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Análise da Eficiência na Produção de Energia nos Parques Eólicos no Estado de Pernambuco por Meio da Aplicação de Análise por Envelope de Dados

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Resumo. A produção de energia eólica no Brasil vem ganhando destaque, seja devido ao potencial de geração presente no País, ao desenvolvimento de novas tecnologias que permitem o barateamento da implantação e manutenção de parques eólicos, ou mesmo aos incentivos fiscais oferecidos pelos governos federais e estaduais. A energia eólica é produzida pela força dos ventos e é considerada razoavelmente limpa e renovável. Logo, o presente trabalho buscará identificar fatores que possam ser utilizados para analisar a eficiência na produção de energia eólica, mapear os parques eólicos presentes no Estado de Pernambuco, e aplicar a técnica de Análise por Envoltório de Dados com o objetivo de analisar a eficiência relativa dos parques eólicos presentes no Estado, neste contexto também serão aplicadas técnicas de desempate aos possíveis resultados. Por fim, espera-se estudar a eficiência dos parques de produção de energia eólica no Estado de Pernambuco, estudar o contexto em que estão inseridos, assim como as tecnologias aos quais estão sujeitos, buscando oferecer informações para a tomada de decisão para a melhoria da eficiência nos empreendimentos.

Palavras-chaves: Energia, Análise, Decisão.

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Implementação de Medidas de Mitigação das Mudanças Climáticas no Planejamento de Longo Prazo da Expansão da Geração utilizando uma Abordagem Multicritério

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Abstract. Em todo o mundo, tem havido uma preocupação cada vez crescente com o aquecimento global. Neste sentido, diversos países têm se comprometido com metas para a mitigação das mudanças climáticas. Considerando que os benefícios das ações de mitigação das emissões dos gases de efeito estufa estão intimamente ligados a estratégias de longo prazo, i.e., com o planejamento da expansão do sistema de geração, seria interessante que as metodologias e os modelos para o planejamento de longo prazo da expansão de sistemas elétricos passem a ser promotores de ações para a mitigação das mudanças climáticas. Este trabalho apresenta uma abordagem para o planejamento de longo prazo da expansão da geração, especialmente adequada para sistemas interligados de grande porte, a fim de considerar, de forma explícita, as emissões dos gases de efeito estufa. A abordagem é baseada em métodos de apoio à decisão multicritério e permite a obtenção de soluções de compromisso envolvendo múltiplos objetivos (ou critérios), entre os quais, mudanças climáticas, segurança energética e econômico. A abordagem engloba duas características relevantes do ponto de vista pragmático da atividade de planejamento de sistemas elétricos: a formulação de alternativas de planos de longo prazo da expansão da geração e avaliação do desempenho de cada alternativa de plano de expansão em cada um dos objetivos (ou critérios) adotados. Estas duas etapas são realizadas através da utilização integrada de modelos para o planejamento da expansão e da operação. Ao término destas etapas, uma análise multicritério é realizada para a seleção da “melhor” alternativa de acordo com as preferências do decisor. Resultados da aplicação da metodologia proposta em configurações do sistema interligado brasileiro planejadas para 2030 são apresentados e discutidos.

Keywords: Métodos multicritério; Mudanças climáticas; Emissão de gases de efeito estufa; Planejamento da expansão.

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Decision analysis model use renewable energy sources in airports

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Abstract. This project aims to develop a multicriteria analysis model that will assist in the decision making to choose the implementation of a system of electricity generation from renewable sources in airports. In the current social environment, the large emission of polluting gases, the continuous degradation of the environment and the global energy crisis, lead countries to look for new sources of clean energy production. The work was elaborated based on three renewable energy sources, namely: biomass energy, photovoltaic solar energy and wind energy. This study has, as a characteristic, an exploratory-descriptive research. At the beginning of the work, a quantitative and later qualitative survey was performed as a form of validation. The multicriteria method used for modeling the model was Trad-off. Some criteria chosen for the development of the work, having as the deciding agent the one that defines the starting parameters for model analysis, were listed: operating cost, maintenance cost, initial investments and others. In order to make the presentation of the work clearer, from a theoretical point of view, the concepts used to elaborate it consist in the approach of the multicriteria model already mentioned, as well as the names referring to the types of renewable energies. The result of the project was characterized by the creation of the multicriteria model for the airport in question, which is a tool that allowed managers to make a better decision regarding the choice of renewable energy to be used in the airport power generation system.

Keywords: Airport, Renewable Energy, Multicriteria Analysis.

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Produção e reciclagem de ELVs no Brasil: uma estimativa com base em um modelo híbrido de previsão

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Resumo. A indústria automotiva é a maior indústria do mundo, e, por conseguinte, é também a que mais gera impactos ao meio ambiente. O número total de automóveis globais, desde 2014, excedeu a 1,2 bilhão. Além disso, estima-se, que apenas o setor de veículos seja responsável por aproximadamente 5% de todo o lixo industrial do planeta, sendo que um quarto do fluxo desses resíduos são considerados como perigosos. Desta forma, desde a década de 90 a União Europeia (UE) tem classificado os Veículos em Fim de Vida (ELV) como fluxo prioritário de resíduos. Todavia, em países de economia emergente, tais como o Brasil, o estabelecimento de políticas eficazes no gerenciamento de ELVs ainda são tidas como incipientes. Sendo assim, o presente estudo tem por objetivo estimar o número de ELVs existentes e a sua quantidade reciclada no Brasil para o ano de 2030, traçando um paralelo entre produção e reciclagem. Para tanto, será utilizado um modelo híbrido de previsão, por meio de um conjunto de dados temporais, extraídos da Associação Nacional dos Fabricantes de Veículos Automotores (ANFAVEA) e Departamento Nacional de Trânsito (DENATRAN). No que tange ao delineamento da pesquisa, o foco será na categoria de veículos - passageiros automotor -, visto que este, é o segmento de maior proporção ambiental. Como parte dos resultados alcançados, constatou-se que para o ano de 2030, a expectativa é de que mais de meio milhão de automóveis em final de vida útil sejam gerados no Brasil. Além disso, estimou-se ainda a quantidade de automóveis que poderá ser reciclada considerando as atuais taxas de reciclagem de veículos no Brasil. Para além disso, acredita-se que as previsões possam auxiliar estrategicamente a tomada de decisões na cadeia de suprimentos reversa da indústria automotiva, bem como, ponto de partida para conscientizar a população e as instâncias governamentais sobre a importância do gerenciamento adequado do resíduo automotivo. Instigando as pessoas a reverem os seus padrões de consumo, a refletirem a respeito da necessidade de planejamento urbano, e a pressionarem os líderes no sancionamento de leis que favoreçam a sustentabilidade. Isto posto, o estudo poderá ainda contribuir com a geração de *insights* dentro da comunidade científica, direcionados a proposição de alternativas convergentes ao desenvolvimento sustentável, e conseqüentemente, assegurar o futuro das próximas gerações.

Palavras-chave: Gestão de Resíduos; End-Life Vehicles (ELV); Modelo de Previsão.

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Multi-criteria decision-making method: Management of the malfunction of a retail wholesale method company.

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Abstract. The wholesaleretail company, of the municipality of Natal/RN, has an array located in the commercial center of the city, three subsidiaries spend in the north and south of the city, and an external deposit. We currently work with more than 35 thousand active items; the traffic of merchandise to meet the ascending demand of the company becomes routine and with great growth in internal and external customer service. In the case of the external customer, the company has qualified consultants for this type of service, as well as has own fleet to meet the deliveries. As a result, the generation of breakdown from transport, to its disposal at the sales points, has been increasing due to the absence of methods of prevention and follow-up on the causes; the damage caused by the supplier that meets the company if it is treated on receipt, the difficulty that the company has is to prevent in its units and deliveries to the external customer; today the company has a place to be saved the damage and not be done the treatment. Methods – For the treatment of the generated failures, the tool of the AHP method shall be applied to the analysis of which criteria and subcrities shall be taken into account for the treatment of the malfunction generated by the matrix, subsidiaries, external deposit and deliveries to external customer. The criteria and sub-criteria will be defined along with logistic supervision and breakdown leader, in order to assign the quantitative weight. The implementation of the AHP method will require the use of PDCA and DMAIC quality tools to introduce the project and follow the development. In order to obtain a treatment of the damage completely, it will be necessary to observe its entrance, processing and exit; in the entrance it will have to have the criteria of the entrance of the fault, because provided with this information we will be able to observe the primary cause of the damaged and apply quantitative and qualitative methods to prevent, after the entry stage, processing will be the organization and communication for the due sectors, such as purchases that will be of importanic sum for future dealings with suppliers to seek better negotiation and ultimately the output will be the destination of the breakdown, whether for the supplier, donation or shipping.

Keywords: Multicriteriamethods for decision-making; Failure; AHP method; PDCA; DMAIC.

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Aplicação do Método de Borda-AHP a Indicadores dos Setores da Indústria Brasileira

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Abstract. The use of multicriteria methods to decision-making is due to consideration of multiple criteria as the basis for a broader and more assertive observation of the present scenario. The combination of “De Borda” and Analytic Hierarchy Process (AHP) methods, having the first one the ordination algorithm profile and the second one about how criteria weights to be assigned, becomes a tool capable of assisting in the decision-making process, considering the levels of importance of each criterion. In the present study, firstly presents the central concepts of “De Borda” and AHP methods. Subsequently, presents the description of the database of indicators related to the Brazilian sectors of industry, that was selected to the application of the method to embase the variables and criteria selection. Then, is detailed the applying of "De Borda-AHP" method the variables and criteria, to further analysis, followed by the founded results. It can be observed that there is the advantage of using the integrated method rather than using the independent methods.

Keywords: Decision, De borda, Analytic Hierarchy Process, Industry sectors, Multicriteria

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INTEGRATION OF AHP AND TOPSIS METHODS FOR CONTRACTING SOCCER PLAYERS: A CASE STUDY IN A POTIGUE CLUB

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Abstract. The decision-making process for hiring athletes involves multiple, often conflicting criteria, so that it significantly influences team performance in sporting competitions and from a financial standpoint. In this sense, the objective of this work is to perform two multi-criteria decision support methods in the process of hiring soccer players in the case of a Rio Grande do Norte club, in order to assist in the definition of its team. The applied models were the AHP and TOPSIS, because with the first method the criteria weights were obtained and with the next method the ranking of the alternatives was acquired, to consider the need of the responsible manager.

Keywords: AHP, TOPSIS, Football.

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Simulação de Eventos Discretos em uma Indústria Alimentícia de médio porte utilizando ARENA

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Resumo. A constante busca das indústrias para elevar seus índices de produtividade e reduzir seus custos é indispensável para que possam estar competitivas no mercado. Sistemas de manufatura em batelada costumam apresentar variações de produtos e processos nos sistemas de produção e, planejar e executar essas operações, com excelência, pode ser uma tarefa de difícil execução, devido ao surgimento de gargalos e tempos de espera nas linhas de produção, que aumentam os custos associados. A Simulação de Eventos Discretos tem se mostrado uma eficiente ferramenta de suporte às tomadas de decisão na modelagem de fluxos de trabalho na indústria de transformação, devido ao seu baixo custo, quando comparado à forma empírica, por tentativa e erro. A disponibilidade e a qualidade de dados, fatores imprescindíveis para identificação do comportamento do sistema, são duas das questões mais desafiadoras na realização de projetos de simulação, sobretudo, em pequenas e médias empresas, devido à ausência de investimento na coleta de dados e o complexo mapeamento de diferentes recursos. Foi desenvolvido um supervisor para coleta de dados através de uma rede industrial, protocolo de comunicação *MODBUS*, conectando a um servidor, todos os equipamentos da linha. Foram identificadas variações de comportamento no sistema provenientes, em sua maioria, por falta de disponibilidade de alguns equipamentos e pela alta quantidade de itens produzidos compartilhando os mesmos recursos (máquinas e pessoas). Vários modelos de aprimoramento foram simulados, no *software* ARENA®, para minimizar/eliminar os problemas. A análise do melhor modelo mostra a melhoria de produtividade na linha.

Palavras-chave: Simulação de Eventos Discretos, Coleta de Dados, ARENA.

Abstract. The incessant pursuit of industries to increase their productivity rates and reduce their costs is indispensable for them to be competitive in the market. Production systems of batch processing often present product and process variations. Planning and executing these operations with excellence may be an arduous task due to presence of bottlenecks and waiting time in the production lines, that increases associated costs. Discrete Event Simulation has proven to be an efficient decision support tool to modeling workflows in the manufacturing industry due to its low cost when compared to the empirical approach, guided by trial and error. Data availability and data quality, which are essential factors in identifying system behavior, are two of the most challenging questions in conducting simulation projects, especially in small and medium enterprises, due to the lack of investment in data collection and the complex mapping of different resources. A supervisory was developed for data collection through an industrial networking, MODBUS communication protocol, connecting to a server all the equipment of the line. Behavior variations were identified in the system mostly due to the lack of availability of some equipment and the high number of items produced sharing the same resources (machines and people). Several enhancement models have been simulated in ARENA® software to minimize/eliminate problems. Analysis of the best model shows productivity improvement on the line.

Keywords: Discrete Event Simulation, Data Collection, ARENA.

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Study of inconsistencies in the Tradeoff elicitation procedure using the eye-tracking neuroscience tool

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Abstract. The tradeoff procedure is a method for elicitation of scale constants in additive model, it is axiomatically robust and allows the incorporation of an intracriteria evaluation with nonlinear value functions. However, during the elicitation process, the decision maker is susceptible to biases, which may be linked to subjective issues or even because the rationality of the human being is limited in the face of complex problems, in view of pay-off analysis which are tiring and may result in inconsistencies that affect the execution of the procedure. Thus, this paper presents a behavioral study of inconsistencies using the tradeoff procedure to elicit the decision maker's preferences. Neuroscience tools were used to analyze behavioral issues not controlled by the decision maker in order to enrich the investigation, seeking to verify patterns during the procedure that indicate how inconsistencies impact the process.

Keywords: Multicriteria decision making; Trade-off method; Inconsistencies; Behavioral analysis

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Compatibility and correlation of multi-criteria decision analysis applied to discrete decision problems

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Abstract. A continuous decision problem (CDP) has a large set of alternative solutions. Extremely, a CDP may have infinite solutions. Conversely, a discrete decision problem (DDP) has a smaller limited set of alternative solutions. On the other extreme, a DDP may have only two alternative solutions. Multicriteria decision analysis (MCDA) has been successfully applied to a plethora of DDP, including all problems from Bernard Roy's typology: Choice, Sorting, Ranking, and Description. Naturally, it is expected that different MCDA methods applied to same DDP, i.e., with the same data, result in the same output, for instance, in the same rank of alternatives. However, it does not happen all the time. This work is about this divergence. And it is also about how to measure and analyze with Compatibility indices and correlation coefficients. An illustrative example is presented of a DDP problem with three criteria and four alternatives. Results from four MCDA methods are compared and considered some correlated and some incompatible.

Keywords: Compatibility, Correlation, Multi-criteria decision analysis.

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Decision Support System with Flexible and Interactive Tradeoff for Preferences Elicitation

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Abstract. This work aims to present a Decision Support System (DSS) for preferences elicitation in Multicriteria Decision Making (MCDM) problems. The system works based on the Flexible and Interactive Tradeoff method, which elicits preferences considering partial information from the decision maker (DM). During the elicitation process, the DM provides strict preference statements, and a recommendation is built based on linear programming. The DSS incorporates a step of intracriteria evaluation, and there is also an evaluation of inconsistencies that may happen during the elicitation process. **Keywords:** FITradeoff; Decision Support System; Multicriteria Decision Making

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An unsupervised approach for weighting criteria in Multicriteria Decision Analysis

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Abstract. The process of assigning precise weights for the relative importance of criteria is an essential routine in Multiple Criteria Decision-Making. In general, the weights are assigned by eliciting preference from the decision makers, which aims to gather valuable information to aid the decision maker. However, in some cases, the elicitation process can be costly, as well as being highly subject to bias. In such situations, it may be desirable a way to obtain the weights automatically, through a data-driven process, the so-called unsupervised, or objective, approach. In this paper we propose a novel unsupervised method, that relies exclusively on data from the decision matrix and appropriately exploits the linear regression between pairs of criteria to model relations as redundancy and synergy. Computational experiments show that the proposed approach can outperform some state of art methods as CRITIC, CCSD, and Entropy, especially when the number of alternative decreases.

Keywords: Weighting criteria; Unsupervised; Decision-making.

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Abstract. The process of assigning precise weights for the relative importance of criteria is an essential routine in Multiple Criteria Decision-Making. In general, the weights are assigned by eliciting preference from the decision makers, which aims to gather valuable information to aid the decision maker. However, in some cases, the elicitation process can be costly, as well as being highly subject to bias. In such situations, it may be desirable a way to obtain the weights automatically, through a data-driven process, the so-called unsupervised, or objective, approach. In this paper we propose a novel unsupervised method, that relies exclusively on data from the decision matrix and appropriately exploits the linear regression between pairs of criteria to model relations as redundancy and synergy. Computational experiments show that the proposed approach can outperform some state of art methods as CRITIC, CCSD, and Entropy, especially when the number of alternative decreases.

Keywords: Weighting criteria; Unsupervised; Decision-making.

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A NEW STANDARDIZATION METHOD BASED ON THE IDEAL REFERENCE CONCEPT IN FUZZY LOGIC

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Abstract. For many years, researchers have been devoting themselves to the study of tools that assist individuals or organizations in their decision-making processes. Thus, one of the most used decision-making methodologies in science, engineering and business is Multicriteria Decision Support (AMD), which is based on the purpose of improving the quality of decisions related to situations in which two alternatives, at least, are analyzed in a comparative way based on criteria and objectives that are often related in a conflicting way. Recently, in the context of AMD, the authors Cables, Lamata and Verdegay (2016) presented the ideal reference concept from the Ideal Reference Method (RIM). Considered by the authors as a variant method of the Technique for Order of Preference by Similarity with the Ideal Solution (TOPSIS) and Multicriteria Optimization and Compromise Solution (VIKOR). This method allows the ideal solutions to vary between the maximum value and the minimum value, which does not occur in the TOPSIS and VIKOR methods, since the ideal solutions for these methods are the extreme values. In 2018, the RIM was extended to the Fuzzy environment by the same authors who called it an Ideal Fuzzy Reference Method (FRIM). Despite the new possibility that the RIM and FRIM method propose, it is suggested in this work that in some situations, the normalization procedure applied in these methods may not adequately represent the decision maker preference structure. Thus, this study aims to propose a new method of normalization, based on the ideal reference conception and Fuzzy logic, allowing the differentiation of alternatives even when their performances in a given criterion belong to the ideal reference range. For this, the current method and the proposed method will be applied in a real case study, making possible a comparative analysis and verification of the merit of the new method.

Keywords: Multicriteria, Fuzzy, Ideal reference, Normalization.

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Bidding decision model based on MCDM/A in a fuzzy environment

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Abstract. The bidding decisions are strategic for project-oriented companies. When submitting bids, it is important to consider the availability of resources needs for the project's conclusion and the estimation of the appropriate mark-up. These decisions require the systematic evaluation of relevant criteria and the assessment of their importance for the decision making, to produce effective results. In this context, the present paper aimed to suggest a model that employed the ELECTRE TRI-C in a fuzzy environment for the decision between bid or not, considering the attractiveness level of the potential projects and can be used as an input for the mark-up estimation. The model's main contributions are: the better use of decision maker (DM) preference's information; using the result of model as an input for the markup estimation; the classification can support the DM to prioritize the projects to bid and; the model is appropriate in cases where past data are not available.

Keywords: Bidding, fuzzy ELECTRE TRI-C, attractiveness level..

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Flow-based Choquet integral formulation for multicriteria sorting problems with heterogeneous scales

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Abstract. In multi-criteria decision aiding, the Choquet integral has been used as an aggregation operator to deal with the case of interacting decision criteria. One requirement of the Choquet integral is to use a common scale for all criteria which can be seen as a limitation in some practical decision-making problems. In this paper, we address this limitation in the context of multi-criteria sorting problems whose purpose is to classify alternatives into predefined and ordered categories. For that, we propose a new Choquet integral formulation based on the concepts of preference function and flows used in methods of the PROMETHEE family. More specifically, in our proposal for sorting problems, FlowSort framework is used. The idea of the proposed formulation, called FlowSort-Choquet, is first to make pairwise comparisons (between the evaluation of the alternatives and the limiting profiles that define the categories) using preference functions. The results of these comparisons take us to a common scale. Then, the flows are computed using the Choquet integral instead of the weighted sum. The assignments of alternatives to the defined categories are conducted using the same attribution rules proposed in FlowSort. This is possible due the fact that the flows based on the Choquet integral keep the same proprieties of the flows computed using weighted sum, as proved in this study. A numerical example is presented, showing that the proposed approach is conceptually simple to be implemented. We also conducted a comparison between FlowSort-Choquet and the original FlowSort. This comparison showed that whether synergy or redundancy between criteria are considered, the same alternatives may end up assigned to different categories, showing the importance of considering interaction between criteria when it exists. The proposed method can be seen either as an extension of FlowSort for problems with interacting criteria or as a new Choquet integral formulation for multi-criteria sorting problems with heterogeneous scales.

Keywords: Multi-criteriasorting problem; interacting criteria; Choquet integral; common scale.

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Proposal of a supply risk prioritization method based on the application of fuzzy techniques for group decision making

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Abstract. Supply Chain Risk Management (SCRM) is an issue that has been widely discussed in academic studies and in organizations. In SCRM, supply risk assessment attracts the largest volume of research, where four major research opportunities have been identified: (1) adequately deal with the imprecision present in human assessments due to their uncertainties or lack of data, (2) using a suitable technique for the decision process to be in a group, (3) appropriately addressing compensation and non-compensation between criteria, and (4) use real data for the application of risk management models in the supply chain. Analyzing the current state of the art, it is clear that there is no model that simultaneously contemplates all the opportunities for studies identified. In order to contemplate these opportunities, the present project aims to propose a decision-making model that combines the hesitant fuzzy technique to deal with the imprecision and hesitation present on the experts opinions during the group judgment process; and Fuzzy Inference System, to find the degree of importance for each risk assessed in a compensatory and noncompensatory approach. The project also includes the computational modeling of the proposal and the implementation of a pilot application in a company in the animal health industry with the purpose to prioritize the supply risks that have the greatest impact on the evaluation of decision makers. Thus, the advantages, difficulties and limitations identified during the pilot application of the proposed model are analyzed.

Keywords: Supply Chain Risk Management, Group decision making, Supplier Management, Hesitant Fuzzy, Fuzzy Inference System.

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Proposta de modelo analítico-avaliativo em unidades de Orçamento Participativo (OP)

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Resumo. O Orçamento Participativo (OP) é uma política pública que objetiva descentralizar processos de alocação orçamentária, envolvendo entidades administrativas, organizações populares e sociedade civil. A expansão das experiências, representadas por uma vasta quantidade de características divergentes, resultou nas mais variadas fenomenologias participativas. Isto desencadeou a necessidade de inovar nas avaliações destes procedimentos, amparando-se na hipótese de relações causais entre as variantes metodológicas e seus respectivos resultados. Partindo disto, este trabalho apresenta um modelo avaliativo desenvolvido para processar estatisticamente as experiências participativas, relacionando suas características metodológicas aos respectivos resultados e eventos ocorridos. Para tanto, foi realizado um mapeamento das variantes metodológicas encontradas na literatura, bem como seus resultados e eventos previamente definidos como preferíveis. Os dados foram categorizados e organizados em um banco de dados numérico-nominal, respeitando um recorte amostral do contexto avaliativo das experiências. O processamento de dados posterior foi fundamentado no modelo matemático desenvolvido e, assim, uma matriz de consequências entre as variadas características da política pública e os eventos favoráveis foi gerada. O modelo proposto é capaz de auxiliar os gestores públicos na definição da metodologia do OP mais adequado às características da sua localidade, bem como na sua avaliação *ex ante*.

Palavras chaves: Orçamento Participativo, Processo Decisório, Matriz de consequências.

Abstract. The Participatory Budgeting (PB) is a public policy that aims to decentralize the process of budget allocation, involving administrative entities, popular organizations and civil society. The expansion of experiences represented by the large quantity of divergent characteristics, resulted in the most varied participative phenomenologies. This raised the need to innovate in the evaluation of these procedures, based on the hypothesis of causal relations between the methodological variants and their respective results. Thus, this work introduces an evaluative model developed to process statically the participatory experiences, concerning their methodological characteristics and their respective events and results. For that, it has been realized a mapping of methodological variants found in the literature, as well as their results and events previously defined as preferable. The data was categorized and organized in nominal-numerical dataset, respecting a delimited sample of evaluative context of experiences. The later processing of data was based on mathematical model building and, thus, a consequence matrix between the varied characteristics of the public policy and their favourable events was made. The proposal model is capable of assisting public managers in defining the PB methodology that best suits their local characteristics, as well as in their *ex ante* evaluation.

Keywords: Participatory Budgeting, Decision Making Process, Consequence Matrix

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Ranking using η -efficiency and relative size measures based on DEA

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Abstract. In this work, we propose a new way to define the size of organizations or Decision Making Units (DMUs) based on Data Envelopment Analysis (DEA). A great number of managerial decisions, social and economic activities, political analysis and engineering process include in their analysis some information about the size of corporations. Usually, organizations consider particular attributes such as revenues, employees, number of clients, profit and so forth to evaluate their sizes, which could result on an incomplete and/or partial size evaluation. Here, we investigate this question more deeply and propose a non-parametric approach for ranking size. To address this issue, we first construct a DEA super-efficiency target vector defined over an extended Technology set and find a common set of weights to determine new efficiencies and sizes, possibly greater than one. After, we define rotation and translation of DMUs and show how to construct a range area, associated to η efficiencies and relative sizes that are less than or equal to one. Additionally, based on managerial decisions, we show how to use these ideas to achieve new η -efficiency and relative size goals for one or more DMUs in the set. We consider an empirical application to illustrate our approach on a dataset of international airlines and conclude our work with some final remarks and future directions.

Keywords: DEA Super-efficiency, Common set of weights, Relative size, η efficiency, Technology set, Range area

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MCDM model for resource allocation in higher education

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Abstract. Resource allocation is one of the main higher education organizations decisions, once it impacts their performance. Nevertheless, governments have decreased university funding, especially in countries where most of the higher education system is state-oriented. In this context, it is necessary to have resource allocation models with a robust theoretical basis and capable to integrate different objectives into a single decision problem. Therefore, we propose a multiple criteria decision making model as a correct approach for this problem. Our model consists of a MCDM project portfolio selection problem, where each academic department has different investment levels to be allocated, based on their performance. We perform a numerical application with real data to test the model. We conclude that each level of investment leads to different benefits for every budgetary unit, which impacts their performance. Plus, the model can select the best combination of values to find an optimal solution instead of choosing the best partial alternatives. Moreover, the process of allocating resources can become clear, transparent and allows people who are involved to set tangible metrics to achieve their results. The model also provides a basis for defining action plans that will affect the allocation of resources and, consequently, the performance of the university itself.

Keywords: Resource allocation; MCDM /A; Project Portfolio Selection; Higher Education.

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Alocação de artilharia antiaérea IGLA-S operada pela FAB utilizando *Value-Focused Thinking e Analytic Hierarchy Process*

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Resumo. Esta pesquisa apresenta a aplicação de abordagens de apoio à decisão multicritério na alocação de artilharia antiaérea IGLA-S no terreno. Inicialmente os critérios (fatores) relevantes para tal alocação foram identificados por meio do *Value-Focused Thinking* (VFT) e, em seguida, utilizou-se o método *Analytic Hierarchy Process* (AHP) para escolher o local (ponto) a ser posicionada a artilharia antiaérea. O resultado evidenciou que a estruturação dos critérios por meio do VFT contribuiu para que os mesmos estivessem alinhados com os objetivos da organização responsável pela alocação. Além disso, por meio da utilização do método AHP, foi possível escolher um local para a alocação da artilharia antiaérea IGLA-S, de forma a proteger pontos sensíveis da área limítrofe do país.

Palavras chave: Artilharia antiaérea, IGLA-S, VFT, AHP.

Abstract. This research presents the application of multi-criteria decision support approaches in the allocation of IGLA-S anti-aircraft artillery in the field. Initially the relevant criteria (factors) for such allocation were identified using the Value-Focused Thinking (VFT). Then, the Analytical Hierarchy Process (AHP) method was used to choose the site (location) where anti-aircraft artillery should be positioned. The result showed that structuring the criteria using VFT contributed to its alignment with the objectives of the organization responsible for the allocation. In addition, through the use of the AHP method, it was possible to choose a site for the allocation of IGLA-S anti-aircraft artillery, in order to protect sensitive points in the country's border area.

Keywords: Anti-aircraft artillery, IGLA-S, VFT, AHP.

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Dificuldades para a Padronização da Ficha de Antecedentes Criminais da Polícia Federal: uma Análise Baseada na Soft Systems Methodology

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Resumo. A informação criminal é parte fundamental do processo de persecução penal, no qual atua como instrumento destinado a auxiliar diversos órgãos governamentais, como a Polícia Federal (PF) e as Secretarias de Segurança Pública (SSP) dos estados. Para tanto, as informações sobre os antecedentes criminais de um cidadão precisam ser apresentadas com qualidade, confiabilidade e segurança. A falta de integração entre os sistemas que operam com antecedentes criminais, de padronização dos dados inseridos nesses sistemas, assim como a insuficiência de treinamento e de investimento para modernização do Sistema Nacional de Informação Criminal (SINIC) foram alguns dos problemas detectados. Este trabalho tem como objetivo identificar alguns entraves à padronização e sistematização do processo de controle de dados sobre os antecedentes criminais no Brasil. Por sua complexidade, tem como caráter inovador e exploratório fazer uso da Soft Systems Methodology (SSM) para estruturação do problema considerando as percepções de três stakeholders da Polícia Federal do Brasil. Com o processo de estruturação de problemas destacou-se que a falta de uma política de Estado, orientada à integração dos dados dos vários sistemas nacionais que trabalham com antecedentes criminais, e apoiada pelos governantes, é o principal impedimento ou entrave à existência de uma sistematização e padronização de antecedentes criminais no Brasil.

Keywords: Antecedentes criminais, Soft Systems Methodology, Polícia Federal do Brasil.

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Science, Technology and Innovation - Brazilian Navy and Academy researching together: the CASNAV/INSID case

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Abstract. The purpose of this work is to present the guidelines for interaction among the Brazilian Navy and the Brazilian Universities, striving for scientific research. Moreover, it details the case of the Centre for Naval Systems Analyses (CASNAV) and the INSID (National Institute for Decision Systems and Information Development) interaction. The method is based on a review, selecting both documents that details the science importance for the Brazilian National Strategy, and the documents which details which are the navy organizations responsible to perform science research, accordingly to each subject. The relationship between INSID and CASNAV is presented as a case topic, highlighting the developments, so far, in an ongoing combined research project, devoted to the integration of multi-criteria methodology to the military decision process. Finally, a brief discussion on the future perspectives, and the specific organizational adaptations required to carry-on the project, is performed.

Keywords: Brazilian Navy; Scientific Research, CASNAV; INSID.

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Multicriteria performance evaluation of retail data management: Industry 4.0 as data management support

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Abstract. This paper aims to analyze the importance of industry 4.0 and big data management as a basis for decision making and the use of potential applications of multicriteria decision and negotiation models. The hybrid integration of this modeling will make it possible to formulate strategies in which industry 4.0 will work in a focused manner to meet stakeholder needs by reducing store gondola disruptions, smart store layout optimization, inventory management and customer buying behaviors. Enabling retail to evolve in a connected, fast and smart way. From this view, the main criteria and variables were selected to formulate strategies for different segments of Retail. The selected research period was from 2016 to 2019. With this database, the main criteria were identified, the methods and tools used in the research were Radio Frequency Identification (RFID), Real-Time Information Sharing (RTIS), Internet of Things (IoT), Blockchain, Wearables, Digital Supply Chain, among others. This will support future research to be developed in this area.

Keywords: Industry 4.0, Big Data, Multicriteria, Retail, IoT.

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MODELO MULTICRITÉRIO PARA SELEÇÃO DE INDICADORES DE DESEMPENHO PARA EMPRESAS DE TRANSPORTES COM BASE NO BSC E FITRADEOFF

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Abstract. Em um ambiente cada vez mais dinâmico e repleto de informações, desenvolver uma estratégia de negócios e avaliar o desempenho usando apenas dados passados pode não ser o suficiente para a sobrevivência de uma empresa. O Balanced Scorecard (BSC) ganhou destaque nesse contexto por considerar medidas financeiras e não financeiras no desenvolvimento e na gestão estratégica como fatores para impulsionar o desempenho das organizações. É usado para identificar os objetivos estratégicos da organização, traduzi-los em KPIs (Key Performance Indicators) e fazer a gestão do desempenho organizacional. O desenvolvimento de um modelo multicritério com base nas premissas do BSC permite aos gestores incorporar as suas preferências, a fim de selecionar os indicadores mais adequados para o negócio e criar relações entre as perspectivas. A pesquisa propõe um modelo de apoio a decisão que possibilita a concepção, implementação e o gerenciamento de um sistema de medição de desempenho para melhorar a gestão de negócios em uma pequena empresa de transporte de cargas na Região Metropolitana do Recife (RMR), integrando o modelo multicritério FITradeoff com o BSC. Espera-se que as empresas que apliquem o modelo possam tornar o processo de implantação do BSC mais rápido, menos oneroso e tornar a organização mais competitiva, o que deve ser visto por meio do alcance das metas estabelecidas. A principal contribuição do trabalho está no desenvolvimento de um modelo para a seleção de indicadores de desempenho baseados no BSC e FITradeoff, com o objetivo de facilitar a implementação da estratégia de negócios em empresas de transportes de cargas.

Keywords: BSC, FITradeoff, apoio multicritério a decisão, transportes.

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Support decision to prioritize WCM projects using FITradeoff ranking method

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Abstract. In recent years, the World Class Manufacturing (WCM) system has become a subject widely discussed and applied in academia and industry in general. The management method presents itself as an integrated system formed by a set of management principles and practices that focuses on the losses generated in the processes of the companies, considerably reducing their costs and providing organizations with significant results in terms of performance. Thus, most decisions, through the WCM implementation process, are taken considering the impact that a particular action or area presents in relation to reducing losses, waste, defects and inventories. Since the focus is on reducing costs, this WCM pillar acts, in a transversal way, identifying the losses and wastes to be tackled and the areas where both occur. However, issues that go beyond reducing costs, however, must be considered, since such decisions have a strategic impact within organizations and directly influence their competitive position. The decision to invest in improvement projects, within the WCM approach, is therefore a multicriteria problem. In fact, the application of multicriteria modeling in the context of prioritizing and selecting improvement projects, by taking an approach that aims to increase efficiency and competitive advantage, has the characteristic of addressing different criteria (operational, strategic, among others) and allows the decision maker (DM) to clarify other relevant aspects in this type of decision. Thus, with the aim of ranking WCM projects, this paper presents the application of the FITradeoff to prioritize improvement projects in a large, automotive parts factory, using the WCM system.

Keywords: WCM, projects prioritization, FITradeoff, ranking problemati

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Support decision to prioritize WCM projects using FITradeoff ranking method

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Abstract. In recent years, the World Class Manufacturing (WCM) system has become a subject widely discussed and applied in academia and industry in general. The management method presents itself as an integrated system formed by a set of management principles and practices that focuses on the losses generated in the processes of the companies, considerably reducing their costs and providing organizations with significant results in terms of performance. Thus, most decisions, through the WCM implementation process, are taken considering the impact that a particular action or area presents in relation to reducing losses, waste, defects and inventories. Since the focus is on reducing costs, this WCM pillar acts, in a transversal way, identifying the losses and wastes to be tackled and the areas where both occur. However, issues that go beyond reducing costs, however, must be considered, since such decisions have a strategic impact within organizations and directly influence their competitive position. The decision to invest in improvement projects, within the WCM approach, is therefore a multicriteria problem. In fact, the application of multicriteria modeling in the context of prioritizing and selecting improvement projects, by taking an approach that aims to increase efficiency and competitive advantage, has the characteristic of addressing different criteria (operational, strategic, among others) and allows the decision maker (DM) to clarify other relevant aspects in this type of decision. Thus, with the aim of ranking WCM projects, this paper presents the application of the FITradeoff to prioritize improvement projects in a large, automotive parts factory, using the WCM system.

Keywords: WCM, projects prioritization, FITradeoff, ranking problematic.

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Utilização do método FITtradeoff para seleção de subcontratados na construção civil

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Resumo. A complexidade dos sistemas produtivos têm ampliado ao passo que as variáveis que influenciam o desempenho aumentam. Na construção civil não é diferente, a complexidade do projeto está relacionada com o tamanho do projeto, quanto maior o projeto, maior a quantidade de atores envolvidos e, conseqüentemente, maior a complexidade de gerenciar e desenvolver cronogramas. O desempenho do projeto está associado com o cronograma de projeto, no que tange os aspectos de custo, de duração e de qualidade. O crescimento da subcontratação na construção civil dar-se com o propósito de alcançar melhor desempenho nesses aspectos. Nesse contexto, novos pontos podem ser relacionados ao desempenho, como o *know-how* e a cooperação do subcontratado. Nesse sentido, a problemática de Seleção de Subcontratados (SS) ganha ênfase, destacando a importância da seleção do subcontratado certo para atividade e a utilização de abordagens multicritério que permitam avaliar os subcontratados sob estes aspectos de desempenho. O presente estudo tem como objetivo selecionar os subcontratados para cada pacote de atividade considerando cinco critérios: custo, duração, qualidade, cooperação e *know-how*.

Para isso, será utilizado o método *FITtradeoff* em virtude das suas características de facilidade de elicitação e menor inconsistência. O resultado deste estudo é a construção de uma metodologia para SS considerando a subjetividade do decisor, de modo que o conjunto de subcontratados selecionados apresente desempenho satisfatório e que melhor represente as preferências do decisor.

Palavras-chave: Seleção de subcontratados, Apoio à decisão

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Modelo multicritério baseado no método FITradeoff para definição de tempos de inspeção em um sistema sujeito a inspeções imperfeitas

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Resumo. A presente pesquisa apresenta um modelo multicritério para o estabelecimento da política de manutenção, operacionalizada em termos de atividades de inspeção, voltada para um sistema de proteção (válvula de bloqueio). Sua grande motivação deriva do fato da demanda por gás natural estar passando por amplo crescimento, promovendo cada vez mais a utilização e construção de novos gasodutos. Como a procura por esse combustível envolve distintas organizações, variando de grandes indústrias a condomínios residenciais, uma parcela razoável de linhas de dutos está inserida em áreas habitadas ou com possibilidade de habitação, aumentando ainda mais os riscos de acidentes e incrementando as possibilidades de se tornar um desastre. Com isso, a correta política de manutenção assume um papel estratégico para a empresa responsável, sendo necessário um embasamento matemático e científico, baseados nos fatos realísticos, para a correta tomada de decisão. Neste sentido, o artigo propõe um novo modelo de inspeção baseado no *delay time* e sob uma perspectiva multicritério, onde não apenas o custo das inspeções é modelado, como também o tempo de inatividade (*downtime*) das válvulas, que é um fator crítico atrelado as atividades de manutenção nos gasodutos. Dentre as principais contribuições deste trabalho, destacam-se: o desenvolvimento do modelo para válvulas de gasodutos sujeito a inspeções imperfeitas (falso negativo) e a aplicação do método multicritério FITradeoff para tratar os conflitos entre os critérios de avaliação, considerando uma problemática de ordenação, chegando então a melhor política de manutenção a ser adotada, de acordo com as preferências do decisor.

Palavras-chave: Modelo Delay Time. FITradeoff. Inspeções imperfeitas. Política de manutenção.

Abstract. This research presents a multicriteria model for the establishment of a maintenance policy, operationalized in terms of inspection activities, focused on a protection system (shutoff valve). Its great motivation derives from the fact that the demand for natural gas has been undergoing a large growth, increasingly promoting the use and construction of new pipelines. As demand for this fuel involves many organizations, from large industries to residential condominiums, a reasonable portion of pipeline lines are in inhabited areas or in places with possibility of housing, further increasing risks of accidents and the chances of becoming a disaster. Thus, a correct maintenance policy assumes a strategic role for the responsible company, showing the necessity of a mathematical and scientific study, based on real facts, for the correct decision making. In this sense, this work proposes a new inspection model based on delay time and in terms of a multicriteria perspective, where not only the cost of inspections is modeled, but also the downtime of the valves, which are critical factors linked to pipeline maintenance activities. Among the main contributions of this work, one may highlight: the model development for pipeline valves subject to imperfect inspections (false negatives) and the application of the FITradeoff multi-criteria method to deal with conflicts between criteria evaluation, considering the ranking problematic, according to the preferences of the decision maker.

Keywords: Delay Time Model. FITradeoff. Imperfect Inspections. Maintenance Policy.

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Negotiation on Drama Theory: a Problem Structuring Method

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Abstract. Problem Structuring Methods (PSM) are designed to solve certain types of problem. Drama Theory (DT) is a PSM that may be seen as a “soft” variation from Game Theory. It is dedicated to use live action characters to simulate complex relations. DT allows insights to emerge and formulates new ways to model a Messy Situation involving confrontation, collaboration or negotiation, i.e., relation between people. Although the treatment of relations is a very important theme on this decade, few PSM papers are available on the subject. The purpose of this paper is to describe DT as a useful PSM to model those Messy Situations. To accomplish this task, the author describes briefly the PSM and its basic bibliographic references. After that, the author describes how has been conducted a case study using DT’s tools to prepare a debate about an aviation safety threat, enlightening the possible scenarios, and putting a light on the arguments that can be discussed over an aviation accident messy situation and all its stakeholders. The experiment was able to reveal insights and probable results to support decision makers on the preparation of a real public meeting, emphasizing method’s usefulness.

Keywords: Problem Structuring Methods, Drama Theory, Confrontation Analysis.

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Framework de aquisição para negociação entre empresas incluindo a responsabilidade social corporativa

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Abstract. Acquisitions and other of strategic alliances between companies are proactive management methodologies whose fundamental objective is to increase shareholder value, enter new markets or gain advanced technology. The Green Supply Chain Management (GSCM) concept integrates environmental behavior within the Supply Chain Management (SCM). Thus, GSCM's main objective is to minimize or eliminate waste including chemical waste, emissions, energy and solids in the supply chain. While the original focus of Corporate Social Responsibility (CSR) was on “social” responsibility (fair pay for employees, community-based programs), a recent development is the inclusion of environmental responsibility (eg reducing CO2 emissions).). Consistent with stakeholder theory, CSR can be an instrument for building stakeholder support, for example, implementing a new recycling program would increase the company's image or could attract new environmentally conscious customers. . Thus, the application of environmental policies can lead to competitive advantages in companies. However, corporate social responsibility issues are not widely considered as critical success factors in current procurement methodologies and are not taken into account in due diligence processes within the acquisition process. Thus, the main objective of the research was to propose a framework for the process of negotiation of acquisitions between companies, including social and environmental corporate responsibility as a negotiation subject, along with other factors, such as the price of acquisitions. Environmental issues are critical success factors that can be used in the negotiation process. It is concluded that companies with social responsibility programs can increase their economic value in strategic negotiation processes when the acquiring company perceives the implementation of socially and environmentally responsible programs as a successful resource for corporate advantage.

Keywords: Acquisition. Negotiation. Corporate Social Responsibility

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Estabilidade do Otimismo Pessimismo no Modelo de Grafo para Resolução de Conflitos Multilaterais

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Resumo. A principal contribuição dessa pesquisa é a introdução de um novo conceito de solução para o Modelo de Grafo para Resolução de Conflito (GMCR) para analisar conflitos multilaterais considerando um horizonte variável. O novo conceito de solução é recomendado para as situações onde os tomadores de decisão (TDs) não possuem informações sobre as preferências dos seus oponentes. Para descrever como os TDs devem fazer as suas escolhas, considera-se que o comportamento dos TDs corresponde com o princípio da regra de *Hurwicz* e que eles escolhem a alternativa com maior valor ponderado pelo seu grau de otimismo entre o melhor e o pior cenário passível de alcance no conflito. Semelhante a estabilidade de movimento limitado, a estabilidade do otimismo pessimismo antecipa em h movimentos qual será o estado final do conflito.

Palavras-chave: Análise de Conflitos, Modelo de Grafo para Resolução de Conflito, Conceito de Solução, Estabilidade do Otimismo Pessimismo.

Abstract. The main contribution of this paper is introducing a new solution concept for multilateral conflicts in the graph model for conflict resolution (GMCR) with variable horizon. This new solution concept is useful in a range of conflict situations where decision makers (DMs) have no information about the opponents' preferences. In order to describe how DMs should act, we consider that DMs behave according to the Hurwicz principle and select the alternative with the higher weighted average value between of the best and worst scenarios according to their degree of optimism. Similar to the limitedmove stability, the Optimism Pessimism stability anticipates in h moves what will be the final state of the conflict.

Keywords: Conflict Analysis, Graph Model for Conflict Resolution, Solution Concept, Optimist Pessimism Stability.

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The use of ordered weighted operators in negotiation protocol

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Abstract: This study proposes an evaluation of the ordered weighted operators in the assistance of negotiators in a negotiation protocol. This study evaluates some concepts and important metrics of the area to exhibit some characteristics compatible with the traditional negotiation framework. These characteristics should contribute with some bargain protocol points, for example: improvement the efficiency of negotiation, coherent representation of negotiation perception, improvement in an elicitation process, learning about the negotiation process, among others benefits. A numerical example is presented to demonstrate an example of the process.

Keywords: Negotiation, Ordered weighted operators, Bargain

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How interactions between patients and the emergency department can reduce overcrowding: A gametheoretical approach

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Abstract. The ability to treat patients in emergency departments (ED) are limited by the number of doctors, nurses, support and services staff. Moments of overcrowding occur when the number of patients arriving exceeds the capacity limit of the ED. Using a two-stage game model, in which the first one understands the choices of the ED and the second the strategies of the patient, this paper shows that solutions can be found. The model contains the definition of payoffs in moments of superlotations, considering the risk levels of each patient. The Results show the increase in risks for patients and the importance of overcrowding problem solution.

Keywords: Emergency department overcrowding; Patients; Decision making; Game theory; Play in extensive form.

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Análise da influência de fatores da qualidade em um modelo de manutenção de inspeção e substituição preventiva

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Abstract. The maintenance function, supported by mathematical models capable of bringing effective solutions to impacting problems, plays an essential role as a base provider, over which productive systems are able to remain operational for as long as possible. On the other hand, rapid changes in production systems bring with it a high effort to adapt and master underlying technologies that reverberate in the often insufficient quality of maintenance actions. For this reason, this work brings as its main contribution a quantitative analysis of the impacts related to the different quality aspects of maintenance actions. To this end, an analysis of the quality of maintenance in a context of inspection and replacement by age is proposed for a single component system, where there is the possibility of defect detection errors (false positive and false negative). The quality of preventive maintenance is modeled on the premise that components derive from a heterogeneous population composed of strong and weak items and with a mix parameter reflecting quality. As a practical impact, it is expected that counterintuitive results will be found with respect to measures normally in the maintenance function, where they usually aim to reduce costs without noting the influence of the effect of quality reduction on maintenance actions. Expected results are information on how different aspects of quality can be identified and understood by maintenance managers for a particular policy so that they can direct resources and time into actions that promote effective improvements, which may be more closely related. with training and capacity building than investment in physical system improvements.

Keywords: Maintenance policies, Quality, delay time.

Abstract.. A função manutenção, suportada por modelos matemáticos capazes de trazerem soluções efetivas a problemas impactantes, tem papel essencial como provedora de base, sobre a qual os sistemas produtivos são capazes de manterem-se operacionais por maior tempo possível. Por outro lado, rápidas transformações nos sistemas produtivos, trazem consigo esforço elevado de adaptação e de domínio de tecnologias subjacentes que reverberam em uma qualidade muitas vezes insuficiente das ações de manutenção. Por esta razão, este trabalho traz como principal contribuição uma análise quantitativa dos impactos relativos aos diferentes aspectos de qualidade das ações de manutenção. Para tanto, é proposto uma análise da qualidade em manutenção em um contexto de inspeção e substituição por idade para um sistema de um componente único, onde existe a possibilidade que erros na detecção do defeito (falso positivo e falso negativo). A qualidade da manutenção preventiva é modelada a partir da premissa que os componentes derivam de uma população heterogênea, composta por itens fortes e fracos e com um parâmetro de mistura refletindo a qualidade. Como impacto prático, espera-se que sejam encontrados resultados contra intuitivos no que diz respeito às medidas normalmente tomadas na função manutenção, no qual estas normalmente visam a redução de custos sob pena de uma redução na qualidade, que a longo prazo termina por acrescer o custo total. Nesse sentido, uma análise da influência do efeito da redução da qualidade nas ações de manutenção faz-se imprescindível. Os resultados esperados são informações de como diferentes aspectos de qualidade podem ser identificados e entendidos pelos gestores de manutenção, para uma política em particular, a fim de que estes possam direcionar recursos e tempo em ações que promovam melhorias efetivas, as quais podem estar mais relacionadas com ações de treinamento e capacitação do que investimento em melhorias dos sistemas físicos.

Keywords: Manutenção, Qualidade, *Delay time*.

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Estudo e mensuração da eficácia de políticas de manutenção

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Abstract. Measuring the impacts from using maintenance policies in practical contexts is essential so that maintenance models can actually be applied to real scenarios in order to provide benefits to companies. In this sense, this work proposes that the evaluation of the effectiveness of a maintenance policy should not only be established from the perspective of the potential level of improvement that it can provide to the system, but also be analyzed according to the quality of maintenance resources and the management cost of practical policy implementation. The consideration of these three dimensions is important to avoid harmful discrepancies between the mathematical theory used for the development of maintenance policies and their respective practical application. Thus, this paper proposes that the effectiveness assessment should be based on three different aspects: (i) the level of improvement provided by the maintenance policy when compared to not taking planned actions (leaving it to failure); (ii) the influence of the quality of maintenance resources on policy effectiveness; and (iii) the management cost related to the implementation of a certain maintenance policy. Studying these aspects allows different dimensions of policy effectiveness to be assessed, providing a comprehensive analysis of the effectiveness of maintenance policies. It is observed that there is not yet an approach in the literature as proposed in this work. Therefore, it brings reflections and insights that may explain the very frequent use of maintenance policies considered ineffective in different production systems, besides proposing a comprehensive framework for evaluating the effectiveness of maintenance policies.

Keywords: Maintenance policies, effectiveness, effectiveness of maintenance policy actions, delay time.

Abstract. A mensuração dos impactos advindos da utilização das políticas de manutenção em contextos práticos é imprescindível para que os modelos de manutenção possam ser de fato empregados à realidade de forma a prover benefícios para as empresas. Nesse sentido, este trabalho propõe que a avaliação da eficácia de uma política de manutenção não seja estabelecida apenas sob a perspectiva do potencial nível de melhoria que ela pode proporcionar ao sistema, mas também seja analisada de acordo com a qualidade dos recursos de manutenção e segundo o custo gerencial da implementação prática da política. Dessa forma, a consideração dessas três dimensões se mostra importante para evitar a ocorrência de distanciamento entre a teoria matemática utilizada para o desenvolvimento de políticas de manutenção e sua respectiva aplicação prática. Assim, este trabalho propõe que a avaliação da eficácia deve ser baseada em três aspectos diferentes: (i) o nível de melhoria proporcionado pela política de manutenção em relação a não adoção de ações planejadas (deixar falhar); (ii) a influência da qualidade dos recursos de manutenção na eficácia da política; e (iii) o custo gerencial relativo à implementação de uma determinada política de manutenção. O estudo desses aspectos permite que diferentes dimensões da efetividade de uma política sejam avaliadas, proporcionando uma análise abrangente, no que concerne a efetividade de políticas de manutenção. Observa-se que ainda não há na literatura uma abordagem tal como a proposta neste artigo. Este trabalho vem, portanto, trazer reflexões e insights que possam explicar o uso bastante frequente de políticas de manutenção consideradas pouco efetivas em diferentes sistemas produtivos, além de propor um framework abrangente de avaliação de efetividade de políticas de manutenção.

Keywords: Políticas de manutenção, eficácia, efetividade de ações de políticas de manutenção, delay time

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Política de planejamento de ordens de manutenção para parques eólicos offshore baseada em uma abordagem de racionamento de sobressalentes

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Abstract. Maintenance is a critical operation in offshore wind farms, since it affects the wind turbine downtime and therefore the energy production. The latter is very sensitive to turbine stoppages since the wind speed oversea is very high. Therefore, any maintenance strategy that keeps the system in operational status is valuable to the business. Despite that, when spare parts are not available in the inventory, some planned maintenance actions could be no longer executed and then, the maintenance strategy could become inefficient. The dependency of the maintenance actions on the availability of spare parts makes rationing the on-hand inventory a complex and vital task. This is particularly true when the spare parts demanded for maintenance actions is higher than the available inventory, since it is costly to wait for a spare part ordering to arrive. In such a case, it is necessary to ration the on-hand inventory, and outsource some maintenance actions. The proposed study aims to develop a maintenance demand planning model for a wind farm that uses an opportunistic maintenance policy. The model is based on an inventory rationing approach that could allow managers to attend more turbines by the internal maintenance crew, while minimizing the maintenance cost.

Keywords: Opportunity maintenance, offshore wind farm, demand planning, spare parts.

Resumo. A manutenção é uma operação crítica em parques eólicos offshore, pois afeta o tempo de inatividade da turbina eólica e, portanto, a produção de energia. Este último é muito sensível às paradas da turbina, pois a velocidade do vento em alta mar é muito alta. Portanto, qualquer estratégia de manutenção que mantenha o sistema em status operacional é valiosa para o negócio. Apesar disso, quando os sobressalentes não estão disponíveis no estoque, algumas ações de manutenção planejada não podem mais ser executadas e, em seguida, a estratégia de manutenção pode se tornar ineficiente. A dependência das ações de manutenção da disponibilidade de sobressalentes torna o racionamento do estoque disponível uma tarefa complexa e vital. Isso é particularmente verdadeiro quando os sobressalentes exigidos para ações de manutenção são mais altos que o estoque disponível, pois é caro esperar a chegada de um pedido regular de sobressalentes. Nesse caso, é necessário racionar o estoque disponível e terceirizar algumas ações de manutenção. O estudo proposto visa desenvolver um modelo de planejamento de demanda de manutenção para um parque eólico que utiliza uma política de manutenção oportunista. O modelo é baseado em uma abordagem de racionamento de estoque que pode permitir que os gerentes atendam a mais turbinas usando a equipe de manutenção interna, minimizando o custo de manutenção.

Palavras-chave: Manutenção oportuna, parque eólico offshore, planejamento de demanda, sobressalentes.

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MODELO PARA DEFINIÇÃO DE POLÍTICAS DE INSPEÇÃO EM INDÚSTRIA DE MASSAS E BISCOITOS COM BASE NO DELAY TIME

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Resumo. O desenvolvimento de sensores capazes de auxiliar o diagnóstico incipiente de defeitos permitiu o desenvolvimento de modelos de apoio ao planejamento da manutenção mais eficientes na proposta de minimizar as chances de falhas de equipamentos e tornar as empresas mais competitivas. Neste sentido, a manutenção preditiva se desenvolveu com políticas de inspeção que se baseiam na condição do equipamento com uso de técnicas de monitoramento. A análise de vibração é uma técnica de manutenção preditiva que consegue detectar falhas como: defeito de rolamento, desbalanceamento, desalinhamento, cavitação, engrenagens quebradas entre outros. Muitas empresas definem políticas de inspeção forma arbitrária levando em consideração apenas a criticidade dos equipamentos. Entretanto, tal abordagem pode ser efetiva em situações com ausência de dados do histórico de inspeções e monitoramento. Nesta pesquisa, é proposto um modelo de apoio a decisão para determinar qual a periodicidade de inspeção com base em dados históricos de inspeções preditivas e no conceito do delay time. Esta proposta de construção do modelo deu suporte para determinar qual é o tempo de inspeção mais adequado de cada conjunto de equipamentos semelhantes como motores, redutores, bombas, mancais e avaliar o custo de manutenção de cada equipamento atrelado esta política de inspeção. Um estudo de caso foi desenvolvido em uma indústria de massas e biscoitos com mais de 8 anos de histórico de dados de monitoramento. O modelo proposto permite melhorar o processo de inspeção dos equipamentos definindo o momento ideal para inspeções, possibilitando em alguns casos monitorar uma maior quantidade de equipamentos sem interferir na qualidade da inspeção e também programar o melhor momento para a substituições.

Palavras-chave: Gestão da Manutenção, Manutenção Preditiva, Delay Time.

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Aplicação da modelagem delay time na política preventiva de segurança pública

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Resumo. A segurança pública no atual cenário brasileiro ganhou grande destaque com os trabalhos policiais desenvolvidos pela Polícia Federal no combate ao crime organizado e à corrupção, tendo também importante papel no trabalho preventivo de crimes, notadamente em ações de assalto a agências bancárias e veículos de transporte de valores. Essa forma de crime exige sempre um planejamento por parte das quadrilhas, o que invariavelmente fornece vestígios identificáveis por ações policiais. Vislumbra-se em tal atividade a aplicação da modelagem delay time, um método bastante utilizado no setor industrial. Este modelo prevê a ocorrência de situações de defeitos como precedente das falhas em componentes industriais, sendo que no caso se adaptou a ferramenta interpretando-se como defeitos os atos preparatórios do bando, enquanto que os crimes em si são tratados como as falhas. O intervalo de tempo desde o primeiro momento de ato preparatório dos grupos criminosos até a prática dos assaltos é analisado, cujo período é visto como a janela de oportunidade para execução das ações policiais preventivas. Para a modelagem no caso é explorada toda a expertise do órgão policial na apuração de crimes dessa espécie, extraído-se das apurações anteriores os elementos mais comuns a fim de se identificar os atos preparatórios do intento criminoso. A ferramenta, originalmente desenhada para a área industrial, mostrou-se plenamente aplicável na área de segurança pública. Os resultados obtidos são coerentes com a realidade posta sob exame. A aplicação prática de inspeção periódica na forma proposta, considerando os resultados favoráveis obtidos, certamente poderá incrementar a efetividade da Polícia Federal no combate às ações cruéis de assalto a instituições financeiras e de transporte de valores. O estudo se mostra pioneiro, principalmente pela pouca aplicação de métodos matemáticos às ciências sociais, inserindo-se na literatura a integração das políticas de manutenção da engenharia com as ciências policiais. Aplicando analogicamente a estrutura de uma planta industrial complexa, o trabalho busca identificar o tempo ótimo para mobilização de recursos humanos, como uma das ações de inteligência, no escopo da atuação da polícia federal em compasso com os custos arcados pela sociedade com a ocorrência dos graves crimes.

Palavras-chave: Segurança pública, Política preventiva, Manutenção, Inspeção, Delay time, DTM.

Abstract. Public security in the national scene has gained the spotlight with the police work carried out by the Federal Police in the action against organized crime and corruption, and also has an important role in the preventive work avoiding crimes, notably in robbery on bank agencies and armored cash transportation. This species of crime always requires gang planning and that's invariably provides traces identifiable by police action. In this activity, the application of the delay time modeling, a method widely used in the industrial sector, is envisaged. This model predicts the occurrence of defect situations as precedent of failures in industrial components, in which case the tool was adapted by interpreting the preparatory acts of the gang as defects, while the crimes themselves are treated as the failures. The time interval from the moments of preparatory acts of criminal groups to the practice of robberies is analyzed, whose period is seen as the window of opportunity for the execution of preventive police actions. For the modeling in this case, all the expertise of the police agency in investigating crimes of this kind is explored, extracting from the previous findings the most common elements in order to identify the preparatory acts of criminal intent. The tool, originally designed for the industrial area, proved to be fully applicable in the public safety area. The results obtained are consistent with the reality under examination. The practical application of periodic inspection in the proposed form, considering the favorable results obtained, can certainly increase the effectiveness of the Federal Police in combating the cruel actions of assault on financial institutions and transportation of values. The study is pioneering, mainly due to the little application of mathematical methods to the social sciences, including the integration of engineering maintenance policies with the police sciences. Applying analogously the structure of a complex industrial plant, the work seeks to identify the best time for police action, the optimal time for mobilization of human resources in keeping with the costs borne by society with the occurrence of serious crimes.

Keywords: Public safety, Preventive policy, Maintenance, Inspection, Delay time, DTM.

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Cultural aspects and monetary implications: A comparative study across Brazil and India

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Abstract. Cultural aspects such as perception of time, risk and cultural dimensions of Hofstede can be a start to better know a consumer/negotiator. Brazil and India have been increase the participation in economic bodies and also in the number of negotiations. The aim of the work is to analyze the main characteristics of the people from each culture in order to know the other part better before starting some interaction with them, improving processes. With the maximum of information in hands it is better to formulate strategies to negotiate reaching to the best results for all parts. Questionnaires were used and applied among students and researchers in Brazil and India. Related to perception of time, a person's choice of payment-amount for a good/service depends on his/her trade-off between price and time, often not consistent across different situations and different time-horizons. In online sales perspective, results show that Uncertainty Avoidance and Long-term Orientation dimensions do not have an influence over the Decreasing Impatience index while the country they belong does and the Brazilian sample is more impatience. About risk, Brazilians are risk averse while Indians are risk prone, confirming earlier studies. Based on the sample, it was also found that culture affects risk attitudes while gender does not. While there are some similarities with the results found by Hofstede, participant perceptions about themselves differ from that for the negotiation counterpart, suggesting a possible barrier for a negotiation.

Keywords: Cross-cultural differences, time preference, risk attitudes, Hofstede's cultural dimensions, Brazilians, Indians.

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Problem Structuring Methods: A Scoping Review

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Abstract. The goal of this study is to present a scoping review of the existing literature in Problem Structuring Methods (PSMs) field, in terms of volume of publication over the years, topics that are being covered by these studies, location, the main authors, and how these studies are related with each other. For this, the Web of Science™ database was used and the VosViewer and CitNetExplorer tools were applied for construction of the bibliometric network (co-occurrence network and the country coauthorship network) and citation relationship network, respectively. Since 1979, it was verified 604 papers concerning PSMs and most of them occurred in the last decade, being England the country with highest number of publications in this topic. The study also identified the ten most relevant authors and the ten most important publications. This study aims to understand the advances of the field over the years, identify its boundaries and can be useful to identify existing gaps.

Keywords: Complex Problems; Problem Structuring Methods; Soft Operational Research.

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Assessing the relationship between supply chain performance and organizational culture: a fuzzy grey cognitive maps based decision model

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Abstract. To comprehend the relationship between supply chain performance and organizational culture can help predict scenarios and improve decision making. However, their interface remains unexplored due to the complexity of quantitatively address the interference of subjectivity. Soft computing techniques associated with computational processing of human language have the potential to overcome this difficulty and are rarely applied to this context. Therefore, this research aims to associate grey clustering (GC) and fuzzy grey cognitive maps (FGCM) to analyze and quantify the causal relationship between organizational culture and supply chain performance. This application is not found in the literature and, therefore, can provide new perspectives. The development of this research, based on SCOR[®] (Supply Chain Operations Reference) model performance attributes and Hofstede's organizational practices, is executed in four stages: literature review, computational modeling and simulation, practical applications and result analysis. The main contribution is the proposition of a decision making model that sets guidelines for the elaboration of action plans to promote the alignment between organizational culture and supply chain performance management. In addition, the combination of GC and FGCM, also not found in the literature, increased the reliability of the model by reducing the inputs required to the user and, therefore, the uncertainty associated with the inserted data, contributing to improve the chances and speed of convergence of the system. It is expected, from pilot applications, to provide practical results that foster the search for the congruence between organizational culture and performance management in supply chains adherent to different competitive strategies.

Keywords: Supply Chain, Performance Management, Organizational Culture, Decision making, Fuzzy grey cognitive maps, Grey Clustering.

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The influence of music and arithmetic problems solving in the tradeoff elicitation context

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Abstract. The aim of this paper is to explore how the cognitive efforts of a decision maker in different situations such as listening to music and solving arithmetic problems can be related to the cognitive effort that is necessary to make different decisions. The use of neuroscience tools such as Eye Tracker and Electroencephalogram (EEG) allows the analyzes of neurophysiological signals during the decision making process.

Keywords: Tradeoff elicitation, Neurodecision, decision making.

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Sistema de votação por subconjunto aleatório e demanda cognitiva: um estudo pupilométrico no contexto de decisões sociais

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Abstract. A important questioning in pupillometry has experienced resurgence in the last 20 years which is the cognitive effort expended by individuals during a decision (Van der Wel and Van Steenbergen 2018). On this perspective, this study displays, with expediency, recent research on the pupil dilation caused by activities within the scope of cognitive administration tasks, with the aim of assessing the individual's cognitive effort through the variation in pupil mean diameter, supplied by eye-tracking equipment during the use of the voting procedure of RSV (Random-Subset Voting) in a scenario of five (5) votes in institutional projects. It should be emphasized that the research fits as the literature, experimental and quali-quantitative approach. This study was conducted an experiment of neuroscience combined with the RSV that involved the ocular tracking of undergraduate students (sample = 26) of UFPE, in order to investigate whether there is a reduction in the cognitive load of students during the use of RSV as an instrument of collective decision, taking as reference the baseline, intrinsic to each participant. As a result, exhibited the pupillary dynamics associated with the votes (V1 = 2 projects; V2 = 4 projects; V3 = 8 projects; V4 = 14 projects; and V5 = 22 projects) through the analysis of the variation of the pupillary diameter of voters. In this sense, it was discovered that the reduction of the number of options does not contribute to the minimization of cognitive burden of individuals, but can unite in an analysis of imprint more rational and directive. The results also assist further discussion about the tool and possible applications in different contexts in the conjuncture of social decision.

Keywords: Random-Subset Voting, Dilation of the pupils and Cognitive effort.

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A Hybrid Fuzzy Group Decision Model Based on consensus techniques and mathematical programming for supplier evaluation

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Abstract. Supplier evaluation plays an important role in performance management and supply chain development. In these decision making processes, several criteria, alternatives and decision makers should be considered, which could bring complexity to the problem. Several multi criteria techniques based on fuzzy set theory are used to deal with the imprecisions inherent to a decision process. Techniques are usually classified between consensus techniques or aggregation of judgments techniques that are used in a different ways, however consensus and judgment aggregation approaches can be combined, used at different stages of the decision making process. To represent the information of the decision maker opinions, the dual hesitant fuzzy theory was developed to overcome the limitations of the intuitionistic fuzzy and hesitant fuzzy representations. The general objective is to propose a group decision making model that combines the approaches of consensus and aggregation of judgments. The Value Focused Thinking (VFT) is used in order to structure the decision problem, defining the goals, alternatives and attributes that should be evaluated. A consensus approach is applied in the second stage for the definition of criteria importance and decision makers' weight, while the aggregation operators will be used in the stage of alternative performance evaluation. Then, the fuzzy cognitive maps is used to rank the alternatives in each criterion considering their relationships. Finally, a programming model is applied to identify the best solution considering all criteria. A Pilot application will be developed in a company in the animal health industry with the purpose of evaluating the proposed model. The project proposal includes five phases: literature review; structuring and detailing the model; implementation of decision making techniques; comparative analysis of the results and, pilot application. It is expected that this project will develop a model that is consistent with the needs of complex group decision making processes.

Keywords: Supplier evaluation, dual hesitant fuzzy, group decision making, consensus; fuzzy cognitive maps.

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Proposition of a group decision model to determine risk management strategies in organizations integrant of a supply chain.

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Abstract. Supply chains are the modern structural reality of the organizational relationships. It is a challenging environment where information, material, and financial flows go beyond organizational, and sometimes national, boundaries. Relationships with global suppliers, fluctuations in demand, outsourcing, bring complexity to these chains and make them more vulnerable to interruptions in normal flows and that may affect end-customer service. Aiming to assure the achievement of expected performance, organizations' management needs to be able to respond to factors that jeopardize accomplishing their goals. However, the choice of the most appropriate strategies for doing that is complex, since it involves several aspects, interests of numerous stakeholders and has influence in the organizational future. Decision making process on this context will bring the consideration of all those characteristics so it is highly important that managers can rely on methods that support that process and ensure consideration of the organizational objectives. This work proposes the elaboration of group decision models that support the selection of the most adequate strategies for organizations members of supply chains to respond to factors that may threat their performance and sustainability. The characteristics of the decision context establishes a group decision environment where uncertainty and subjectivity of judgements need to be approached. The use of Fuzzy Logic Theory will enable dealing with those factors. A Value Focused Thinking (VFT) approach will be applied to clarify and capture the values of stakeholders in the context for a more coherent decision-making process. Then, a group decision model will be structured accordingly the steps presented by the relevant literature, including the selection of the most adequate Multicriteria Decision Aid (MCDA) technique to the context considered. Finalizing, the model will be applied to select the strategies, which may be defined from supply chain organizations environment and scientific literature. This research project is structured in the following phases: literature review, modeling, selection and implementation of decision aiding techniques, and application.

Keywords: Supply chain, Strategies, Group decision making, Decision model

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Group decision framework for multidimensional risk analysis

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Abstract. This paper aims to propose a group decision framework for multidimensional risk analysis problems. In decision-making process that involves two or more decision-makers, it can lead to different results, from the perspective of each decision-maker separately. This is not different on the multidimensional risk analysis, where the decision-makers have different risk behaviors (risk preference), that may be conflicting among decision-makers. When all decision-makers agree on the criticality level of a particular system risk, there is little to discuss in the group view. However, in several real situations, there will be conflicting views of decision-makers about the criticality of risk of a system, i.e., it probably means that each decision maker wants to direct levels of resources to treat the risks of each system differently. Therefore, for these conflicting points, the focus should be on efforts to structure a group decisionmaking (GDM) process. For this, this work proposes a Multidimensional Risk Analysis framework that assigns systems to certain risk categories considering multiple decision-makers.

Keywords: Multidimensional risk, Risk Analysis, Group Decision Framework.

Desenvolvimento de um modelo de negociação integrativa para a definição de ações individuais no canal de fluxo reverso

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Resumo. A Política Nacional de Resíduos Sólidos (PNRS), promulgada pela Lei nº 12.305/2010, é uma tentativa de provocar a conscientização de diferentes esferas da sociedade para a sustentabilidade. Para tanto, a PNRS propôs o conceito de responsabilidade compartilhada pelo ciclo de vida do produto. Este incorporou, além dos fabricantes, outros stakeholders como consumidores e o poder público, precisando lidar com suas diferentes perspectivas, o que pode gerar conflito na definição de suas responsabilidades individuais. Além disso, este conceito coloca a logística reversa (LR) como ponto-chave para a gestão dos resíduos gerados. Porém, a LR é muitas vezes negligenciada por falta de conhecimento ou estímulos corretos, o que leva ao descarte inadequado dos resíduos. Desta forma, o presente estudo objetivou desenvolver um modelo de negociação integrativa para a definição de um subconjunto de ações individuais na LR para a gestão de resíduos sólidos, que viabilize a implementação da responsabilidade compartilhada prevista pela PNRS. O modelo foi desenvolvido em três fases: Pré-Negociação, Negociação e Pós-Negociação. Como resultado, o modelo proposto foi capaz de promover o fortalecimento do engajamento entre as partes envolvidas e o seu comprometimento efetivo com o atendimento à PNRS por meio do cumprimento das ações definidas.

Palavras-chaves: Responsabilidade Compartilhada, Logística Reversa, Negociação multi-atributo.

Abstract. The National Policy of Solid Waste (NPSW), promulgated by Law No. 12,305 / 2010, is an attempt to raise awareness of different spheres of society for sustainability. The NPSW proposed the concept of shared responsibility for the product life cycle. In addition to manufacturers, it has incorporated other stakeholders such as consumers and the government, needing to deal with their different perspectives, which can create conflict in the definition of their individual responsibilities. Moreover, this concept places reverse logistics (RL) as a key point for waste management. However, RL is often neglected due to lack of knowledge or correct stimuli, which leads to improper waste disposal. Thus, the present study aimed to develop an integrative negotiation model for the definition of a subset of individual actions in RL for solid waste management, which enables the shared responsibility implementation foreseen by PNSW. The model was developed in three phases: Pre-Negotiation, Negotiation and Post-Negotiation. As a result, the proposed model was able to promote the strengthening of engagement between the stakeholders and their effective commitment to meeting the PNRS through the fulfillment of the defined actions.

Keywords: Shared Responsibility, Reverse Logistics, Multi-attribute negotiation.

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UM FRAMEWORK DE APOIO À DECISÃO MULTICRITÉRIO EM GRUPO BASEADO NO CONCEITO DE REFERÊNCIA IDEAL PARA AMBIENTES FUZZY

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Resumo: Os métodos de apoio à tomada de decisão multicritério podem apoiar a tomada de decisão mais eficiente por parte dos gestores. Por essa razão, muitos trabalhos utilizam esses métodos para uma tomada de decisão mais eficiente e também buscam melhorias e extensões para métodos já existentes. Conhecendo os métodos RIM e FRIM e sabendo que os mesmos não possuem extensões para a tomada de decisão em grupo, este trabalho tem como objetivo propor e validar um framework de apoio de decisão multicritério baseado no conceito de referência ideal e lógica fuzzy para a tomada de decisão em grupo. Foi realizado um levantamento bibliográfico durante todo o curso da pesquisa, até o presente momento, sendo consultadas publicações de alcances nacionais e internacionais, abordando teorias necessárias para o entendimento do campo em que a pesquisa está sendo desenvolvida. Para tal, foram utilizados, como bases de dados, repositórios de universidades federais para acesso a teses e dissertações, livros e as bases de dados SCOPUS e Periódicos CAPES. Baseado no que foi encontrado e discutido no levantamento bibliográfico, o próximo passo do trabalho consiste em elaborar uma extensão dos métodos RIM e FRIM para decisão em grupo. Depois de implementar o modelo, o passo seguinte é fazer a validação do mesmo e avaliar os resultados. Como resultados, espera-se conseguir implementar e validar com sucesso o modelo proposto, de forma que possa oferecer aos interessados direcionamento para futuras aplicações e/ou aperfeiçoamentos.

Palavras-chaves: Análise de decisão, métodos multicritérios, método de referência ideal, lógica nebulosa.

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Aplicação de modelos de localização de facilidades no estudo de localização de Centrais do Cidadão em Natal/RN

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Abstract. Não só à melhor utilização de recursos públicos são fundamentais do planejamento a execução de projetos, como também o cumprimento do objeto fim do serviço. Nesse sentido, este artigo tem como objetivo analisar possíveis localizações das Centrais do Cidadão na cidade de Natal/Rio Grande do Norte - RN. Utilizando três modelos clássicos de problemas de localização (Problema de p-Mediana não-capacitado, Problema de Localização de Máxima Cobertura (PLMC), Problema de Localização para a Cobertura de Conjuntos) foram definidas localizações considerando parâmetros pré-definidos. Com isso, foi realizada uma comparação da atual localização das Centrais do Cidadão e ao planejamento do Governo do Estado do RN. Por fim, verificou-se com os locais atuais são os também definido pelos modelos.

Keywords: otimização combinatória, problemas de facilidade, centrais do cidadão.

A heuristic algorithm for solving an integrated location-scheduling problem

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Abstract. We present a heuristic algorithm for solving an integrated problem involving location and scheduling decisions. Scheduling problems represent a well-studied class of combinatorial optimization problems. The main motivation for their study relies on the high potential of applications in real-life contexts, e.g., in industrial production (manufacturing), project scheduling and healthcare. Location problems, also represent a well-studied class of combinatorial optimization problems with several practical applications, for example, in the design of supply chain networks. Commonly, the studies in the literature are focused on solving these problems independently, disregarding the relationships between them. However, admitting that there exist relationships between them, it is known that considering both of them in an integrated way can lead to improved global solutions. In this study, we consider the problem of scheduling a set $J = \{1, \dots, n\}$ of jobs in at most m parallel machines whose locations are selected from a set $L = \{1, \dots, l\}$ of candidate locations. Each job $j \in J$ must be processed for p_j units of time and cannot start being processed in a machine located in $l \in L$ before time r_{jl} . Preemptions are not allowed and the objective consists in: (i) selecting the location of the machines, (ii) assigning jobs to the machines, and (iii) defining the sequence of jobs on each machine in order to minimize the makespan, i.e., the maximum completion time of the machines. To solve this problem, we propose an Iterated Local Search metaheuristic that combines the use of a greedy procedure to generate initial feasible solutions with a Randomized Variable Neighborhood Search method as local search procedure. The method consists in firstly defining an initial set of machines to be used and then scheduling the jobs on them. Then, in a second step, the local search procedure is applied to possibly improve the solutions until finding a local optimal solution. Thus, a perturbation is performed aiming at exploring a new search space of the solutions and the process reiterates. This process is repeated until the stopping criterion is reached. Computational experiments on benchmark instances from the literature show that the proposed metaheuristic algorithm is able to improve results from the literature, providing high quality solutions in reduced execution times.

Keywords: Location and Scheduling, Metaheuristic, Iterated Local Search

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MULTICRITERIA EVALUATION OF WAST DISPOSAL FACILITIES

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Abstract. Rio de Janeiro has been historically problematic in regards of its urban waste management. Serious environmental damage has been inflicted in the city due to inadequate waste disposal facilities. This works aims to evaluate the main waste disposal facilities in the Rio de Janeiro Urban area since the 20th century using the MACBETH (Measuring Attractiveness by a Categorical Based Evaluation Technique) Multicriteria decision aid method, being those the Seropédica, Gericinó, Gramacho and Caju landfills. To acquire the necessary information, a Geographic Information System (GIS) was made through the QGIS software, using cartographic files provided by the Brazilian Institute for Geography and Statistics (IBGE). The criteria considered in this analysis were Disposal Technology, Distance to Permanent Protection Areas, Distance to Airports and Access to Road Network. The landfills were compared for each criterion through the MACBETH software, generating a score for each unit. The results found shows that there was a clear evolution at the implementation of each new site, confirming that the waste management problem has been constantly getting more attention from authorities.

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Avaliação das capitais brasileiras em relação às cidades inteligentes e sustentáveis utilizando o método FITradeoff

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Abstract. The rapid increase in population in cities has brought several urban problems related to traffic, health, education, safety and environment, making it difficult to manage it. According to the United Nations (UN), more than 70% of the world's population will live in cities by 2050, which may further aggravate this scenario. Given the postulate, it is necessary to adopt measures that mitigate this situation. It is in this context that the concept of smart and sustainable city emerges, referring to an innovative city that uses information and communication technologies (ICTs) and other means to improve the quality of life, efficiency of urban operations and services, and thus meet the needs of current and future generations regarding economic, social, environmental and cultural aspects. This new terminology emerged after criticism from some authors regarding the term Smart Cities, especially for emphasizing the technocentric bias, with little focus on sustainable bias. Therefore, the objective of this research is to classify the Brazilian capitals in stages of development with regard to smart and sustainable cities. The choice of the research object is justified by the fact that the capital, for the most part, is the most populous city in the state. To achieve the proposed objective, the model developed by the European Standards Organization with Global Impact (ETSI) will be adapted, which presents 75 indicators, divided into four dimensions: Person, Planet, Prosperity and Governance. The choice of the model was due to the greater balance between technology and sustainability among the main models found in the literature. The classification process of the Brazilian capitals will be made through a multicriteria analysis, using the deterministic additive model within the scope of the Multiple Attribute Value Theory (MAVT). The Flexible and Interactive Tradeoff method (FITradeoff) will be used as it reduces the cognitive effort of the decision maker and decreases inconsistencies when compared to the traditional Tradeoff. As preliminary results it was found that the Prosperity dimension presented the largest deficit among the analyzed approaches, being, therefore, the dimension that requires the greatest efforts to improve the overall performance of cities. Moreover, it was observed that there is a correlation between the richest cities and the performance in the Planet sphere. The Southern region of the country was highlighted in the dimension that mainly evaluates the quality of life of the population. It was also found that the city of Recife was the only capital of the Northeast to be classified in a higher category, and this performance was obtained in the Governance dimension. Finally, it is believed that this work can serve as a guiding tool for managers, city planners and private sector entities in the search for development strategies that increase the performance of municipalities.

Keywords: Sustainable Smart City; FITradeoff; Problematic Sorting.

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Análise da tomada de decisão na interação de veículos autônomos em cenários específicos

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Resumo. A automatização de veículos tem atraído crescente interesse nos últimos anos, tanto para empresas e montadoras quanto para pesquisas acadêmicas. Modelos baseados na teoria dos jogos têm sido amplamente utilizados para analisar interações entre veículos autônomos e outros usuários. A literatura nesse campo é voltada para o comportamento entre o veículo autônomo e o pedestre diante o cenário da travessia destes pela faixa de segurança. Sendo assim, o objetivo deste trabalho é analisar a tomada de decisão em uma negociação entre veículos autônomos e pedestres, para a priorização da passagem no cenário de travessia de faixa de segurança sem sinalização semafórica, utilizando o modelo *chicken game*. Os resultados mostram que a qualidade da comunicação é essencial para uma travessia segura, sugerindo adoção de políticas regulatórias.

Palavras-chave: Teoria dos Jogos, Veículos Autônomo, Tomada de Decisão.

Abstract. Vehicle automation has attracted growing interest in recent years, both for companies and automakers and for academic research. Game theory models have been widely used to analyze interactions between autonomous vehicles and other users. The literature in this field focuses on the behavior between the autonomous vehicle and the pedestrian facing the scenario of their crossing through the safety lane. Thus, the aim of this paper is to analyze the decision making in a negotiation between autonomous and pedestrian vehicles, to prioritize the passage in the safety lane crossing scenario without signaling, using the chicken game model. The results show that the quality of communication is essential for a safe crossing, suggesting the adoption of regulatory policies.

Keywords: Game Theory, Autonomous Vehicles, Decision-Making.

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Modelagem multicritério e análise de sensibilidade para avaliar a classificação de risco em gasodutos

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Resumo. Considerando o contexto crítico em que risco é avaliado através múltiplos objetivos, a abordagem multicritério desempenha um papel adequado para orientar o processo de tomada de decisão, de modo que as perdas sejam minimizadas no sistema. Nesta perspectiva, os gerentes enfrentam desafios frequentes para decidir sobre como avaliar estratégias de eliminação, aceitação e redução de riscos em operações. Nesses casos, a alocação de recursos financeiros para gerenciar riscos pode depender de parâmetros instáveis quando os riscos são avaliados. Portanto, gerenciar a incerteza em operações de risco requer mais esforço de modo a manter a segurança estável continuamente, sendo necessário entender a precisão de modelos de risco precisos em relação as recomendações dadas. Com base nessa condição, este trabalho realiza uma Simulação de Monte Carlo para avaliar a robustez de um modelo de risco multidimensional para classificação de seções de risco de gasodutos, usando o ELECTRE TRI integrado à Teoria da Utilidade, cuja formulação utiliza julgamentos de preferência, consequências de eventos e sua ocorrência. Diferentes casos de incerteza são formulados, fornecendo informações importantes ao tomador de decisão sobre como as estratégias de mitigação flutuam no domínio da incerteza, proporcionando uma melhor percepção de risco.

Palavras-chave: Avaliação de Riscos, Gasoduto de Gás Natural, ELECTRE TRI, Análise de Sensibilidade, Simulação de Monte Carlo

Abstract. Considering the critical context in which risk is assessed through multiples objectives, multicriteria approach plays a proper role to guide the decision-making process such that losses are minimized in the system. In this perspective, managers face frequent challenges to decide on how to evaluate strategies such as elimination, acceptance, and reduction of risks in operations. In these cases, allocating financial resources to manage risks may depend on unstable parameters when risks are assessed. Therefore, managing uncertainty in risk operations requires more effort to maintain safety stable continuously, being necessary to understand how accurate risk models give recommendations properly. Based on this condition, this work undertakes a Monte Carlo Simulation to evaluate the robustness of a multidimensional risk model for classification of pipeline risk sections, using ELECTRE TRI integrated to Utility Theory, whose formulation uses preference judgments, consequences of events and its occurrence. Different cases of uncertainty are formulated, giving important information to the decision maker on how mitigating strategies fluctuates the uncertainty domain, providing a better risk perception.

Keywords: Risk Evaluation, Natural Gas Pipeline, Teoria da Utilidade, ELECTRE TRI, Sensitivity Analysis, Monte Carlo Simulation

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Road safety decision making: prioritization of causes of traffic accidents by a multi-criteria and multi-period approach

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Abstract. This work aims to help decision-making for the prioritization of the causes of traffic accidents in federal roads of Pernambuco through the consideration of multiple criteria and multiple period. In order to this, this paper proposes a decision-making framework that aggregates the Multicriteria Multi-period Outranking Method (MUPOM) to traffic accident context. The multicriteria approach considers the performance of the alternatives in the different criteria and considers the decision-maker's preference, and the multi-period approach reflects the performances of the alternatives in the different periods (different years), adding more information to obtain a more realistic of result, because the data of the traffic accidents vary with time. As case study, the model proposed is applied in the network of the federal roads of Pernambuco in the 2007-2018 years. As result, it is highlighted that the main causes of traffic accidents prioritized are 'lack of attention', 'incompatible speed', 'alcohol ingestion' and 'undue overtaking'. These causes are the ones that deserve greater attention from decision-maker.

Keywords: Decision-making Framework, Multi-criteria analysis, Multi-period analysis, Traffic accident, Federal roads, Pernambuco.

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Multicriteria Method in Decision Making: Supply Chain Development Strategies for a Brazilian Oil and Gas Company

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Abstract. This article aims to apply multicriteria method for decision making in defining supplier development strategies for a large Brazilian company. When it comes to the Oil & Gas supply chain, companies need to contemplate several long-term strategies to stimulate supplier development, as they are scarce depending on the type of services / asset. One such strategy is the nationalization of Brazilian suppliers to reduce dependence on foreign suppliers. With these effects, this kind of stimulus triggers a spread in the economic development of the region where suppliers seek to qualify technically to meet the specific requirements of this industry. The research method used was qualitative and quantitative over a ten-year panorama to follow the evolution of the criteria for selecting suppliers. Due to the size of the company, supplier selection procedures are different due to the large volume of company transactions. Therefore, this type of procedure evolves each year due to the requirements of Brazilian law. On the other hand, the company seeks with this kind of process more qualified suppliers that support its low cost strategic planning. Given these elements, the strategic alignment of the company is renewed in this last cycle with the verticalization process in which it helps managers to make better decisions.

Keywords: MCDM; Supply Chain; Supplier; Oil and gas.

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Método multicritério de tomada de decisão: aplicação ao caso da localização espacial de uma Unidade de Pronto Atendimento – UPA 24h

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Resumo. Este artigo apresenta o método multicritério de tomada de decisão, em uma Unidade de Pronto Atendimento - UPA 24 h, localizada no interior de São Paulo, com uma população aproximada de 70mil habitantes e com 23 unidades de saúde público e privado. **Objetivo** - Para tomar a decisão de qual localização será a construção da UPA 24h. **Métodos** - Foi aplicado o método AHP, método esse que leva como considerações critérios e subcritérios quantitativos e qualitativos para obter o resultado, utilizou o Software Expert Choice 11, na versão estudantil para avaliação e construção das matrizes a partir dos dados obtidos no cálculo dos somatórios dos pesos da avaliação e a matriz de comparação par a par normalizada. Foi convocado para participar da equipe pessoas ligadas ao setor da saúde e administração pública que apresentou os seguintes critérios: Aspectos Sociais, Facilidade de Acesso e Aspectos Locais e os subcritérios: Condições socioeconômica local, vulnerabilidade da população/Violência Local, Densidade Demográfica para Aspectos Sociais, Transporte Público, Congestionamento Local, Corpo de Bombeiros, Central de Ambulâncias para Facilidade de Acesso e mão de Obra, existência de serviços e proximidade com Unidades de Saúde para Aspectos Locais, para localização, considerando também os subcritérios e as alternativas para chegar ao resultado final; a prefeitura municipal disponibilizou 6 terrenos, possíveis locais que será a construção, munido dessas informações foi analisado critério e subcritério sobre cada terreno para assim chegar sua localização final. **Resultados**- O local 1 teve média aceitável sobre o critério e subcritério estabelecidos prévios, pois apresentou melhores condições; com os resultados obtidos foi apresentado para a comissão o local considerando cada critério e assim chegar a localização que irá atender a população. **Conclusão** - Após o estudo do artigo vir que com aplicação do método AHP a tomada de decisão fica bem mas aceitável, pois leva em considerações as variáveis que impacta direta e indiretamente em qualquer decisão, e é um método da área de pesquisa operacional ao qual tem outros métodos que pode levar a decisão.

Palavras-chave: Localização de instalações; Métodos multicritério para tomada de decisão; Unidades de Pronto Atendimento – UPA 24h; Critérios, métodos e modelos para a localização de Instalações; Software Expert Choice 11.

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Análise da relação entre a criminalidade e as regiões administrativas do Estado de Pernambuco

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Resumo. A análise dos dados quanto à segurança pública utilizando métodos estatísticos apropriados auxilia na identificação de padrões de ocorrência do crime e possibilita uma tomada de decisão mais efetiva em relação às ações a serem realizadas para minimizar as ocorrências criminosas. Este artigo tem como objetivo identificar se as regiões administrativas do estado em estudo podem ser consideradas fatores relevantes para ocorrência do crime, possibilitando destacar quais regiões merecem atenção especial de ações de segurança pública mais efetivas. A pesquisa utiliza dados referentes as taxas médias anuais de Crimes Violentos Letais Intencionais (CVLI) de cada região administrativa do estado de Pernambuco divulgados pela Secretaria de Defesa Social. Para realização das análises e considerações foram utilizadas as ferramentas ANOVA de um critério e a aplicação do teste de Tukey para comparação par a par. Posteriormente é proposto um ordenamento das regiões administrativas com base em critérios associados à vulnerabilidade de ocorrência de eventos criminosos utilizando o método PROMETHEE II. Com base nos resultados encontrados é possível afirmar que a gestão pública deve se atentar ao fato de que às ações desenvolvidas em determinadas regiões do estado não estão sendo tão eficazes quanto em outras e que a característica local do crime está sendo um fator que influencia para a ocorrência desse tipo de evento.

Palavras-chave: Segurança Pública, ANOVA, PROMETHEE II.

Abstract. Analyzing data for public safety using appropriate statistical methods helps in identifying patterns of crime occurrence and enables more effective decision-making regarding actions to be taken to minimize criminal occurrences. This article aims to identify whether the administrative regions of the state under study can be considered relevant factors for the occurrence of crime, making it possible to highlight which regions deserve special attention for more effective public security actions. The research uses data referring to the average annual rates of intentional lethal violent crime (CVLI) of each administrative region of the state of Pernambuco released by the Secretariat of Social Defense. For the analysis and considerations were used the one-way ANOVA tools and the application of Tukey test for pairwise comparison. Subsequently, an ordering of administrative regions based on criteria associated with the vulnerability of criminal events using the PROMETHEE II method is proposed. Based on the results found, it can be stated that public management should be aware of the fact that the actions developed in certain regions of the state are not being as effective as in others and that the local characteristic of crime is being a factor that influences the crime. occurrence of this type of event.

Keywords: Public Safety, ANOVA, PROMETHEE II.

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Factors Influencing the Conversion of Common Investigations into Federal Police Operations

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Abstract. This study aims to understand how a common police investigation becomes a police operation by exploring which factors and aspects are relevant for this transformation to occur. Understanding this theme allows, among other things, to coordinate the focus of future operations with the strategic objectives of the Federal Police and the Federal Government, as they constitute their deployment. Additionally, this study contributes to increasing the effectiveness of police work as a whole.

Keywords: Federal Police Operations, Investigation, Factors of Influence.

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Analysis Of Conscious And Unconscious Consumers Responses To Marketing Stimuli

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Abstract. Packaging is a marketing tool to capture the attention of the consumer, and it can shape expectations, evaluations and experiences regarding consumer goods. Companies spend lots of resources in research to gain answers that can help them to create strategies to attract new customers. However, there is a difference between interview responses and actual buying actions. The purpose of this paper is to analyze whether there is consistency between what consumers look at most when exposed to productbased stimuli, and what they actually buy. To accomplish this goal, visual stimuli as image of different packaged products were presented in an experiment for 31 participants. The experiment was conducted in two phases, the first entailed the use of eye-tracking technology, to capture the unconscious responses, and the second phase entailed declarative methods as questionnaires, to obtain direct responses from participants. The results suggest that there is consistency between the responses in the sample for the products surveyed: products that have a higher number of fixations (unconscious response) are better evaluated in relation to the purchase decision (conscious response).

Keywords: Packaging; eye-tracking; purchase decision.

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Aplicação do método multicritério PROMETHEE para definir estratégias de prevenção de acidentes dos transportes terrestres na região Nordeste

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Resumo. Uma das maiores causas de mortes no mundo é provocada por acidentes de transportes terrestres (ATT) envolvendo veículos, segundo a organização mundial da saúde. Este artigo apresenta uma aplicação de decisão multicritério para ordenação de ações preventivas mitigadoras, na região Nordeste, no Brasil, considerando os acidentes de trânsito envolvendo vítimas fatais. Por meio da base de dados da Polícia Rodoviária Federal sobre acidentes de trânsito no ano de 2018, o estado da Bahia foi identificado como o que apresentava o maior número absoluto de vítimas fatais. Considerando uma racionalidade não compensatória, aplicou-se o método PROMETHEE II aos dados coletados e obteve como resultado a ordenação de ações preventivas que deve ser incorporada pelo decisor. Os resultados enaltecem a necessidade de intensificar fiscalização de trânsito no Estado da Bahia, pois em 2018, ocorreram 83 mortes causadas por excesso de velocidade, representando 18% dos dados coletados envolvendo vítimas fatais no mesmo ano. Além disso, ultrapassagem indevida e não acionamento do sistema de iluminação/sinalização representou 9,6% dos óbitos ocorridos no ano de estudo. Logo, o decisor poderá definir estratégias, ações e medidas para melhoria da segurança no trânsito.

Palavras-chave: Acidentes de transportes terrestres. Decisão Multicritério. PROMETHEE II.

Abstract. One of the leading causes of death in the world is caused by road traffic accidents (RTA) involving vehicles, according to the World Health Organization. This article presents a multicriteria decision application to rank mitigating preventive actions in the Northeast region of Brazil, considering traffic accidents involving fatalities. Through the Federal Highway Police database on traffic accidents in 2018, the state of Bahia was identified as having the highest absolute number of fatalities. Considering a non-compensatory rationality, the PROMETHEE II method was applied to the collected data and obtained as a result the ranking of preventive actions that should be incorporated by the decision maker. The results highlight the need to intensify traffic enforcement in the State of Bahia, as in 2018 there were 83 deaths caused by speeding, representing 18% of the data collected involving fatalities in the same year. In addition, improper overtaking and non-activation of the lighting / signaling system represented 9.6% of deaths in the year of study. Thus, the decision maker can define strategies, actions and measures to improve traffic safety.

Keywords: Road traffic accidents. Multicriteria decision. PROMETHEE II.

Modelo de decisão em grupo para apoio a escolha de variedade de

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manga em novas fazendas

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Resumo A decisão sobre um investimento desempenha um papel muito importante na realização dos objetivos de desenvolvimento de uma empresa. Ultimamente, numerosos estudos foram realizados para construção de modelos para auxiliar gestores na tomada de decisões sobre o complexo e altamente incerto ambiente de negócios. Dada a alta complexidade, cada vez mais as decisões são tomadas por grupos de indivíduos, melhorando a qualidade e eficácia dos processos decisórios. A partir de uma decisão em grupo, é possível reunir mais conhecimento da abordagem do que cada membro isoladamente, além de elevar o nível de detecção de falhas nas alternativas. Todavia, pode haver influências e pressões, elevando o tempo e os custos do processo decisório, dificuldade de negociação e consenso. Neste contexto, problemas de decisão em grupo podem ser desenvolvidos com o apoio de métodos multicritérios, haja vista a aderência em rotinas práticas em que as organizações se deparam comumente. Para tanto, este trabalho apresenta um estudo de caso na área de agronegócio, sobre o problema de escolha de variedade de manga a ser implementada numa empresa exportadora que pretende duplicar sua área cultivável nos próximos quatro anos. Sendo assim, foi elaborado um modelo de apoio à decisão em grupo, com a participação dos principais interessados (diretores, gerentes e analistas). O estudo é composto por 4 etapas: 1) estruturação do problema; 2) ordenação das preferências individuais; 3) agregação das preferências do grupo; 4) análise de satisfação entre a escolha do grupo e a ordenação individual. Esperase obter resultados que demonstrem a praticidade de aplicação para problemas dessa natureza, bem como enriquecimento da análise e debate da solução final no processo de planejamento estratégico da empresa. **Palavras chave:** Decisão em Grupo. Sistema de Apoio a Decisão. Variedade de Manga.

Abstract. Deciding on an investment plays a very important role in achieving a company's development goals. Lately, numerous studies have been conducted to build models to assist managers in making decisions about the complex and highly uncertain business environment. Given the high complexity, decisions are increasingly made by groups of individuals, improving the quality and effectiveness of decision making. From a group decision, it is possible to gather more knowledge of the approach than each member alone, and raise the level of failure detection in the alternatives. However, there may be influences and pressures, increasing the time and costs of decision-making, negotiating difficulty and consensus. In this context, group decision problems can be developed with the support of multicriteria methods, given the adherence to practical routines in which organizations commonly encounter. To this end, this paper presents a case study in the agribusiness area, about the problem of choosing mango variety to be implemented in an exporting company that intends to double its cultivable area in the next four years. Thus, a group decision support model was developed, with the participation of the main stakeholders (directors, managers and analysts). The study consists of 4 steps: 1) problem structuring; 2) ordering of individual preferences; 3) aggregation of group preferences; 4) satisfaction analysis between group choice and individual ordering. It is expected to obtain results that demonstrate the practicality of application to problems of this nature, as well as enriching the analysis and debate of the final solution in the company's strategic planning process.

Keywords: Group Decision. Decision Support System. Mango variety.

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Avaliação da competência do gerente de projetos em *analytics* para a tomada de decisão

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Resumo. Uma das principais responsabilidades do gerente de um projeto é a constante tomada de decisões durante todo o seu ciclo de vida. Os gerentes de projetos lidam com diversas informações durante todas as fases dos projetos e, com o aumento da complexidade ao longo dos anos, o volume de dados relacionados aos projetos tem aumentado consideravelmente, gerando desafios e, ao mesmo tempo, grandes oportunidades no âmbito de análise de dados que podem apoiar as decisões a serem tomadas. O objetivo deste trabalho é apresentar a importância do uso de uma abordagem chamada *analytics* na gestão de projetos, por meio de um mapeamento em estudos anteriores, e validar a necessidade do desenvolvimento desta competência pelos gerentes de projetos. Como uso de *analytics* pelo gerente de projeto, pode-se destacar: análises e simulações de alternativas de ações, painéis de monitoramento, otimizações de recursos, análises preditivas e prescritivas, e o apoio à seleção de portfólios de projetos. A partir da revisão de literatura, foram apresentados trabalhos associados às competências de gestão de projetos, bem como de *analytics*, e, então, foram evidenciados os resultados da aplicação conjunta destas competências e seus principais usos. Este trabalho esclareceu como gerentes de projetos podem aumentar seus desempenhos, melhorando a tomada de decisões nos projetos através do uso da abordagem de *analytics*, entregando, assim, melhores resultados às suas organizações.

Palavras-chaves: Gestão de Projetos; Gerente de Projeto; Competências; Habilidades; Analytics; Apoio à Decisão.

Abstract. One of the key responsibilities of a project manager is constant decision making throughout its life cycle. Project managers deal with a wealth of information throughout all project phases, and with increasing complexity over the years, the volume of project-related data has increased considerably, creating challenges and great opportunities that data analysis can support decisions to be made. This paper aims to present the importance of using an approach called analytics in project management, through a mapping in previous studies, and validate the need for the development of this competence by project managers. As the project manager's use of analytics can be highlighted: alternative actions and simulation analysis, monitoring dashboards, resource optimizations, predictive and prescriptive analytics, and support for project portfolio selection. From the literature review, studies associated with project management skills as well as analytics were presented, and then, the results of the joint application of these competencies and their main uses were highlighted. This paper clarified how project managers can increase their performance by improving project decision making through the use of the analytics approach, thereby delivering better results to their organizations.

Keywords: Project Management; Project Manager; Competencies; Skills; Analytics; Decision Support.

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BUSINESS INTELLIGENCE: PROPOSAL FOR IMPLEMENTATION IN SMALL INDUSTRIES

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Abstract. The present study aims to propose the implementation of a Business Intelligence platform aligned to the strategic demands of a small industry, having as object of study an industry of mattresses and upholstery located in the city of Campina Grande-PB. After a theoretical study on the strategic management of information, the main concepts related to Business Intelligence, and the main platforms offered in the market; a mixed research approach was adopted, in which the exploratory phase identified the main singularities of the company, thus directing the criteria to be considered in the proposed platforms to be used; and in the descriptive phase the choice of the ideal platform was made using the PROMETHEE II multicriteria method, supported by an aggregation of preferences based on the evaluation of the alternatives by three experts in the area of information technology. Thereby, it was possible to consider the opportunities offered by the presented alternatives and to choose a proposal of ideal solution for the company under study. In this regard, there has been a great strategic potential in the application of the management of information and knowledge technologies, in order to support more assertive decision-making. However, for this application to be really efficient the needs of the organization in question must be considered, so that the application of consistent selection methods becomes more relevant, adding more reliability to the company's projects and increasing its competitive capabilities.

Keywords: Business Intelligence; Information Technology; PROMETHEE II.

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Sistemática para Avaliação do desempenho de projetos

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Abstract. Due to the increase of market competitors in different sectors, organizations are currently looking for ways of continuous improvement, initially focused on their internal processes that may attract to customers and stakeholders, interested in the acquisition of products, services and economic or social returns. In this sense, having processes that demonstrate competitive advantage is relevant to gain market advantage. The influence of project management is closely related to the identification of these needs to be met, establishing clear and achievable objectives by balancing the conflicting demands of quality, scope, time, cost and adaptation of market-consistent specifications. In this context, the present work aims to propose a project performance evaluation system, aligning it with the organizational strategic planning and the projects that are under development at any stage of the life cycle. The proposed methodology was the result of a model that employs the adaptation of the Balanced Scorecard, Earned Value Management indicators and basic aspects of the Project Excellence Model. In this system, quantitative and qualitative key performance indicators were added, which is a tool of interest for the control and management of the organization. This system will allow to control and measure the processes, to support decision makers in making corrective and preventive actions ensuring better use of resources. It was concluded that the system contributes to the integration of all sectors of the organization including the different quality management systems or work safety required today, enabling maintenance and fluidity at all operational levels.

Keywords: Project evaluation methodology, Indicators, Performance, Decision making.