, the systems’ functionality, etc. Indicatively, models like Consumer’s Purchase Decision, Consumer Behaviour and Satisfaction, Data Analysis, Multicriteria or Simulation techniques are some, which constitute the base of MKIS discrimination. In addition, application of artificial intelligence, neural networks, data mining, recommendation and forecasting are techniques incorporated into systems and may characterize them as either Expert, Knowledge-based or Intelligent Decision Support. Furthermore, MkDSS may be categorized in regard their functionality, as web-based or stand-alone applications, as supporting a single user or simultaneously many users, as multifunctional or not, as integrated with Information Systems or not, etc. In this framework, the undertaken effort is dedicated on the presentation and classification of DSS in marketing, as the key competitive business tools, according to a set of methodological and technological type of criteria.

Keywords: Decision Support Systems, Marketing, Artificial Intelligence

Criteria Weights Assessment through Prioritizations (WAP) using Linear Programming Techniques and Visualizations

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Abstract: Utilising linear programming techniques in order to estimate the criteria weights based on preferences of decision makers expressed in the form which is used in Simos method usually results in infinite number of optimal solutions bordered into a n-dimensional hyper-polyhedron. The barycenter used in the cases of low robustness cannot always considered satisfactory as far as the representation of the DM's preferences is concerned. This paper presents a revision of method presented by Siskos and Tsotsolas methods which on the one hand enriches the preferential information used in a friendly and comprehensive by the DM way and
on the other leads to the estimation of weights vectors with higher robustness. Also, a software module supporting this method was developed and embedded into the RAVI system. The WAP method is presented through an illustration example and is compared with the Revised Simos and The method of Siskos and Tsotsolas.

**Keywords:** Decision Support Systems, Multicriteria Decision Aid, Operational Research
Public Awareness on Renewable Energy Sources: a Case Study for the Piraeus University of Applied Sciences

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Abstract: Public attitudes towards renewable energy sources (RES) have positively changed in recent years. Determining factors are the rapid growth of energy demand, depleting fossil fuels resources and the negative effects of climate change. The purpose of this paper is to examine public perceptions concerning their knowledge on various forms of RES, understanding of RES advantages and RES contribution to improving life quality. Data was collected via questionnaires given to postgraduate, undergraduate students and personnel in the area of the Piraeus University of Applied Sciences. Research hypotheses were analyzed, according to the relevant literature. Factor analysis and cluster analysis were used for locating common groups concerning attitude on RES. Results revealed that there is a positive attitude towards RES, especially for the case of solar energy. Also the majority of the sample believes that RES can contribute in life quality improvement. On the other hand, most respondents declared that the major obstacle for RES expansion is lack of information which leads to public apathy. An interesting finding is that most respondents consider that investments in RES are difficult to be implemented by individuals.

Keywords: renewable energy sources, public acceptance, factor analysis

An Advanced and Integrated turn-key Solution for Smart Energy Cities

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Abstract: Smart Energy Cities constitute an emerging urban development strategy in Europe. It is aimed at assisting Smart Cities to exploit recent opportunities in technology and economy, in order to provide citizens with a better quality of life, while addressing urban energy challenges, such as climate change, shortage of energy resources and need for energy use optimization. In this context, the main aim of this paper is to present an advanced and integrated turn-key solution, addressed to any city authority that has as purpose to optimize the energy use in its premises.

The proposed solution integrates innovative ICT (Information and communications
technology) tools and methods, namely the SCEAF (Smart City Energy Assessment Framework) Tool for assessing the performance of the city or building, in terms of energy optimization, CO2 emissions reduction and energy cost minimization, a Decision Support System (DSS) that introduces a list of practical Action Plans for the city authorities, structured upon a number of inference rules, as well as Tracker web tool for assessing the theoretical potential for energy optimization and CO2 emissions reduction due to OPTIMUS DSS application. More specifically, its overall contribution is directly related to the following questions:
- How optimus is your city / building in terms of energy optimization?
- What is the potential of the DSS?
- What domains / Action Plans can DSS support in your case?
- What are the achievements after one year of application?

It should be noted that the proposed solution has the necessary degree of generalization, so as to be easily adapted to cities with different characteristics.

**Keywords:** ICT tools, Energy use optimization, City authority, Smart Energy Cities

**Air Traffic and Energy Consumption Management Methodology with Free Flight Aspects**

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**Abstract:** The insufficient air routes combined with the adverse weather and congestion to air sectors lead to economic, environmental and safety problems to political aviation in Europe. This situation creates negative aspects to airlines and airports, as well. Furthermore, according to recent studies over 40,000 daily flights are predicted for 2020, and therefore the current ATM system will not be able to handle this volume of traffic in an efficient manner. A new promising approach of solving these problems in the future consists of transforming the ATM system from an ‘airport-centered’ to an ‘airplane-centered’ system so it can: (i) increase safety and energy efficiency, (ii) support the free flight concept, (iii) distribute fairly ground – holding and air delays among the flights, (iv) minimize the volume of work of ATCs as an observer, (v) relax the existing distance limits between airplane since the human factor has been annihilated, and therefore, (vi) increase the air sectors’ capacity avoiding congestions and (vii) prioritize the airline preferences. Our attempt will be to develop a mathematical model for a support system for the free flight concept that will decrease the energy demands and fuel consumption of flights. We divide the problem into two sub – problems (upper and lower level) in order to decrease the computational efforts and the complexity of the air traffic flow management problem and to allow flexibility, supporting in the same time the free flight scenario.

**Keywords:** Air-Traffic Management, Integer Programming, Operations Research, Air Traffic Energy Efficiency, Free Flight
PS 1.3  9/6/2016 Thursday, 12:45-14:15, Room 3
Information Technology and OR

Optimal Assignment of Partially Collaborative Servers in two-stage Queueing Systems

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Abstract: We consider two-stage tandem queueing systems with a dedicated server in each queue and a flexible server that can attend both queues. We assume exponential interarrival and service times as well as linear holding costs for jobs present in the system. We study two models: i) clearing systems and ii) systems with arrivals. For these two models we study the optimal dynamic assignment of servers to jobs assuming partial collaboration with idling and preemptions allowed. We formulate the problem as a Markov decision process and derive structural properties of the optimal policy. Regarding clearing systems with larger holding costs in the upstream station we show that i) non-idling policies are optimal, and ii) for certain ranges of the parameters values, the optimal allocation strategy for the flexible server has a threshold-type structure. For larger holding costs in the downstream station we show that idling the upstream dedicated server is optimal when the number of jobs downstream exceeds a certain threshold. We also identify conditions under which the optimal policy always assigns the flexible server to the same station. For systems with arrivals we obtain similar structural properties of the optimal policy when there is no dedicated server upstream.

Keywords: Tandem queues, Flexible server, Dynamic programming

GIS-based Suitability Analysis using Fuzzy PROMETHEE

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Abstract: In order to support efficiently planning decisions decision makers are often dealing with complex and multifaceted decisions. They must ensure sustainable usage of the natural resources, economic development, to address socioeconomic issues and to achieve citizens’ consensus. Compromise solutions should be obtained aiming to balance conflicting objectives. During the last three decades the combined use of Geographical Information Systems (GIS) based tools and Multi-Attribute Decision Analysis methods (MADA) has emerged as a sophisticated decision process that provides significant advantages in the direction to overcome these difficulties. The above synergy provides a consistent framework for dealing with conflicting objectives, in structured or semi-structured problems, and at the same time allows the analysis to take into consideration the preferences of many stakeholders. Recent developments in both fields expand the abilities of the Boolean overlay procedures, which are supported by the commercial GIS software packages, to the consideration of decision criteria as well, in order to rank the acceptable locations according to their relative importance in satisfying the analysis objectives. The output of this procedure is the suitability index that is used for ranking the candidate locations according to the decision makers’ preferences. However, when it comes to raster-based suitability
analysis performance the concept of the GIS-MADA synergy is dominated by the performance of Weighted Linear Combination approaches. The latter is principally owned to technical limitations that arise when pairwise comparisons among the candidate alternatives is demanded in order to perform outranking relations methods such as ELECTRE and PROMETHEE. To overcome the above limitation a combined synergy of GIS and Fuzzy extension of the PROMETHEE method is proposed aiming to reduce calculations complexity. The proposed framework is implemented in a real world case study regarding the suitability analysis for the implementation of natural systems for the wastewater treatment in Thrace region. Natural systems for wastewater treatment seem to be strongly preferred in comparison to the conventional ones due to their ability in performing low cost effective waste water treatment. Finally a comparative analysis with other well established approaches is conducted to examine the efficiency of the proposed framework.

**Keywords:** Suitability Analysis, GIS, PROMETHEE, Fuzzy Logic

**Multicriteria GIS-based Wind Farms Suitability Analysis: Literature Review and Case Study**

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**Abstract:** The rise of both population and life standards worldwide resulted to the rapid increase of fossil fuels consumption which resulted to the release of tremendous amounts of greenhouse gases to the atmosphere and the rapid depletion of them. Therefore, many countries as well as the European Union are implementing policy frameworks to support sustainable development. The use of renewable energy sources instead of the conventional ones is in the core of policy actions and consists a field of great priority nowadays. Due to integral role of renewable energy sources in future energy consumption much research emphasis has to put in enabling the implementation of these technologies. However, it is recognized that renewable energy resources are not fully environmentally safe granted that they are associated with a variety of environmental impacts. Recent experience highlights that as major disadvantage the fact that they are not available at every geographic location. Their use is mostly advantageous at remote locations that often are of high ecological value. Thus, identification of preferable locations for the establishment of renewable energy system is a decision-making problem that requires evaluation of the available land in relation with economic and environmental limitations. Wind farms siting can be considered as a Multi Criteria Decision Making problem that consists of set of alternative locations and set of selection criteria. As a result the implementation of multicriteria decision analysis frameworks to the spatial context can significantly support strategic spatial planning. The current paper aims to present the framework for the development of a spatial decision support tool for wind farms site evaluation and selection. The paper at hand, through a comprehensive review of the literature and current Greek laws and legislations discusses in detail both criteria and the constraints implemented in wind farms site evaluation approaches. Criteria and constraints are classified to three main categories which namely are: environmental, socio-economical and technical-planning.

The proposed approach is implemented in Thrace region northeastern Greece enabling wind farms suitability analysis using GIS-based multicriteria evaluation of the examined area. At the first step constraints analysis is performed to obtain candidate alternative locations. Afterwards, suitability index estimations in GIS environment is obtained using Analytic Hierarchy Process. The proposed framework provides insights into the most feasible sites for a large geographic area based on user inputs, and can assist planning decisions of both wind
Wind Energy Investments Portfolio Formation using GIS and Integer Programming

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Abstract: The use of renewable energy sources instead of the conventional ones is in the core of policy actions and consists a field of great priority nowadays. Due to the integral role of renewable energy sources in future energy consumption research emphasis has been given in enabling the implementation of these technologies. Up to now the Renewable Energy Sector (RES) has become a driving force for a sustainable economy in the 21st century. Nowadays it is considered that renewable energy sector investments will play crucial role in the direction to overcome economic crisis worldwide. With respect to wind farms it is noted that during 2014 investment in EU was between €13.1bn and €18.7bn. EU’s wind power’s share of total installed power capacity has increased five-fold since 2000 from 2.4% in 2000 to 14.1% in 2014. Over the same period, renewable capacity increased from 24.4% of total power capacity in 2000 to 41.5% in 2014. Granted that it is inevitable that investment decisions in new energy generating capacity taken today will have an impact on Europe’s energy mix for the decades to come.

However, wind farms construction demands an in-depth evaluation while robust estimates must be provided to support investment and financing decisions. Estimations of the wind velocity should be followed by accurate and reliable estimations with respect energy production potential from a wind farm for every candidate location. Factors effecting economic viability of a wind energy project can be broadly grouped as site-specific factors, machine or system parameters, market factors and policy issues. The strength of the wind spectra available at the project site is one of the critical factors deciding the cost of wind generated electricity. Although the cost of the wind turbines can be considerably reduced by scaling up the system size, while economic life span of the turbine influences the cost calculations of wind energy systems.

The use of Geographical Information Systems (GIS) in renewable energy investments is valuable given their ability to support effective land management. Moreover their implementation can enrich significantly the performance of the traditional Capital Projects Evaluation Methods (CPEM) by providing physical data to the dimensioning process both quickly and accurately. Granted that a framework for wind energy investments portfolio formation is necessary in order to achieve time savings and to support efficient decisions. The paper at hand proposes such a framework that allows wind energy portfolio formation using GIS, CPEM and integer programming in order to simulate budget limitations. Finally the proposed model is illustrated through a case study in Thrace region north-eastern Greece.

Keywords: GIS, Investments Evaluation, Portfolio, Integer Programming
PS 2.1  9/6/2016 Thursday, 15:00-16:45, Room 1

Transportation

Business Analysis for the Optimal Place to establish a Mezcal Selling Business unit based on the Transportation Problem

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Abstract: In this work we use the linear programming methods to determine the best place to open an inclusive business unit dedicated to selling Mezcal, a traditional Mexican alcoholic drink. We analyze the situation as a transportation problem, solving it by using the simplex method and the Solver tool in Excel. The optimization problem considers three different cities from Jalisco, Mexico to establish the business unit: Guadalajara, Zapopan and El Salto. These cities were selected according to the target market which was established as people economically active in the range of 25 to 50 years old. The Mezcal can only be acquired from eight different regions in Mexico due to international regulation for the denomination of origin: Guerrero, Durango, Guanajuato, San Luis Potosi, Tamaulipas, Michoacán, Zacatecas and Oaxaca. From each region we consider only the most important brands of Mezcal. For solving the transportation problem we consider the shipment costs from three shipment companies. The optimization problem to minimize the transportation cost was done three times, one for each possible business unit in Guadalajara, Zapopan or El Salto. From the corresponding results and comparison of them we conclude which is the most suitable place to establish the Mezcal selling business unit. By using the optimal scenario we obtain a 39% utility margin when compared to benchmark business units for selling Mezcal.

Keywords: Logistics & supply chain management, Transportation problem, linear programming method, Simplex method, Solver tool

Vehicle Routing with Stochastic Travel Times and Service Reliability Aspects

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Abstract: This work studies the combined Vehicle Routing and Time Window Assignment Problem with stochastic travel times, where the time windows are assigned to customers in order to construct reliable and robust routes against the stochastic travel times caused by vehicle breakdowns, bad weather conditions and traffic jams. A two stage hierarchical solution framework is proposed. At the first stage, a routing solution is generated via an Adaptive Large Neighborhood Search metaheuristic algorithm, while at the second stage, the time windows are imposed to customers with respect to a given set of service restrictions. In addition, probabilistic chance constraints are introduced to attain a certain level of reliable service. Finally, various computational experiments are reported on well-known benchmark instances and the trade-off between routing cost and service reliability is examined.
Keywords: Vehicle routing, stochastic travel times, reliability

Branch and Price for the Mobile Targets Vehicle Routing Problem

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Abstract: We present a generalization of the vehicle routing problem which consists of intercepting non-stationary targets with a fleet of vehicles in order to bring them to a common destination. We propose a novel Mixed Integer Second Order Cone Program for the problem and exploit the problem structure using a Lagrangian decomposition and propose an exact branch-and-price algorithm.

Keywords: Vehicle Routing, Integer Programming, Branch and Price

Optimal Decisions in Pipeline Systems Development based on Multi-level and Multi-objective Spatial Price Equilibrium Models

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Abstract: Decisions on vast transportation infrastructure investments typically involve a number of components that have to be taken into consideration, related to economic, social and political elements. In this paper, optimal strategic decisions regarding the expansion of natural gas pipelines network are investigated, accounting demand-supply equilibrium conditions. In particular, optimal pipelines network design is analyzed as a bi-level mathematical programming problem, where at the upper level an authority aims to simultaneously optimize multiple objectives while at the lower level a competing natural gas market equilibrates in production levels, distribution plans and pricing policies. The objectives that are aimed to be optimized are reflecting competing economic performance, environmental impact and political stability (introduced in reliability terms), while the market organization is formulated as a spatial price equilibrium case. This analytical setup is composed by a mixed integer programming problem of optimal investment plans selection (upper level), which is constrained by a nonlinear market equilibrium model, additionally to budgetary and physical bounds. The proposed optimization paradigm belongs to the NP-hard class of mathematical programming problems and for this reason it is tackled by a suitable extension of Particle Swarm optimization algorithm able to stochastically approximate the Pareto Front of conflicting objectives and ultimately optimal investment plans. The application is tested on a reasonably simplified model of the European market for natural gas with 6 competing supply regions/fields and 5 demand economic areas. The results are providing a comprehensive illustration of the complexity involved in such transportation infrastructure investment planning.

Keywords: Pipeline Systems, Network Design, Multilevel Mathematical Programming Spatial Price Equilibrium, Multi-objective Particle Swarm Optimization
P 2.2 9/6/2016 Thursday, 15:00-16:45, Room 2
Management (1)

Incorporating six sigma Analysis in Customer Satisfaction Measurement

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Abstract: Six sigma approach has been well recognized as an important tool for continuous improvement and business excellence. It is a statistical concept that analyzes a process in terms of defects and can be used in order to measure the probability that companies can manufacture or produce any given unit of a product (or service) with zero defects. While many companies have adopted the concept of six sigma and zero defects in manufacturing processes few have extended it to customer satisfaction. Six sigma can be used to measure the number of dissatisfied customers (defects) and can constitute a tool for developing strategies to improve customer satisfaction. Since sigma level can be used as a measure of the number of dissatisfied customers, it can be assumed that there is a direct relationship between satisfaction ratings and sigma levels. However, higher sigma levels for certain attributes do not necessarily translate to correspondingly higher customer satisfaction scores, while some attributes with higher satisfaction scores may not have a very high sigma level. This can be due to the different importance given by customers to the satisfaction criteria or their expectations on a set of quality characteristics. The main goal of this paper is to incorporate the concept of six sigma analysis in customer satisfaction measurement by introducing the principals of Kano’s customer satisfaction model in order to derive important information for the selection of strategic actions. The proposed approach has been implemented in a real case study concerning the evaluation of customer satisfaction from Greek mobile service providers.

Keywords: Customer satisfaction analysis, MUSA method, Kano’s model, Greek mobile service providers

Improving Service Quality to local Communities via a Citizen Satisfaction Measurement: The Case of Skopelos Island

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Abstract: Citizen satisfaction represents a modern approach for service quality in local communities and serves the development of a truly citizen-focused management and culture. Measuring citizen satisfaction offers an immediate, meaningful and objective feedback about citizens’ preferences and expectations. In this way, service performance may be evaluated in relation to a set of satisfaction dimensions that indicate the strong and the weak points of a Municipality. The objective of this paper is to propose a model of citizen satisfaction for the Municipality of Skopelos based on five main satisfaction criteria: C.S.C (Citizen’s Service Centre), Municipal Roll-Registry Office, Cleanness-Electricity, Municipality Works, Home Help. These criteria are aggregated through an additive value function which is
inferred from a set of satisfaction judgements with the use of the MUSA multi-criteria methodology and software. A questionnaire was developed in both paper and electronic form which was distributed to local citizens, users of the municipality services. According to the findings of this research, the citizens of the Municipality of Skopelos seem to be satisfied to a large extent, either fully or partly, with the total of the provided services. However, there appeared some fields that need further improvements, such as cleanliness-electricity and Municipality works.

**Keywords:** Citizen Satisfaction, MUSA Methodology, The Municipality of Skopelos

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**Evaluating Activities to outsource following a Constructive Deviance Approach. A Case Study from Public Organizations**

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**Abstract:** Constructive deviance suggests that cases that positively deviate from the norms should act as best practices and provide organizations with evidence-based roadmaps for action. In this work, we adopt this paradigm to support the outsourcing decision for a group of municipalities. In particular, we focus on the building permits process, a process that commonly within Europe is a municipal responsibility. This is a rather complex process because it comprises hundreds of activities, in a great variety of sequences. That led five Dutch municipalities to open their data for the 2015 Business Process Intelligence Challenge (BPIC’15), hoping to receive elaborated insights about their process. One important question concerned the outsourcing of some of the activities. This work proposes a novel methodology to support decision making for that particular issue. We apply process analytics to check two hypotheses: If process flows differ within the categories (positive, normal) of cases, and if flow differences can actually recommend which activities should be outsourced. Initial results suggest that our methodology can provide valuable decision support, yet current work is limited to performance-wise elements.

**Keywords:** Process Analytics, Constructive Deviance, Clustering

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**E-Service Evaluation: User Satisfaction Measurement and Implications in Health Sector**

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**Abstract:** The study of the user satisfaction is one of the most significant issues of modern management. Modern companies, including hospitals, have recognized the importance of measuring satisfaction and have developed measuring procedures targeting at the immediate finding and improvement of their weaknesses. Furthermore, the modern competitive environment makes more intense the need of studying the clients’ behavior, in our case the patients’ behavior. It is of great importance, that by measuring satisfaction, companies and organizations have a clear view of their performance compared to the competition.

The target of this paper is the application of the multicriteria method MUSA (Multicriteria Satisfaction Analysis) to a study of users’ satisfaction of an e-appointment service of a Greek state hospital in Thessaloniki. Target of this method is to combine the preferences of a group of users into a mathematical function. The method assumes that the user satisfaction is reflected by a set of variables, which depend on the quality characteristics of the service or the product.
In the initial stage of the study, research was conducted in order to identify e-services provided by the Greek state hospitals. We ended up studying this particular service, as it is available to the public and therefore, it is easier to collect larger amount of questionnaires. In the next stage, the quality characteristics of the service were defined. Next, the questionnaires were designed in an electronic form and have been sent to the e-mails of the registered users of the service. The collection of the questionnaires is still in progress. The analysis of the questionnaires will be made using the MUSA method and software implementing the method. The results of this study will contribute to the understanding of the perceptions of the users, but also to the finding of the spots which satisfy the users and those which can be improved.

The need of using such methods is growing, as companies need tools which contribute to the rational decision making.

**Keywords:** MUSA method, user satisfaction, user satisfaction measurement, health sector, e-service
PS 2.3  9/6/2016 Thursday, 15:00-16:45, Room 3
New Developments and Applications

A Comprehensive Evaluation of Supplier Selection Approaches and Suggestions for Future Researches

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Abstract: Supplier selection is one of the most popular subjects of supply chain management studied by numerous researchers. Some researchers prefer to use one or a combination of few Multi-Criteria Decision Making techniques sometimes with fuzzy variations to solve this problem while some others prefer to use single-objective or multi-objective mathematical modelling approaches. In this study, we first determined the criteria which affect the supplier selection process. During this phase of study, we mainly benefited from the opinions of the experts in the field and from the relevant literature. We observe that there are both qualitative and quantitative criteria which affect this decision. This was one of the issues which make this problem difficult. Then, we have considered some other issues (e.g. lot size constraints, fast service options) about this problem and based on these issues we have defined the characteristics of an effective supplier selection approach. We compared the use of MCDM based approaches and mathematical modelling based approaches in terms of those characteristics and we observed that although both approaches have some of those characteristics, neither of them have all the necessary characteristics. Finally, we propose a framework that encompasses all these characteristics and conclude our study by giving suggestions for future researches.

Keywords: Supplier Selection, Demand allocation, Multi-criteria decision making, Mathematical modelling

Benchmarking Port Security Performance by Applying Fuzzy Inference System (FIS) to Key Security Performance Indicators (KSPIs)

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Abstract: The improvement of performance under the umbrella of safe operation remains as a top item in the agenda of the shipping industry. The aim of this paper is to present a framework using the Fuzzy Inference System (FIS) method to facilitate a semi-quantitative approach to port facility security assessment. The proposed method employs a set of key security performance indicators (KSPIs) proposed by designated authorities in the port facility security plan and assesses potential security threats in a two-level FIS evaluation. The outcome of this two-level process is a crisp value indicating the potential of each security threat to escalate into a security incident. The added value of this method comes from the ability of the FIS to aggregate risks with different units in security assessment, providing decision-makers with a significant tool to analyze different port security threat scenarios and identify efficient corrective measures taken to mitigate the potential risk.

Keywords: Fuzzy Inference Systems (FIS), Key Security Performance Indicators (KSPIs), Port Security Assessment
Ground Resistance Estimation using Genetic Programming

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Abstract: The objective of this paper is to utilize genetic programming methodologies for the modeling and estimation of ground resistance with the use of field measurements related to soil resistivity and rainfall. Grounding is important for the safe operation of any electrical installation and protects it against lightning and fault currents. It is important for a grounding system to have low levels of resistance within a whole year. The proper estimation of the ground resistance is useful from a technical and also economic viewpoint, for the proper electrical installation of constructions. Problems like lack of space or huge costs are encountered in most of the cases of electrical installations. In order to solve these problems during the last decades, several techniques have been developed and proper materials have been invented for reducing the ground resistance value and maintaining it at a low level. The knowledge of the attributes and the behavior of ground enhancing compounds are essential in order to made decisions that reflect in the functionality of electrical installation.

In this paper, we attempt to approach the problem of ground resistance estimation by applying genetic programming techniques in order to extract useful formulas from existing data corresponding to field measurements. Genetic programming corresponds to the construction of high-level auto-evolving code, incorporating solutions as tree-structure representations. The basic methodological steps adopted are the following: The problem is primarily treated with conventional techniques for locating the most relevant attributes and the appropriate sets of rainfall values for predicting ground resistance. Then we apply a genetic programming approach in order to acquire a generalized formula that best describes the given data. If the formula estimates satisfactorily the behavior of ground resistance, is treated further i.e. it is simplified for the improvement of readability and ease of handling. The final aim is the discovery of an appropriate formula for the characteristics of the system using a simple function set with terminal parameters of the system such as the rainfall amount. At the same time, the influence of genetic programming execution parameters is investigated in order to improve the effectiveness of the applicable algorithm.

Keywords: Ground Resistance, Soil Resistivity, Genetic Programming, Symbolic Regression

Financial Crisis and Inventory Management: Some Direct Quantitative Consequences

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Abstract: In this paper, we study the effect of the financial crisis on inventory management decisions. For this purpose, an inventory model with partial backlogging is developed, considering: 1) the supplier’s requirement for full or partial order prepayment, 2) the existence of budget limitations for inventory procurement 3) the manifestation of customer tolerance on inventory shortages due to reduced purchasing outlets. Closed form expressions for the optimal system variables are obtained, in order to minimize the total cost of the inventory system. Some special cases of the derived model are also examined. Numerical computations and comparisons reveal the serious impact that the financial crisis has on inventory management decisions.

Keywords: Crisis, Constraints, EOQ, Optimization
PS 3.1 9/6/2016 Thursday, 17:00-18:30, Room 1
Project Management and Scheduling

A Reference Model for Supplier/Customer Relationship Management in Construction Supply Chains

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Abstract: The transient nature of construction supply chains does not allow for long-term cooperative and trust building relationships between contractors and their suppliers and customers. The construction industry is characterized by very high diversity but in order to sustain improvement it needs to improve relationships between its supply chain members. In order to assist in the direction of beneficial cooperation between construction project actors, the concept of partnerships was introduced in the mid 90’s. The partnership concept suggested promised to help create an environment where teamwork would ensure better performance in construction projects and a healthier business environment. Despite the efforts to implement partnering, these mainly focused on the customer side of the supply chain and neglected the needs and opportunities presented by suppliers. Supply chain management was introduced to the construction industry in the late 90’s. It does not cancel out partnering, but builds on it in order to improve the efficiency of the construction industry even more. Regardless of the benefits that stem from the adoption of this new paradigm, relationships between construction supply chain actors still remain highly unaltered. This paper describes the functions of supplier and customer relationship management as part of a conceptual process reference model for the construction industry supply chain. In order to identify sub-processes, the REMEDY process reference model was adapted according to the state of the art of the construction literature regarding supplier and customer relationships. The proposed processes are described briefly and aim to provide a framework that will help managers in the construction industry to improve their performance through cooperation and trusting relationships with other actors of a projects supply chain.

Keywords: Construction supply chain, Supplier relationship management, Customer relationship management, Process reference model, Partnering, Construction industry

Financial driven Project Scheduling: A Dynamic Programming Approach

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Abstract: The present landscape in software industry with a plethora of software development in a wide spectrum of application areas, development platforms and deployment options leads to much shorter cycle time of applications and increased competition in allocating development funding. Thus, in many instances, the focus of software development scheduling practices needs to be shifted from the traditional approach of meeting market-entry target dates within budgetary and scope constraints, towards maximizing potential revenues associated with progressive product development and deployment. Traditional project scheduling methods such as PERT/CPM cannot adequately address these issues which are driven by financial mechanics.

In this paper we present a dynamic programming based approach in scheduling the development of a software product composed by self-contained units that create business value and can be deployed progressively (called minimum marketable feature). This approach identifies the optimum deployment sequence of all project units in a way that the present value of expected profits (revenue minus development cost) is maximized. Furthermore, the proposed allows for identifying alternative sequences during the course of the project development, once expectations of future earning are revised.

A comparison with previously presented algorithms within the framework of the Incremental Funding Method shows that the proposed algorithm outperforms them in both efficiency and effectiveness. The proposed approach provides means for software project managers to plan and react dynamically in setting optimum development scheduling sequences.

Keywords: Dynamic Programming, Project Scheduling, Incremental funding

Towards a Multicriteria Evaluation Approach of Projects' Selection and Efficiency Measurement

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Abstract: The evaluation of the projects' effectiveness are usually based on the assessment of the degree that the projects were implemented on time, within budget constraints and with the desired quality levels. This research work proposes an approach for the selection of projects' portfolio and the on-going assessment of its effectiveness based on: a) Multi Criteria Disaggregation - Aggregation approach, where the effectiveness of a project is linked not only to the cost, time and quality factors but also to the business strategic objectives and perspectives and b) in multi-objective (0-1) linear programming techniques, where a set of projects is identified taking into consideration the maximisation of the estimated multicriteria global values and the minimisation of the risk. Conditions related to the availability of the resources and the market competition are also taken into consideration.

An illustration example is used for the presentation of the proposed approach.

Keywords: Multicriteria Decision Aid, Multiobjective Linear Programming, Project Management, Evaluation
Resources Levelling Using Multi-Attribute Decision Models: Models Implementation and Case Study

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Abstract: Project scheduling is one of the most vital processes in Project Management. It is a widely discussed topic among academic and practical environments due to its importance and complexity. Manpower, machines, materials and equipment are used for the execution of project activities, which mostly have limited availability, adding constrains in project scheduling procedures. Project resources might exceed or fall short of the resource demand of project time horizon. This phenomenon causes issues for Project Managers, who are trying to properly allocate these demands in order achieve the best possible utilization during project lifetime. Resource leveling is classified among the biggest challenges faced by project managers as the success of a project largely depends on it. Given that the existence of peaks in the resource usage histogram is responsible for cost overruns, due to the necessary recruitment, dismissal and training of the personnel. Moreover issues arise regarding the efficient management of the available resources since large peaks correspond to the existence of fluctuations in the allocation of resources during projects life cycle or construction period. To address these issues resource leveling aims to provide procedures and frameworks that ensure the efficient management of resources to obtain smooth resource usage profiles. Basically these procedures attempt to identify activities that should be delayed to resolve resources overallocations under time and cost constraints. Given the existence of a variety of the available rules that should be followed by project managers during the prioritization of activities the paper at hand examines the implementation of five Multi-Attribute Decision Making models and their performance to the scheduling of a solar park project. Namely these models are Weighted Sum Methods, Analytic Hierarchy Process, PROMETHEE, TOPSIS, Ordered Weighted Average (OWA) and Hybrid Weighted Average (HWA). Finally the derived results are discussed in comparison with those obtained by the standard procedures of MS-Project.

Keywords: Project Management, Project Scheduling, Resource Levelling, MultiAttribute Decision Models
PS 3.2  9/6/2016 Thursday, 17:00-18:30, Room 2
Supply Chain Management

Risk-Identification Approach in the Steel Supply Chain for decentralized and proactive Risk Mitigation

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Abstract: Steel manufacturers are an inseparable part of several complex supply chain networks and deliver key resources for different manufacturing industries such as automotive, machineries and building companies. These various industries require customized steel products along with several business and branch-related supply chain requirements like in-time supply of products, individual transportation and packaging as well as high delivery quality. However, operating these complex supply chain network is accompanied by several operational risks - for instance transportation risks like adverse weather conditions, transportation route blockades and poor shipment quality. For competitive risk mitigation in future steel supply chain networks a decentralized risk identification corresponding to the 4th Industrial Revolution is required.

By integrating cyber physical systems (CPS) in supply chain networks, a large number of real-time data in different formats will be available and need to be consolidated. A framework is missing that supports an improved risk identification and mitigation process by linking the risks and CPS. In response to this challenge, a state of the art analyses of relevant supply chain risks will be consolidated in a catalogue and adapted to the requirements of steel supply chains. Afterwards a framework will be presented which correlates the identified supply chain risks, suitable CPS and relevant finance indicators. The framework enables not only to identify relevant risks and their potential impact on companies’ assets and working capital, but also gives advice how these risks can be registered in advance, monitored in real-time and by using of CPS also mitigated autonomously.

Keywords: Supply Chain Risk Management, Cyber Physical Systems, Financial Supply Chain Management, Steel Industry, Digitalization

Strategic Design of Cold Supply Chain Networks

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Abstract: The main objective of this study is to develop a set of features and parameters and evaluate their importance and effect in strategic design decisions associated with the cold supply chain network. The research is founded on the fact that globalization, modification of economies, rapid demographic changes and alterations in dietary preferences have led to the increased significance of cold supply chain. In a rising global market, the demand for temperature controlled food is rapidly growing in a vast majority of markets worldwide. Based on the foregoing this work focuses on the concept of cold chain logistics, its importance and network design features. Within the paper we have considered a comprehensive framework and review of previous research efforts that will assist us on the
following areas: (i) define main challenges and constraints facing the cold supply chain; (ii) emphasize factors affecting network design decisions for cold supply chain; (iii) propose issues that need to be considered in planning and operation of cold chain in order to reduce food losses and increase the performance of cold logistics.

**Keywords:** Strategic design, Cold supply chain, Network design, Logistics

**Truck Fleet Optimization in fuel distribution**

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**Abstract:** Energy is essential for the economy growth. In a developing world increasingly “energy hungry” countries are seeking for every available energy source of fossil fuels (like coal, crude oil, natural gas) or renewable resources (waterfalls wind, solar etc). The energy sector is a major business activity that provides jobs and profit opportunities in a wide spectrum of activities exploration, production, processing and transportation/distribution. The motivation of the current work was a call for proposals issued by a market/public actor in an Arabian country, aiming to optimize its truck-based fuel distribution fleet. Although for confidentiality reasons no actual data are provided, the pragmatic aspects of the system are presented for a hypothetical case that includes all pertinent elements (demands of small and big customers, tank trucks of various types, distribution hubs in selected country’s sites, system effectiveness in terms of cost and lean time).

The work focuses on the methodology and model proposed to investigate the transport and distribution problem by examining solutions for a number of scenarios that reflect different operating conditions and fleet truck configurations. The analysis will be based on formulating suitable mathematical programming problems and a combination of methods that have been used for network and facility location optimization, adapted for the specific problem.

**Keywords:** Fuel transportation and distribution, Truck fleet optimization, Facility Location and Service Problems

**The potential of Southeast European Ports of Adriatic, to offer Competitive combined Rail Services, in Relation to the Port of Piraeus, in the North Europe**

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**Abstract:** The investments of the Chinese company Cosco, one of the world’s leading providers of integrated container shipping services, in the port of Piraeus, has given to Greek Railways, the opportunity to develop/expand their services towards North Europe. The current paper, investigates the potential of the developing ports of Southeast European ports in the Adriatic Sea, to provide competitive combined-rail services. The analysis will try to quantify the effects of location it terms of total service time by forming a supply chain network covering the most important attractions/productions in the region and the network development (rail and road), developing a comprehensive decision support framework for policy purposes. Detail and realistic information on the current organization will be tested against an ‘optimal’ planning freight system for the region of Southeast region, offering the
benefits and threats for future investment schemes in this extremely competitive industry. **Keywords:** Combined rail services, Freight supply-chain, Southeast European ports
OR and Education

Training Teachers on the Use of Modern Assessment Techniques: The first Signs of Success

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Abstract: School education is being reformed as teachers apply modern pedagogical methods such as computer supported collaborative problem solving and inquiry learning for promoting the acquisition of "21st Century Life Skills", i.e. creativity, critical thinking, collaboration, and problem solving skills. A key success factor, often neglected mainly, is the use of state-of-the-art assessment strategies tailored to needs of the specific methods in order to better measure their impact on the improvement of children’s skills. Main reason is the lack of teacher training. In this paper, we present the design, the implementation and the evaluation of a teacher’s training seminar on the use of modern techniques for e-assessing students’ performance during Inquiry Based Science Educational (IBSE) scenarios. The purpose of the seminar was to train teachers on the design authentic inquiry learning scenarios within science courses, which will involve the use of several modern techniques and tools for ensuring an in-depth assessment of the students’ performance (quantitatively and qualitatively). This paper contains results from an evaluation study of the seminar, which were quite encouraging. The results showed that: a) teachers were able to produce their own well-designed inquiry learning scenarios which incorporated various modern techniques (such as assessment rubrics, concept maps, etc.) for formatively assessing students’ performance across the phases of the scenarios, and b) teachers were in favor of implementing IBSE scenarios in everyday school practice.

Keywords: Teacher training, Inquiry Based Science Education, Modern assessment techniques

Analyzing Students’ Preferences in Blended e-Learning Courses Using the Criteria Weights Assessment through Prioritization (WAP) methodology

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Abstract: Designing and developing learning activities for a course that combines traditional, face-to-face education, with distance learning turns out to be a complex and difficult task. Blended learning can offer better learning experiences provided that it effectively combines the best aspects of both "worlds". Greek academic institutions recently developed, in
response to the "Open Academic Courses" program, an extensive repository of open educational resources and courses that can be used complementary to the teaching in the classroom in an effort to improve the efficiency of the courses in higher education. This article has as pretext and builds on the effort that took place at the Piraeus University of Applied Sciences while it conforms to the following general question: "How do I develop engaging blended e-learning courses that successfully merge e-learning with traditional education?"

The assessment of the learner’s preferences on various learning activities that are offered in a course provides invaluable insights that can help the course designer/developer to determine which aspects of the learning activities require improvements. In this context the article presents a case study in which we attempt to analyze the learners’ preferences in a blended teaching model that was applied to the open undergraduate course “Introduction to computer science and programming” of the Business Administration Department of Piraeus University of Applied Sciences which was offered during the spring semester of the academic period 2015-2016. In the study we utilized the Criteria Weights Assessment through Prioritization (WAP) methodology from the domain of Decision Making, having as ultimate objective the improvement of the attractiveness and the effectiveness of the course. By utilizing the WAP methodology we were able to determine weights according to the learners’ preferences for each learning activity. Combining these weights of the learners’ preferences with Moodle’s log data, that was used in the class to support our mixed teaching model, we were given valuable feedback to evaluate and redesign the course’s learning activities.

**Keywords:** Weights Assessment through Prioritization (WAP), e-Learning Analytics, Blended e-Learning Courses, Analyzing Students’ preferences

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**Assessing Inquiry Skills in Classroom: An Empirical Evaluation Study**

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**Abstract:** Nowadays, Inquiry Based Learning model and particularly Inquiry based science education has been promoted by international reports (Rocard, 2007) to encourage motivation and engagement of students with science. In addition, this developmental model of learning has been established as a particularly effective pedagogical approach as it contributes drastically to the development and cultivation of inquiry skills (e.g. collecting - analyzing experimental data, forming hypotheses, etc) directly linked to the so-called Key Skills and Competencies or 21st Century Skills, such as creativity and innovation, critical thinking, problem solving and decision making, metacognition, communication and collaboration (teamwork) etc. (Griffin, McGaw, & Care, 2012)

The current paper presents in detail an empirical evaluation study of an original technologically supported learning scenario enriched with modern assessment techniques, which was implemented in Primary Education in Physics and it pertains to the section 'Electricity'. This specific intervention was aimed at cultivation and development of particular inquiry skills (critical thinking, developing hypothesis, carrying out investigation, forming coherent arguments, teamwork) evaluated by a combination of contemporary
assessments methods and techniques (self-assessment, peer-evaluation, rubrics, mind maps, scale). Furthermore, the particular learning scenario leveraged the added value of digital technologies (e.g. interactive simulations of the electronic platform “Photodentro”, mind mapping software, rubric making tools etc.) as a dynamic tool that enriched both, the learning and the evaluation process, and contributed to the maximization of the desired learning results, giving the students and the educators the opportunity to transcend from traditional to experiential learning process, design and assessment.

The current study aims at presenting thoroughly a) the development and implementation of a well-designed technologically supported scenario which is based on the inquiry based learning philosophy, b) the inquiry based skills that the educator expected to cultivate to their students and finally c) the multiple modern assessment techniques of the students’ performance that the educator utilized and the empirical results of the evaluation of these techniques in the classroom. The particular scenario was implemented by 75 fifth grade students of both sexes and three educators.

**Keywords:** Inquiry Based Learning, Inquiry Skills Assessment, Modern Assessment Techniques, Empirical Evaluation Study

### Identifying Defects in Learning Design through a Risk Analysis Process based on Learning Analytics

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**Abstract:** Learning design aims to devise approaches and tools to assist teachers/designers in planning educational events of various kinds, based on pedagogically sound criteria for the identification of learning objectives, appropriate learning strategies, assessment criteria, digital tools and media (Persico et. al., 2013). Identifying defects in learning design is not an easy task. Learning design is a goal-directed, problem solving activity that results in the creation of something useful that did not exist before as noted by Ertmer, Parisio, and Wardak (2013). They also note that design occurs in a complex conceptual space, which offers both opportunities that can be exploited and constraints that must be satisfied to achieve the desired effect. Moreover, Latour (2008) notes that “to design is always to redesign” that is reusing, augmenting, and improving previous designs. In such a context it is crucial to identify key points for reflection upon a design approach. In a technology-enhanced learning environment, learning analytics could provide the appropriate reflection that is triggered by data monitored during the learning process.

In this paper learning design is examined in the light of CADMOS approach principles. These principles highlight learning activity as a fundamental entity and define the relationships of the learning activity with other entities, such as actors, goals and resources. Any defect in any of these relationships should highly affect the learning design suitability. We propose that the risks factors should be traced in the view of these relationships. This paper suggests a way of generating indicators to identify risks factors within the previous context. In parallel manner, this paper sheds light upon a way of monitoring these indicators through learning analytics. Additionally, the paper focuses attention on a specific case study that has been conducted in the context of a specific e-learning course in order to stress on the generated
indicators in a more elaborate manner.

**Keywords:** Learning design, Risks factors, Risk analysis, Learning Analytics

**Scaffolding the Process of (co)creating, sharing and reusing Innovative Learning Designs**

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**Abstract:** When a novice teacher is designing a new learning unit or thinking about redesigning an existing one, help is needed with the orchestration of learning activities, the application of technology-enhanced learning strategies and/or (re)use of learning resources and services (Kali et al., 2015). According to Donald et al. (2009) a learning design “documents and describes a learning activity in such a way that other teachers can understand it and use it in their own context. Typically a learning design includes descriptions of learning tasks, resources and supports provided by the teacher”.

Although substantial research and development efforts have been performed in creating graphical tools that enable teachers/practitioners to produce learning designs, there are still limited publications about the way to train them how to enhance the collaboration of practitioners and reuse of learning designs and best practices (Bennett et al., 2007, Hernández-Leo, 2014).

Our research has been focused on developing a strategy to support the learning design process so that teachers/practitioners elicit, depict, reflect on, share their ideas and co-create during the learning design process. Cornerstone of the strategy is the CADMOS graphical design tool and a related virtual community that offers scaffolding during the complex process of (co)creating, sharing and reusing innovative pedagogical solutions that will be lead to re-usable learning designs of high quality. CADMOS is the only graphical learning design tool which guides a teacher through the process of creating a script of a technology-enhanced learning unit that can be exported to a Moodle-based environment for enactment (Katsamani & Retalis, 2011).

This paper presents the findings of our early trials of the strategy with a small group of pre & in-services teachers yielded some promising results. We have continued to trial and modify the strategy, as well as set up a social networking site to support its use.
PS 4.2  10/6/2016 Friday 09:00-10:45 Room 2  Data Analysis and Analytics

An EM Algorithm for Count Data Production Frontiers

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Abstract: This work examines the efficiency of the expenditure in Research and Development by firms into patents. More specifically, the number of patents is modeled via a mixed Poisson regression model where the log-link function is the linear predictor of the production function minus a positive inefficiency term that serves to shape the mixing distribution. According to the distribution function that is assumed for the inefficiency term, namely half-normal, exponential, inverse Gaussian and inverse gamma, the corresponding mixed Poisson regression model is presented. The maximum likelihood estimates for the proposed models are obtained applying the Expectation – Maximization algorithm.

Keywords: Production Frontiers, Counts, EM, Poisson regression

Models of Intergenerational Occupational Mobility

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Abstract: Intergenerational occupational mobility in Greece (data EU-SILC, 2011) is analyzed by applying a series of loglinear models on the corresponding mobility tables and by using conditional multinomial logit - discrete choice- models. The effects of gender, age and level of poverty are examined.

Keywords: intergenerational occupational mobility, loglinear models, discrete choice models

Probabilistic Evaluation of Advertisements Spreading

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Abstract: The case of moving sales (e.x by offering chocolates) is been examined. The range which a seller is existing follows exponential distribution. More over the range which product can be perceived from a client is another parameter which affects the probability of success. With the usage of Lagrange equations the optimization of the two parameters is investigated.

Keywords: Optimization, Lagrange equations, evaluation

Football Matches: Decision Making on Betting

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Abstract: The main idea relies on the specification of the score of a football match. Through the use of Poisson's distribution we calculate the probability of the final score in a football match and then we compare this probability with the values that three betting companies offer. Using the goals’ average for both home and away teams and the Poisson distribution, it is possible to make a decision which betting company is more profitable for the players. The case study of English championship is examined.  
Keywords: Decision Making, Binomial distribution, betting  

Banking Data Analysis using Differential Equations  

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Abstract: The purpose of this research is to investigate the possibility of applying mathematical theories of war models based on differential equations in a set of banking data. The mathematical models which will be applied in this research, will be based on 4x4 differential equations systems. Previous research has already proved that mathematical theories of war models can be successfully applied to business data as there are many similarities between the battle fields and the business competition. The examined models applications results will lead to the analysis of the competition between the four banks with the biggest market share in Greece.  
Keywords: Operations research, Differential equations, Mathematical theories of war, Banking data
PS 4.3  10/6/2016 Friday, 09:00-10:45, Room 3
Simulation Methods and Applications

A Simulation-Optimization Approach for Multimodal Multicommodity Service Network Problem under Uncertainty

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Abstract: The increasing growth of trade globalization leads to more complex transportation environment than the conventional road mode. To face this issue, the multimodal transportation, which can handle splitting several origin-destination demands among different platforms and some travelling modes, has been proved to be more cost-efficient solution. Thereby, it is more challenging to solve this NP-hard multimodal multicommodity service network problem which can be modeled as a variant of the discrete-cost multicommodity network design problem.

In this context, this paper presents preliminary work done on proposing a simulation-based optimization approach to solve this problem. Unlike most proposed analytical models, our simulation model can handle real-life considerations, such as uncertainty in demand and/or in travel times. Our focus is not only on the tactical scheduling of services, but also on their operational sequencing to routing plans which fulfill the demand. We have used meta-heuristic technique for optimizing the multicommodity flow through the multimodal transportation network. The results of numerical experiments are provided to demonstrate the robustness of our approach. Tests are carried out on randomly generated instances and real-world cases.

Keywords: Service Network Design, Uncertainty, Simulation-Optimization Approach

Assessing Market Power in an Electricity Market using an Agent based Simulation Model

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Abstract: The purpose of this paper is to illustrate how, in a restructured and privatized electricity market, power producers may identify and adopt optimal strategies to exercise market power due to congestion and affect the outcome of the day-ahead market. The market is formulated as a stochastic game with uncertain and inelastic demand while its outcome is determined in the long run using an agent-based simulation model. Producers, being the players of the game and aiming to maximize their profits, adopt greedy strategies over time given the private information that they possess while the market clearance is performed by a third party entity that solves the optimal power flow problem, namely the
Independent System Operator (ISO). Since it is assumed that producers adopt reinforcement learning, they are able to exploit the available profit capabilities by compiling a greedy action plan that conforms to the average reward they have identified by exploring the market formation. To demonstrate both the efficiency of the adopted R-learning algorithm and the exercise of market power, we use a six-bus power system with three identical production units to simulate the market outcome for three diversified versions of the power transmission grid. Specifically, we study an unconstrained version of the power transmission grid, which is considered to be the reference case since it exhibits the most competitive outcome, a version where all lines are constrained equally and an extreme case where each producer has accesses only to a single load.

**Keywords:** Market power, Agent-based simulation, Stochastic game, Reinforcement learning, Electricity markets

**Multi-agent systems for the simulation of maintenance and repair equipment service companies**

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**Abstract:** This report deals with the more efficient use of the available funds for the maintenance and repair of equipment, reducing the load on the staff. Investigated and analyzed the process of repair and maintenance and repair - service enterprise. The basic model objects and sets of functions that they perform. It uses agent-based approach to simulation MRO process. A conceptual and logical models MAS MRO process.

**Keywords:** equipment, maintenance, repair, maintenance and repair, methodical and software and information support of maintenance and repair, maintenance and repair methodologies, agent-based modeling, multi-agent systems

**Comparison of Enhanced Simulation Methods for Pricing American Options with Random Trees**

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**Abstract:** Many methods for approximating pricing of American style options have been proposed because the common dynamic programming approach can not be applied adequately to complex types of options or multi-dimensional problems due to the curse of dimensionality. Even though American options can be exercised at any time up to their expiration, thus the purpose is to find the value achieved by exercising optimally in continuous time, most of the computational approaches approximate American options via Bermudan options, by using discretization of the time interval to expiration into a finite number of periods.

Monte Carlo simulation is of great importance in the development of these methods. The general idea of the Monte Carlo method for pricing options is to create sample paths of the stochastic process of the underlying assets and from these paths compute the value achieved by exercising optimally. Different ways to generate the sample paths, the
dependence among them and how they are combined, correspond various classes of simulation methods.
In this talk we consider the random tree simulation method proposed by Broadie and Glasserman. Each simulated tree includes the trajectories of the Markov process which describes the states of the underlying assets. Even though in common Monte Carlo implementation sample paths are generated independently, a random tree does not contain independent paths, since from each node a certain number of successors is generated, all having the same law. At each node, one biased high and one biased low estimator are produced. Combining the estimates at the root, we obtain a confidence interval for the true price of the option.
We implement and compare several enhancements of the random tree method, in terms of computational time, the accuracy and reliability of the estimators. In order to improve the estimators of the true price, the tree nodes are generated using antithetic variables or Latin hypercube sampling. Although in a single dimensional problem, Latin hypercube sampling coincides with stratified sampling, in a multidimensional problem this is not true. We divide the interval [0,1] into n equal parts in every dimension and select n points at random from the resulting multidimensional cubes. We present numerical results for these methods and discuss the relative advantages and disadvantages of each.
**Keywords:** Option pricing, American option, Monte Carlo simulation, Dynamic programming
12:45 - 13:45    Invited Speaker
(Amphitheatre)  Athanasios Migdalas, Large-scale Nonlinear Programming for Network Flows and Big data Analysis

Abstract: We are concerned with the solution of optimization problems that arise in routing and trans- portation of information, people and goods in networks as well as in the analysis of large data sets. Even though such problems may arise in different applications they share common characteristics with respect to scale, information detail, and data collection, and, moreover, they are typically formulated within the corresponding frameworks of flow optimization and machine learning as structured convex problems of nonlinear programming. It is important that the solution algorithms are able to utilize any inherent problem structure in order to provide scalability through decomposition subject to parallel and distributed realizations. That is, a number of smaller and easier optimization problems, the subproblems, are solved in order to compose the solution of the original problem. Within this presentation, we derive several convex optimization decomposition procedures for decentralized, centralized and even sequential coordination of the subproblems and apply them to solve very large scale network flow as well as massive data analysis problems. Our approach builds upon components such as partial linearization, regularization, and improvements of the classical Frank-Wolfe method.

Keywords: non-linear programming, convex optimization, proximal point method, linearization methods, partial linearization methods, decomposition, regularization, network flows, big data analytics,
A Multiple Criteria Approach Using ELECTRE for the Selection of Maintenance Strategy in Manufacturing Companies

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Abstract: In manufacturing companies, equipment maintenance is a significant contributor to the total company’s cost, so having an optimal maintenance strategy in terms of cost, equipment downtime and quality is an important efficiency enabler. Maintenance is related to all the processes of a manufacturing firm and focuses not only on avoiding the equipment breakdown but also on improving business performance, for instance in terms of productivity and elimination of malfunctions. Various maintenance strategies have been examined and recommended in both the academic and industrial realms in an effort to develop a holistic approach for maintenance management, which enables reactive, preventive and proactive maintenance decision support. However, the selection of the most appropriate maintenance strategy for a manufacturing company is still a challenging task, since different maintenance strategies should be applied according to the type of industry and its unique requirements, while there is no absolute agreement in the literature about the types of maintenance strategies. Consequently, there is the need for an approach supporting the selection of the most appropriate maintenance strategy taking into account the most recent advances in maintenance management theory, technology and information systems in terms of the alternatives and the selection criteria. This paper outlines a multiple criteria approach in the frame of ELECTRE method for the selection of equipment maintenance strategy in manufacturing companies to support manufacturers in choosing the most appropriate one according to the company needs, capabilities and requirements. The ELECTRE I method is applied on the basis of the alternative maintenance strategies and several selection criteria derived from an extensive literature review in the field of maintenance as well as from interaction with industry domain experts. The paper illustrates the methodology in two real industrial scenarios: an oil and gas industry and an automotive lighting equipment industry scenario. The proposed approach is proved to be beneficial since it supports the company’s management to decide about its maintenance strategy and potential investments to new equipment in order to reduce downtime and therefore, to decrease costs. It can be applied in every manufacturing company that aims to decide which maintenance strategy should implement, while the consistent family of selection criteria can be enriched based on the interaction of the analyst with the domain experts.

Keywords: Multiple criteria, Maintenance strategy, ELECTRE Method

Evaluating Efficiency in Retailing Branches based on DEA Method

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Abstract: Evaluating the performance of super market branches has been a subject of growing interest in recent years. The aim of this study is to develop a performance model for measuring the relative efficiency and potential improvement capabilities of super market branches by identifying their strengths and weaknesses. The methodology applied is based on the non-parametric technique of data envelopment analysis. Data envelopment analysis clearly brings out the branches that are operating more efficiently in comparison to others, and points out the areas in which poorly performing firms need to improve. In addition within this performance-evaluation framework, we developed the ability to identify different potential groupings of branches that supported the multiple user views of the system.

Keywords: Data Envelopment Analysis (DEA), Linear programming, Retailing, Efficiency

Comparing Hospitality Innovation Strategies: New Service Development using Multicriteria Analysis

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Abstract: The main purpose of the study is to highlight the new service development as a key determinant of diversification strategy in the hospitality industry. Researchers conclude that hotel managers should enhance the innovation culture in hotels in order to foster innovation of offered services. They need constant innovation to hotels for achieving competitive advantage, because when a hotel manager offering a new service, many changes will probably happen in the market. In difference to other similar works, the identification of critical success factors in this study was attempted with the use of multicriteria methodologies. Data was collected using in depth structured and questionnaire-based interviews with hotel managers in a representative sample of hotels in Central and Easter Macedonia. Finally, the paper aims to justify the validity of the adopted model as a general approach that predicts the success of a new hospitality service based on a set of critical factors, while comparing the different geographical areas included to the sample.

Keywords: New service development strategy, Service innovation, Greek hospitality services, Multicriteria decision analysis, Critical success criteria

A Taxonomy of Barriers to Entrepreneurship

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Abstract: Entrepreneurial intention is a major factor for the prediction of entrepreneurial activity according to academic research. Intention refers to the individuals will to become self-employed, which consequently determines the possibility of actual entrepreneurial startup. Entrepreneurial intention, is extensively investigated, with a growing number of articles approaching the subject both from theoretical and experimental perspectives. However, the constraints and barriers to entrepreneurship, act against ones intention, making the realization of the intentions into entrepreneurial action, difficult or even
impossible. Actual constraints faced by the entrepreneur during the startup and the development of the firm, as well as, perceived barriers faced by the prospective entrepreneur (i.e. student want to be entrepreneurs), impede the decision to engage in entrepreneurial activity. In our literature review we came up with a variety of barriers and views depending on the discipline of each author. Much light was shed upon the factors affecting the entrepreneurial intention. However, along with the minor controversies upon the significance of certain factors, there is also evident lack of a unique and systematic categorization of these barriers. Our objectives are, to review the barriers to entrepreneurship introduced in the literature and examine the significance of each factor. Finally, the aim of this article is to introduce an interdisciplinary taxonomy of barriers to entrepreneurship, in order to provide future research with a unified classification and terminology.

Keywords: Taxonomy, Barriers, Constraints, Entrepreneurship, Entrepreneurial Intention

Comparative Assessment of an Engineering School using Clustering & Multicriteria Analysis Methods

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Abstract: The academic assessment constitutes a topic of major interest both for research purposes and for the applied policies in higher education, as it is related with the quality of teaching, the continuous improvement of educational process and the response of graduates to social needs.

This paper presents an original study focused on the internal assessment process of an Engineering School, in which undergraduate students have participated. The specific survey is applied every year since 2002-03 till today. The total collected data is around three and half thousand replies. Therefore, this study elaborating with eleven years data, presents the results on an annual basis as well as on a comparative one.

In the frame of the study, the year by year trends and variances are examined and analysed. In addition, yearly results are compared to external factors that may influence undergraduate students’ preferences. For this purpose, non-parametric statistical tests and clustering techniques are applied.

The applied methodology for analysing annual data is based on the principles of multicriteria analysis and more specific on the multicriteria satisfaction analysis of undergraduate students by using the MUSA method. The most important results of the multicriteria analysis are the assessment of the critical dimensions that affect satisfaction, the global as well as the partial satisfaction indices on the set of criteria under exploration, the weights of each dimension and the proposed dimensions for further improvement.

Keywords: Academic Assessment, Engineering Education, Students’ Satisfaction, Multicriteria Analysis, Clustering Analysis
Two new Indices for the Evaluation of the one-dimension Cutting Stock Algorithms

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Abstract: Two new indices are proposed for the evaluation of the algorithms used to solve the one-dimension cutting-stock problem.

The one dimension cutting-stock problem is how to cut one-dimension material of standard length (called profile) into pieces of specified length with the minimum material waste. The one dimension cutting-stock problem has many applications in the industry. In this paper we examine the problem in the context of the custom-made doors and windows industry.

The algorithms used to address the one-dimension cutting-stock problem take different approaches in respect to the way (a) the remaining of the profiles are treated and (b) the pieces to be cut are selected, as explained next.

In the standard cutting approach, the material that remains at the end of the cutting (the left-over) is considered as waste. A variation of this problem that may be worth considering in the custom-made doors and windows industry, utilizes useful left-overs, i.e. left-overs longer than a pre-specified size are cut into pieces of required sizes. The usage of useful left-overs reduces the material waste, but on the other hand, introduces extra cost due to the handling they require: the useful left-overs have to be temporarily stored in and consequently selected from a storage area close to the cutting work center.

The set of pieces that are selected to be cut may be formed in various ways. In the simplest case the pieces to be cut are those that form a single window or door. In this case, there is always only one unfinished door or window in the assembly area. Mixing pieces of different doors and/or windows reduces the material waste, but introduces extra cost and increases the number of unfinished doors and windows that are present in the assembly area.

In this work we present two new indices that are used for the performance of the cutting algorithms that utilize useful left-overs. More specifically, we introduce an index related to the number of useful left-overs that are temporarily stored and an index related to the number of unfinished doors and windows. Both indices take values in the range (0, 1), in order to provide results comparable across different algorithms. The formulae that compute the two indices are shown, their proofs are given and their values for real data of an existing door and window manufacturing facility are calculated.

Keywords: one-dimension cutting stock, cutting algorithm, custom-made doors and windows

Efficiency of Tourist Airports and Influencing Factors: An Assessment of Airport Performance Measurement Techniques

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Abstract: Growth of air transport has over the past few decades increased economic
welfare, providing long-term benefits to the society as a whole. In a context of intense global market competition, airport managers and governments pay special attention to the measurement of airport performance for a number of reasons, including the assessment of financial and operational efficiency, the evaluation of alternative investment strategies, the monitoring of airport activities from a safety perspective, and the mitigation of the environmental impact. Focussing on managing tourist airports, performance evaluation has become an important means by which airport authorities can identify weaknesses and improve efficiency in order to attract, or even create, demand and develop strategies for reaching short and long-term goals. There is no consensus among airports on what the best management tool on decision process is in order to obtain evidence of the situation within the sector. As a result, different airports have explored various strategies to maximize efficiency or productivity in regard to operation and resource utilization.

In order to evaluate efficiency and productivity, various studies have adopted quantitative methods, relying on numerical and secondary data and have formulated production functions using econometric techniques and advanced efficiency analysis tools. This paper takes a methodological perspective and deals with the assessment of the determinants that are associated with variations in airport business and operation, which affect the decision process for passengers and tourism development. To achieve this, a structured review of published airport performance evaluation literature for the last two decades is summarized. By analysis of the airport strategic goals and capabilities, the definition of the airport efficiency is given, and the broad range of performance variables present in the literature is exhibited. Additionally, based on literature review, the paper aims to present the methodologies frequently used in measuring airport efficiency in order to outline their differences and highlight the limitations. Finally, assessment of the impact of airport management characteristics on efficiency is discussed providing key messages and conclusions to decision makers, regulatory bodies, governments, airport managers and researchers in field of transportation, planning and management.

**Keywords:** Data envelopment analysis, Benchmarking, Logistic and Supply chain management

**Assessing the Predictive Ability of a Market’s Order Book. A Study on Sports bet Exchange.**

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**Abstract:** Many financial investment companies, particularly in the mid-2000s started to invest more capital in “High Frequency Trading” research and development. Although there are many ways that enable a company to predict short-term, relatively small, but violent movements in the price of a financial instrument, one of the most prevalent is the “Order Book Theory”. Taking advantage of these movements can result in almost risk-free, high Return on Investment trades. According to “Order Book Theory”, excess buy or sell orders of an instrument, alert traders that its price may increase or decrease, due to buying or selling pressure. Identifying order book imbalances, may lead us to an identification of the market’s short-term direction, in the next few seconds. Contrary to investors’ beliefs, existing
literature argues that in financial stock markets it is almost impossible to achieve prediction of prices’ movements, due to the size of the market, the great liquidity and the existence of “dark pools”. In this paper, we try to investigate the “Order Book Theory”, by implementing an empirical study on a sports betting market, following similar attributes with financial stock market, although characterized by less liquidity. By researching existing literature we concluded that "Sports bet-exchange markets" is a satisfying alternative, in order to investigate “Order Book Theory”, as the liquidity and volatility of the exchange prices approximate, although in smaller economic scale, those in financial exchanges. As a result, our empirical study is based on high-frequency data from bet-exchange markets, specifically in horse racing. Our research aims to examine the possibility that “Order Book Theory” is valid and its application to an exchange, in order to predict upcoming, short-term movements of the instrument being traded.

Keywords: market order book, high frequency trading, sports bet exchange, price prediction

Robust Methods in Stochastic Location Models: Evidence from Primary Health Care Network Planning

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Abstract: Robust methods in stochastic location models: Evidence form primary health care network planning. In this paper we present a location allocation model to provide options for configuring the system of primary health care focusing on the location of health services and the allocation of residents among a predetermined number of health centers (HCs). Our aim is to develop a modeling framework that comprises the uncertainty aspects of patient flows in the location of health services. We consider a discrete type of uncertainty where uncertainty is represented by a finite set of scenarios.

We then introduce a stochastic location-allocation model that captures the uncertainty associated with the patient choice in service selection. The stochastic facility location model is formulated as a two stage problem. The first stage problem determines the location decisions and the second-stage defines the allocation decisions that are scenario dependent to contain the uncertainty factors. The main idea of this approach is that: since we cannot anticipate the future, we look for the location decisions that are expected to perform well across all allocation scenarios.

In order to analyze the stability of the solutions obtained from the stochastic model we propose the following three alternative approaches to resolve uncertainty:
1) minimizing the average expected cost over all scenarios
2) minimizing the worst-case performance
3) minimizing the maximum regret

These approaches are employed as robustness measures to compare the results and make value judgments. By performing computational analysis, we analyze the changes in the solutions considering the three different approaches that resolve the uncertainty in a case study for reorganizing the network of 33 HCs operating in South Greece.

Keywords: Location models, Uncertainty modeling, Stochastic planning OR in health services
Determinants of the number of affected victims caused by an 
earthquake in Metropolitan Lima and Callao and contrast of response 
measure through Integer Linear Programming Models for goods 
distribution for humanitarian aid.

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Abstract: Regarding physical geography as an explaining factor of vulnerability, according to 
the Geophysical Institute of Peru (2014),1 up until September of last year, there were 178 
earthquakes registered on Peruvian territory, 9% of which occurred in the city of Lima, 
where 28.4% of the Peruvian population lives (INEI, 2014).2 
The last strong earthquake that affected the country occurred on August 15th, 2007 and 
revealed the lack of stock capacity the warehouses managed by the National Institute of 
Statistics and Computing had. These warehouses proved to be inefficient in supplying people 
greatly affected by the earthquake and in a critical state of emergency, mostly because of 
the lack of an inaccurate stock of goods.3 
Our investigation aims to identify what are the significant variables that determine the 
number of victims and estimate it, due to a possible earthquake of 6.5 or more in Lima 
Metropolitana y Callao. Once we estimate this number, we will design models through linear 
programmation, in collaboration with INDECI, State Government Entity of Civil Defense in 
charge of I in order to have a solution which give alignments that contribute to ameliorate 
the organization and capacity of responsiveness of entities involved in the crisis system 
management of Lima Metropolitana and Callao. 
The main results of this paper were: 
- Detailed diagnosis of the actual situation of Crisis Management Plan of Natural Disasters in 
Lima Metropolitana y Callao (focus mainly in Callao) to identify the opportunities in the 
actual plan in order to increase the effectiveness in responsiveness after an earquake 
happens, specifically in the fast distribution, in collaboration with INDECI, State Government 
Entity of Civil Defense 
- A multivariable model that identifies the significant variables that explain and estimate the 
number of victims due to an earthquake in specifically the region of Lima Metropolitana and 
Callao. 
- A linear program model designed through Lingo Operational Research Model Program, 
which determines an effective distribution of emergency kits for humanitarian help, in order 
to increase governments’ ability to response 
- Simulation, comparison and analysis of results in two specific scenarios: I) according to real 
capacity and Governmental restraints they have nowadays. II) according to the best estimate 
of number of victims and the optimum proposal for Callao. 
Keywords: Multivariable model., Vehicle routing & logistics imeplementation., Humanitarian - 
logistic aid operational research.
Retail Category Management: The Development of a Category Optimization Model

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Abstract: Despite the longstanding recognition of its importance, no dominant methodology for Retail Category Management exists and scientific models address only some of the factors that make assortment, shelf space, and inventory planning problems so challenging. Current shelf space allocation models do not clearly and comprehensively address assortment selection, neglect substitution effects between products, and ignore the stochastic nature of demand. On the other hand, assortment planning models mostly ignore shelf space constraints and neglect space depend demand. We propose an innovative approach by integrating assortment, shelf space and inventory planning problems. We consider a single product category (or subcategory), consisting of different products and, as in most of the literature in joint assortment and inventory planning, a single inventory cycle, assuming that prices and other marketing effects are stationary during each cycle. Our approach also combines the classic assortment planning models with the space elasticity effects of a higher number of facings. The main contribution of this paper is the development of a practical and flexible tool that may help retailers in finding optimal assortments to maximize their expected profit. We apply our model at a supermarket chain in Crete, Greece and compare the recommendations of our model with the existing assortments.

Keywords: Retailing, Assortment planning, Self space allocation, Inventory planning, Decision support systems

A Review of the Hadoop Ecosystem exploring the TFOCS Optimization Solver utilizing the Data Processing Engine of Apache Spark

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Abstract: The volume of data generated by different types of sources such as social media networks, financial transactions, books, video even any kind of sensors are increasing exponentially in terms of their volume, variety and velocity. In general, various mathematical optimization models can be applied leveraging common optimization algorithms in order to better analyze large scale problems. Hadoop is the prime platform which is capable of storing and processing this kind of data, mainly consists of the HDFS distributed file system and MapReduce programming environment. It is well-known that parallelization and distributed file systems can lead to important reductions in total computational time. More recently, clusters of commodity computers have become widely used. Nowadays, there are
alternative ways to run a Hadoop cluster utilizing the virtualization technology. In this paper we investigate how optimization solver TFOCS (Templates for First-Order Conic Solvers) can run on a Hadoop Cluster, comparing and evaluating advantages but obstacles also. Hadoop cluster leverages this distributed data infrastructure to scale to larger problems without the obstacles of storage and memory resources limitations over a single processing node. We review the main features of the most recent version of the Hadoop ecosystem including the data processing engine of Apache Spark exploring ways to scale to larger problems running optimization solver TFOCS with the intention of evaluating the outcome implications in regard to how optimization problems can benefit from it.

**Keywords:** Hadoop, Spark, TFOCS, HDFS, Optimization, Virtualization

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**A Goal Programming Model for Sustainability Analysis of Biomass Plants**

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**Abstract:** Energy production from biomass using forest products and industrial crops is a challenging task due to scheduling constraints that satisfy environmental sustainability and seasonal demand. The quantities that are produced (forest residues and agricultural industrial crops) must be stored in warehouses in special conditions (temperature and humidity) so as to be used as inputs in biomass plants for power production. However the selection of the location of biomass plants is not only based on the financial criterion as the environmental and social aspects should be also considered in the analysis. In this work a multi-objective optimization model is proposed which offers decisions regarding biomass scheduling, optimization of collection, transportation and warehousing biomass quantities. The resulting formulation is a Goal Programming Mixed Integer Linear Programming model for the selection of location biomass plants and scheduling of biomass quantities under financial, economic and environmental goals.

**Keywords:** Renewable Energy, Sustainability, Goal Programming, Mixed Integer Linear Programming
A Multicriteria Decision Support System for Evaluating Urban Development Proposals: The Case of Athens’ Hellinikon Airport

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Abstract: The development prospects of the former airport of Hellinikon are of extreme interest recently since they are directly related to the recovery of the Greek economy. Motivated by the sustainable utilization of Athens’ Hellinikon airport, this paper outlines a multicriteria methodology to assess five alternative investing proposals for the development of the urban site. Since local policy makers are considered to be the stakeholders, the implemented evaluation method consists of several criteria that are based on three main categories, Economy, Environment and Society. The investing proposals diversify on the base of both the usage mixture and the estimated budget. The criteria selected and used represent relevant, controllable and measurable elements and could be used as sustainable development indicators. A questionnaire is designed to gather information from stakeholders to evaluate the degree of influence of each indicator in the selection of the proposals. In the decision support methodology proposed, each stakeholder is able to evaluate every proposal in a personal way according to its scoring on the consistent family of the evaluation criteria. For the successful implementation of the multicriteria analysis, various data about the proposals are estimated or retrieved such as the discounted cash flows, the generated employment and the fiscal multiplier factors. The estimations are based on common assumptions for all scenarios. Finally, the alternative proposals are assessed by means of various scenarios considering different weights for the criteria in order to verify the feasibility of the approach.

Keywords: Multicriteria decision analysis, Urban development, Decision Support Systems, Project selection

Development of a Spatial Decision Support Tool for Reviewing Accessibility

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Abstract: In the modern society connectivity is the basis for economic
Competitiveness, social and regional cohesion and cultural development. Considering a worldwide tendency, transports are growing at a rate that saturates the capacity, resulting in mounting congestion and delay. This paper deals with the assessment of the ground access performance for a region or a specific destination/origin generates or accommodate demand. By a bottom up analysis a tool to support decisions on optimal transport option selection is developed based on spatial transport and economic data providing results on efficiency, attractiveness and sustainability. The application provides results from research in different regions in Greece and Europe providing comparisons, key messages and recommendations to planners, managers and decision makers.

**Keywords:** Logistics and Supply chain management, Decision Support Systems, Spatial Economics

**Reducing Energy and CO2 Emissions at the City Premises: A Decision Support System for Local Authorities**

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**Abstract:** Cities are expected to play a key role in the implementation of Europe 2020 and its flagship initiatives, as well as to address climate and energy challenges using technologically innovative approaches. Taking into consideration that city authorities represent the closest administration to the citizen, they need to lead relevant actions towards energy-efficient neighborhoods. The main aim of this paper is to present a Decision Support System (DSS) addressed to city authorities, so as to optimize the energy use in the municipal building sector (and its interaction with the energy systems) and achieve significant reduction of CO2 emissions. The proposed DSS combines a series of components, as follows:

- **“Data Capturing Modules”:** These are modules that capture data from the sources and send it to the semantic framework. A module has been developed to gather data from each source (weather conditions, buildings’ energy profiles, feedback provided by occupants, energy prices and energy production).

- **“Semantic Framework”:** It consists on the communication system, based on Semantic Web technologies, which facilitates the transferring of data from the distributed sources and the subsequent contextualization of the raw data in specific contexts.

- **“DSS Engine”:** The goal of the DSS Engine is to propose specific Action Plans to the end user. To do so, the intelligent rules have to be fed with predicted, real-time and static data.

- **“DSS Environments”:** The proposed DSS has three environments for different kinds of users, namely the end-user environment for energy managers of the buildings to visualize monitored data and the action plans, the management environment for technical users to setup the DSS and a data portal environment for citizens and third-parties to navigate through the data.

The proposed DSS will provide support to decision makers at the city level (i.e. energy managers), taking into consideration the influence of a broad variety of energy-related and other data available, in order to devise short-term strategies to achieve a significant
reduction of energy consumption in the selected city premises.

**Keywords:** Decision Support System, Data Capturing, Semantic Framework, Intelligent rules, Energy reduction, Energy managers, Smart City

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**Strategic Information Systems Planning: SMEs Performance Outcomes**

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**Abstract:** The environment has become more complex and customers’ needs are changing continuously. Businesses are required to respond to these changes. Information Systems and Strategic Planning contribute in this effort. Information Systems are linked to business strategy, skills, management, decision making and create competitive advantage. The concept of Strategic Information Systems Planning has preoccupied researchers since 1970. Strategic Information Systems Planning aims to support the objectives and strategy of the organization, through Information Systems. Also, Strategic Information Systems Planning aids businesses to innovate, create new products, reduce costs and enhance relationships with customers. The process of Strategic Information Systems Planning includes phases, which are strategic awareness, situation analysis, strategy conception, strategy formulation and strategy implementation planning. Several studies have examined the effect of these phases on Strategic Information Systems Planning success. Other studies have shown that there is a positive relationship between Strategic Information Systems Planning and firm performance. Unfortunately, surveys that have linked the concept of Strategic Information Systems Planning with firm performance have been presented by a theoretical approach. Consequently, the aim of this paper is to investigate the effect of Strategic Planning Information Systems phases on firm performance, to highlight phases that contribute to a greater extent on firm performance and to draw conclusions for the improvement of the process in Greek SMEs which constitute the main component of Greek’s economy. A conceptual model is proposed and describes the research design process, which is followed in order to achieve this aim. Data are collected using questionnaires to Information Systems executives in SMEs, particularly in North Greece. Data are going to be analyzed using SEM analysis. All variables are measured in a 5point Likert type scale. The questionnaire included variables related to Strategic Information Systems Planning phases and firm performance.

**Keywords:** Strategic Information Systems Planning, business strategy, firm performance, Information technology, structural equation modeling
Supporting Change Management using Multicriteria Analysis Approaches and Balanced Scorecard Method

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Abstract: The change management in business requires continuous monitoring of the changes' progress, evaluation of the current situation and identification of interventions to effectively address problems or divergences. This research work proposes a methodological framework for assessing the current situation of enterprises and identify the necessary interventions based on both Multi Criteria Analysis approaches and Balanced Scorecard method. The Multi-criteria analysis is used in order to assess the significance (weights) of a set of factors picturing the firms situation coming from the utilization of the Balanced Scorecard method. This value system provides a holistic and analytic picture of the current situation providing the means to support the determination of the required feedbacks for the efficient change. The proposed approach is illustrated through a real world case study for a Greek firm with high degree of development.

Keywords: Multicriteria Analysis, Change Management, Balanced Scorecard

A methodological approach for linking the learning profiles to blended learning activities.

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Abstract: The research work which is presented, is a thesis section and is intended to be an approach which enhances the effects of learners so that teachers can organize and implement a better blended learning method that is associated with their learning profile. In this effort utilized methodological approaches of multidimensional data analysis [Hurtigan, 1975, Tabachnick & Fidell, 1989]. This analysis will lead to support planning actions in order to improve the educational process organization and effectiveness of learners. For this reason, it was considered appropriate to present here the research results, which initially were obtained through questionnaires (about the way of learning) of L. Mariani (1996), and subsequently supplemented with a similar type of analysis relating to other considerations.

Keywords: Educational Profiling, Learning Styles, Data Analysis

Evaluation of Public Services through Multicriteria Decision Aid Analysis: The case of Public Income Secretariat

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Abstract: The Concept of “Management” is undoubtedly connected to the one of decision making process, since it constitutes the fundamental process of an organization (private or public) on which its beneficial and substantial operation depends. Especially at present time, the Public Management in Greece, the “sick man” of the country is obliged to make radical and crucial reforms in order to function as the profound pylon of the country’s exit from the extensive financial crisis. The multicriteria analysis of the decisions can be a suitable field of finding effective methods offered for implementation during the process of making decisions and the prolific assessment of the action of the Public Sector. This paper presents the benefits of the application of the method in question (“Socrates Method”), which is based on the multicriteria evaluation methods and more specifically refers to the case study of the General Secretariat for Public Revenue of the Ministry of Finance

Key Words: Multicriteria Evaluation Method UTASTAR, robust Internal Benchmarking, “Socrates” Method, G.S.P.R., Tax Offices

Ranking the collectable debts of a portfolio with Multicriteria Method Analysis, UTA (*)

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Abstract: This paper presents the application of a multicriteria disaggregation - aggregation approach for assessing the debtors or the clients of an organization according to the collectability of overdue debts, using a model of Multicriteria Decision Analysis. The result of this study is to improve the management of the debtor’s portfolio efficiency which will result to a better recovery process with reduce cost, time and at the same time minimize the processing time of each debtor portfolio. The set of key criteria includes age, occupation, marital status, presence of estate property, amount of income held by the debtor, consistency in the repayment liabilities of the organization and whether is the debtor recording at the" Teiresias black list ". The overall assessment at this study is achieved through a linear additive value model, estimated with the participation of a single decision maker which is based on the disaggregation – aggregation Multicriteria methodological approach UTA* [Jacquet- Lagrèze and Siskos (1982)]. This approach utilizing the MINORA system [Siskos et al. (1993), Spyridakos and Yannacopoulos (1995)] the spine of which is the disaggregation-aggregation UTA (*) method, construct an additive utility model based on a set of criteria stating the appropriateness and behavioural consistency of the evaluators. Then the evaluation results are examined for their stability.

KeyWords: Multicriteria Decision Analysis, collectability, additive value model.
PS 7.1 10/6/2016 Friday, 18:00-19:30, Room 1
Management (2)

Greek Thermal Springs as an Alternative Tourism Destination: A Study of Satisfaction Level

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Abstract: This paper measures the characteristics of spas in the Greek context by assessing end-user’s overall satisfaction level; the survey taking place between May and October 2015. Data was collected from 19 different spa facilities. The structured questionnaires were distributed to more than 1000 respondents who had previously visited hot springs resorts facilities. Empirical findings indicate that most tourists primarily visit thermal springs for health reasons and secondly for relaxation and enjoyment. Additionally, the majority of them are satisfied by the offered services. However, surprisingly enough, we found that their overall satisfaction level tends to be average. This is a signal that policy makers in the specific sector need to make further adjustments onto their existing tactics and policy implementation procedures, in order to secure and promote growth towards achieving sustainable development in a harsh and demanding economic environment.

Keywords: thermal spring tourism, Greece, satisfaction, sustainable growth

A Fuzzy Multicriteria Decision Analysis on selecting the Most Competent Project Manager considering Personality Traits and Project Procurement Systems

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Abstract: The current research aims at identifying the most competent project manager based on a fuzzy multicriteria approach. In this respect it firstly analyzes the role, responsibilities and the required personality characteristics of what is considered as a successful project manager. Then, the study presents five major personality traits and their complementary facets in order to describe the different project managers’ profiles. It moves on in highlighting and analyzing the available project procurement systems along with their special requirements for successful implementation. The methodology comprises a
structured questionnaire survey that evaluates the importance of the big five personality traits as regards to the implemented project procurement system. The survey was carried out via emails and interviews with project engineers. Survey participants included, amongst others, project engineers from Egnatia Odos SA and the Management Organisation Unit of Development Programmes. Finally, fuzzy TOPSIS was applied on the data in order to identify and highlight the potential profile of a competent project manager per project procurement system.

Keywords: Project Managers, Multicriteria Decision Analysis, TOPSIS, Personality traits, Project Procurement System

Does Business Students’ Perception on Entrepreneurship Education Affect their Entrepreneurial Intentions?

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Abstract: In the academic literature there exists a debate of whether entrepreneurship can be taught at all. Many scientists indicate that one of the prime objectives of entrepreneurship education is to help individuals to acquire all the necessary knowledge and skills, in order to establish sustainable business ventures. Similarly, it was found that entrepreneurship education increases individuals’ entrepreneurial perceptions and attitudes. On the other, in Greece no research has tried to bring together in a coherent way the findings of the considerable literature on measuring the relationship between the effects of those two constructs for University students. Therefore, in this paper we collected data from business administration students in the University of Macedonia; 232 study sample and applied the Ajzen’s theory of planned behavior. By using the method of correlation analysis we found that entrepreneurship education positively impacts on the three latent variables of the students entrepreneurial intentions scale. Further, we found that entrepreneurship courses/seminars strengthen students’ decision to become entrepreneurs. Additionally, based on their beliefs the optimal duration of entrepreneurship courses is two semesters. On the other, the existing courses offered to them fail to address the following entrepreneurial capacities (i.e. opportunity recognition, develop new products/patents/services, etc.). And, females have stronger intention to start a firm after their graduation.

Keywords: Entrepreneurial education, University of Macedonia, Greece

An Adaptive Memory Programming Framework for Optimizing Transportation Activities between Suppliers and Customers with Cross-Docking

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Abstract: This work studies the vehicle routing problem with cross-docking. A new realistic generalization of the problem is addressed, where each customer requests products from one or more suppliers. The aim is to design the minimum cost set of routes for transporting products via a cross-dock, given a set of suppliers and customers with known demands. The generated routes are subject both to capacity and maximum route duration constraints. An Adaptive Memory Programming framework is proposed for solving the problem. The framework incorporates a Tabu Search algorithm that employs a set of edge-exchange neighborhood structures as well as adaptive memory mechanisms for generating provisional solutions and for guiding the search process. Computational experiments on well-studied benchmark instances of the literature with time window constraints, indicate that the proposed framework is capable of generating high quality solutions within reasonable computational times. The impact of using two different types of vehicles for the pickup and delivery routes is examined. Lastly, various experiments on generated instances are performed to evaluate how the number of requests and the geographical distribution of customers affect the transportation costs.

Keywords: Cross-docking, Pickup and delivery, Adaptive memory programming
Application of Binomial Distribution to Greek and Turkey Online Tourism Rating Data on TripAdvisor

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Abstract: In this paper we apply the simple one parameter and the mixed three parameters Binomial Distribution to five stars rating data of TripAdvisor users. Ratings Data extracted from the 10 most popular tourism destinations in Greece and Turkey, proposed in TripAdvisor website. The whole dataset of 600 cases includes the users rating observed frequencies of 100 hotels, 100 restaurants and 100 attractions in each country. The observed five stars’ distribution is approximated by 2 forms of Binomial Distribution, Simple Binomial and Mixed Binomial. The fitting performance of Simple Binomial and Mixed Binomial Distribution, applied by Maximum Likelihood Estimation (M.L.E.) and Non-Linear Least Squares (N.L.S.) using non-linear optimization spreadsheet tools, compared for the sample datasets. A novel suitable fitting criterion named False Rate % is used for the estimation of possible bias, fraud or manipulation on ratings. Finally, some remarks and conclusions both for the TripAdvisor ratings and Binomial Distribution fitting performance discussed.

Keywords: Five Stars Rating, Binomial Distribution, Non-Linear Optimization, Online Rating, TripAdvisor

Financial Evaluation and Efficiency for Agricultural Firms: The Case of Greece

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Abstract: The agricultural sector plays a fundamental role and it is the backbone of economic system of each country. Besides providing food and raw material, agriculture also provides employment opportunities to crucial percentage of population. A smooth development practice of agriculture, leads to reduced imports while exports increased considerably. This helps to confront unfavorable balance of payments as well as saving foreign exchange. The above, is really helpful in periods of economic recession or crisis. Greek agricultural sector managed to keep unchanged its contribution to the GDP of the country in the period of the financial crisis. This depicts the dynamic and the strength of the sector. The aim of this study is twofold. First, a thorough financial analysis with the use of ratios related to profitability, liquidity, asset turnover and market will highlight the strengths and weaknesses of the sector. Secondly, the efficiency of the examined agricultural firms with the use of Data Envelopment Analysis, under the scheme of scale and technical efficiency, will reveal if firms use the available sources in proper way and in which degree this happens. The examined period covers the last decade.
An Authoring Tool for creating Digital Learning Board Games for Cognitive and Social Skills Development

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Abstract: Digital games have been used for many years for the development of Cognitive and Social Skills either in School Settings or in Therapy sessions for children with Autism Spectrum Disorders (ASDs) (Hourcade et al., 2013). Digital board games are a special category of user-friendly games that can be used for learning or therapeutic purposes as documented in the literature (Oppenheim-Leaf, 2012). They can enhance the educational or therapeutic process by making it more interesting, motivating and interactive to students or children with ASDs (Ahmad et al., 2014).

However, developing online board games is difficult. Even though there are some authoring tools available, their development environments are still complicated for teachers and therapists without computing background.

In this paper, we present our vision to design an authoring toolkit that will allow teachers/therapists to produce and personalize their own online board game by adding their preferred game-oriented educational content and rules. In this paper, the architecture of this authoring toolkit is presented.

Keywords: Authoring tool, E-learning, Skills Development, Game-based Learning

Evaluating Lightning Protection Systems for Photovoltaic Installations using a Robust Multicriteria Decision Model

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Abstract: Photovoltaic (PV) systems, due to their installation position, are exposed to significant lightning discharges. These can damage the PV equipment, resulting malfunctions on the entire system, high repair costs and financial losses. Thus, the design and construction of an adequately shielded lightning protection system (LPS) is of utmost importance for the safe and uninterrupted operation of photovoltaic installations. In this paper, different external lightning protection systems of a 100kWp PV installation are evaluated with the use of an additive value model, which is based on economic, technical, and safety criteria and is assessed by means of the UTASTAR ordinal regression method. The safety efficiency of each external LPS is defined using an appropriate computer tool (WinIGS). In order to obtain robust evaluations, given the incomplete determination of inter-criteria model parameters, the extreme ranking analysis method is applied to estimate
each LPS’s best and worst possible rank position. The emerging results are expected to be a guide for the efficient design of the PV systems topologies, increasing their reliability and contributing to the improvement of their lightning performance.

**Key words:** Photovoltaic systems; Lightning protection; Multiple criteria decision analysis; Ordinal regression approach; Robustness analysis