



14th International Conference on Industrial Engineering and Industrial Management XXIV Congreso de Ingeniería de Organización

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PAPER NUMBER: 001

Optimization Model to Support Sustainable Crop Planning for Reducing Unfairness among Farmers

Ana Esteso, María Del Mar Alemany Díaz, Angel Ortiz, Shaofeng Liu

Abstract

Agri-food production must increase while food wastes need to be reduced for improving the position of farmers. To do so it is necessary to manage agri-food supply chains in a sustainable way. In this paper, a novel multi-objective model is proposed to support the sustainable crop planning definition for a region. Three objectives aligned to the sustainability aspects are modelled: profits maximization, wastes minimization and unfairness minimization. The modelling of wastes and settlement prices, as well as the search of a fair solution for farmers in a new business model are the main novelties of the paper. The model is solved by applying the weighted sum method concluding that solutions with near to optimum profit values can be obtained for reducing the food wastes and unfairness between farmers.

PAPER NUMBER: 002

Tecnología BIM 5D: nuevas técnicas para un nuevo modelo arquitectónico

Anna Baldrich

Abstract

There is ample evidence to show that in the Spanish architecture, engineering and construction (AEC) sector, implementation is underway of the Building Information Modeling (BIM) methodology, which is changing the way architectural projects are designed and managed in all their phases. Most of the research to date has been focused on detecting the advantages and difficulties of this implementation, mainly by analyzing the 3rd dimension of the project (graphic representation data) and to a lesser extent the 4th and 5th dimensions (time and cost data, respectively). This document focuses on the architectural project's economic management, carried out using the new digital tools. Through a review of the existing literature, it aims to define the key points related to the new processes, roles and skills required by the engineer in this new paradigm of BIM methodology.

PAPER NUMBER: 003

Workload indicator for cybersecurity officers applying Mental Workload Assessment-Information Theory model (MWA-IT).

Jose Luis Roca Gonzalez, Juan Antonio Vera López, Alejandro López Belchí, Antonio-Juan Briones-Peñalver

Abstract

Workload analysis using information theory allows to predict subjective workload ratings with good accuracy, overall when it is defined by the amount of information processed, several complexity levels relative to a specific task and different skill levels of the workers involved. The aim of this research is to take advantage of “Mental Workload Assessment-Information Theory (MWA-IT) model” to predict a workload indicator as a reference baseline for cybersecurity officers. For such purpose two different organizations were compared, one with the highest demand on security (Defence Matters Organization) and the other one with a lower need of security (Small and Medium Enterprise). Therefore, any other organization after applying the MWA-IT model can compare it with these results.



PAPER NUMBER: 004

Programación lineal entera mixta para optimizar la carga en una etapa del combustible gastado de una central nuclear PWR

Joaquín Bautista, Lluís Batet, Manuel Mateo

Abstract

Presentamos un modelo de Programación lineal entera mixta para optimizar el almacenamiento del combustible nuclear gastado y enfriado en la piscina de una central nuclear utilizando contenedores MPC-32. La validación del modelo se efectúa mediante el solver CPLEX frente a instancias de dimensiones industriales inspiradas en la central nuclear Ascó-1 localizada en Tarragona.

PAPER NUMBER: 005

**Analogía entre los sistemas electorales de representación
proporcional por listas y el sistema Heijunka de planificación
Just in Time**

Joaquín Bautista

Abstract

En contexto Just in Time, Heijunka se utiliza para designar el de planes de producción a partir del mix de productos y de sus horizonte determinado. En este trabajo se establece una analogía entre el sistema de planificación y secuenciación Heijunka y los sistemas electorales en los que las preferencias de la Ciudadanía están representadas de manera proporcional en una Cámara (Baja o Alta) a través de listas electorales.

PAPER NUMBER: 006

Analytic Network Process: A tool for selecting the best intergenerational learning strategies for a Romanian bakery company

Ramona-Diana Leon, Raul Rodriguez-Rodriguez, Juanjo Alfaro

Abstract

This research aims to determine which are the most appropriate strategies for fostering intergenerational learning among the employees who work in a Romanian bakery company. In order to achieve this goal, data are collected from the human resource management department of one of the most important Romanian bakery company. Then, an analytic network process approach is employed. The results prove that the best intergenerational learning strategies are training, mentoring, and communities of practice. These findings have both theoretical and practical implications. On the one hand, they extend the literature from the human resource management and knowledge management fields and on the other hand, they offer the decision-makers a viable tool for selecting the most appropriate strategy for supporting intergenerational learning.

PAPER NUMBER: 007

Towards sustainability in parallel machine scheduling environments

Andres Muñoz-Villamizar, Javier Santos, Jairo R. Montoya-Torres, Elyn Lizeth Solano Charris, Carlos A. Vega-Mejia

Abstract

Practitioners and researchers have become progressively more aware of scheduling operation's impacts on the triple bottom line (i.e. profits, the planet and people). In this article, we present a methodology that uses a mixed-integer linear programming model to evaluate and compare three different criteria for a sustainable scheduling configuration. A case study of a plastic container manufacturing company located in the Basque Country (Spain) was used to validate our methodology. Our results show trade-offs between economic (minimization of costs), environmental (reduction of waste and consumption of resources), and social (a balanced workload between workstations) performances of the parallel machine scheduling problem. The proposed methodology can be used as a guideline regarding measuring and improving sustainability in scheduling contexts.

PAPER NUMBER: 008

An exploratory study into the proportional adjustment of order-up-to policies in hybrid manufacturing/remanufacturing systems

María Arquer, Borja Ponte, Raul Pino

Abstract

The Bullwhip Effect is the phenomenon through which variability grows as orders move upstream the supply chain, generating costly inefficiencies. In this paper, we analyse it in a closed-loop supply chain formed by a manufacturer (of new products) and a remanufacturer (of as-good-as-new products from used products collected from the market). To this end, we adopt a control-theoretic approach. With most previous research focusing on the lead-time and the return-yield effects, the novelty of our work is that we study the regulation of the inventory controller when a proportional order-up-to policy is used. To optimise the hybrid system, the benefits (in terms of Bullwhip) and downsides (in terms of inventory performance) derived from increasing the time constant of the controller have to be considered. In a base scenario, our findings reveal that closed-loop supply chain managers need to react to increasing levels of circularity by decreasing the adjustment of the inventory controller's time constant. In this fashion, they can achieve a significant improvement in the operational performance of their supply chains as they become more circular. This –connecting the environmental and economic gains– is essential to prompt organisations to adopt circular economy models in their operations.



PAPER NUMBER: 009

Business Model Innovation in SMEs: A cluster analysis

Dorleta Ibarra, Juan Ignacio Igartua, Jaione Ganzarain

Abstract

This paper analyses a group of SMEs based on their approach towards business model innovation (BMI), as part of a study to explore the phenomena in established firms. The study has an exploratory character using the two-steps cluster analysis, mean differences and analysis of predictors' importance. The research finds two groups of SMEs with different business model advantages mainly influenced by their dynamic capabilities.

PAPER NUMBER: 010

Using Value Components to Predict Purchasing Channel Use

Emiliano Acquila-Natale, Julián Chaparro-Peláez, Ángel Hernández-García, Laura Del Río-Carazo

Abstract

Multichannel retailing provides customers with shopping experiences across multiple channels. The likelihood that a shopper uses one channel or another, or a given set of channels, is tightly related to the perceived value of each of the available options. Prior research in multichannel retailing focuses on the consumers' intention to use the different channels. This study aims to broaden the understanding of consumer behavior in multichannel contexts by investigating channel use preferences based on the dimensions of perceived value. The empirical analysis of responses from 432 Spanish shoppers of clothing and apparel validates a predictive model to estimate purchasing channel preference. The final model provides an accurate classification of consumers' purchasing channel preference and identifies the influencing variables in such preference.



PAPER NUMBER: 011

Fuzzy multicriteria analysis for hesitant evaluation of stand-alone electrification systems

Marc Juanpera, Bruno Domenech, Laia Ferrer Matyí, Rafael Pastor

Abstract

This work develops a novel procedure for modelling hesitant opinions for multicriteria analysis using non-predefined triangular fuzzy numbers. Different electrification system designs are evaluated with a developed fuzzy formulation of the compromise ranking method and the influence of hesitance on the results is analyzed.



PAPER NUMBER: 012

An ε -constraint method for the multi-objective optimization of stand-alone electrification systems for isolated communities

Antonin Ponsich, Bruno Domenech, Laia Ferrer Matyí, Alberto García, Marc Juanpera, Rafael Pastor

Abstract

This work introduces a multi-objective optimization strategy in the framework of stand-alone electrification system design. Considering installation cost, energy and power supplies as conflicting objectives, the tool developed identifies a set of trade-off (Pareto optimal) solutions that may be subsequently used for multi-criteria decision-making.

PAPER NUMBER: 013

Circular Economy challenges. Case studies of circularity in the use of water

Elisabeth Viles, Javier Santos, Tamara Fernández-Arévalo, Martin Tanco, Maria Florencia Kalemkerian

Abstract

In a circular economy environment, it is important to make a good and efficient use of resources and consider that the waste generated in the production processes can be a valuable resource. However, tools and methodologies conventionally used to analyze and evaluate production systems are based on techniques focused on linear production management models, which do not evaluate productive and environmental efficiency simultaneously and whose primary propose is to reduce as much as possible the treatment and management of waste. The change of paradigm from a linear to a circular economy requires the definition of a new strategy for production systems that makes production processes simultaneously circular and efficient (in terms of quality and productivity). This paper presents two real case studies enlighten the need for this new thinking approach.

PAPER NUMBER: 014

Evaluating the maturity level of continuous improvement based on improvement routines: a case study of a capital goods SME

Gorka Unzueta, Aritz Esnaola, José Alberto Eguren

Abstract

This study analyses the implementation of a continuous improvement process (CIP) in a mature small and medium-sized industrial enterprise in the capital goods sector. The research team developed a continuous improvement (CI) model to implement improvement routines and develop an organizational culture of CI, with the objective of increasing CI maturity. A case study methodology was used, and eight units of the company were analysed. The results confirm that by implementing the CIP, the organization increased its CI maturity level. Routines were successfully assimilated, although the objective of reaching maturity level 2 was not achieved for all routines. Therefore, the company must continue to encourage its employees to participate in CI by applying new improvement methods. The presented work can be applied to any type of company to identify its CI maturity level and define future actions to improve its CI maturity.



PAPER NUMBER: 015

Evaluación de los sistemas de información de una organización manufacturera: Viable System Model & Lean Manufacturing

Julio César Puche Regaliza, Jose Costas, David De La Fuente, Javier Puente, Isabel Fernandez

Abstract

El propósito de este trabajo es desarrollar un sistema de evaluación de los sistemas de información en una organización manufacturera siguiendo el Viable System Model y el paradigma Lean Manufacturing. Desarrollamos los puntos clave para tal evaluación examinando las necesidades de los agentes del sistema, la conversión de tales necesidades en requerimientos para disponer de datos, transformar datos en información, tomar decisiones basadas sobre conocimiento, evaluar el rendimiento y orientar los esfuerzos de cambio.

PAPER NUMBER: 016

Evaluation of a Strategy-Oriented Method to Identify and Prioritise Knowledge Management Initiatives in SMEs

Juan Ignacio Igartua, Jabier Retegi, María Ruiz, Maitane Mindegia

Abstract

This article presents the process followed for the definition, application and evaluation of a method of identifying and prioritising knowledge management initiatives in small to medium enterprises. This method, adapted to the characteristics of this type of company, is simple, not time consuming and oriented to the sharing of a common vision among participating team members. In addition, unlike other approaches, the proposed method is focused on understanding KM as a means towards the implementation of business strategy. The method is based on three key elements: (1) the KM process (2) a catalogue of strategies and (3) an assessment and planning tool that guides the assessment and prioritisation of KM actions in SMEs. Participating companies confirm the importance of KM for the companies' activities, the benefits of the proposed strategic approach towards KM and the support provided by the method and the tool. The fieldwork developed to test the method also revealed a lack of satisfactory support tools and the need of these organisations to protect, standardise and make explicit their knowledge.

PAPER NUMBER: 017

Solving the e-commerce challenge: A linear programming model to support fulfillment strategies

Mar Fernández Vázquez-Noguerol, Sara Riveiro Sanromán, José Antonio Comesaña Benavides, José Carlos Prado Prado

Abstract

The use of online channel has greatly increased the logistics costs of supermarket chains. Against that backdrop, the aim of this approach is to develop a model for scheduling the e-fulfillment activities in order to minimise the total cost. The mathematical programming model presented determines both the time windows during which order picking and transport should take place and the assignment of trucks to delivery routes. The difficulty of these logistics tasks stems from the quantity and the diversity of products offered through e-grocery. As a result, it is possible to make easier the decision-making process with the objective of ensuring maximum efficiency. The proposed optimisation approach works as a planning tool for online supermarkets working with a warehouse-based strategy.

PAPER NUMBER: 018

Network analysis of co-participation in thesis examination committees in an academic field in Spain

José Luis Garrido-Labrador, José Miguel Ramírez-Sanz, Virginia Ahedo, Adrián Arnaiz-Rodríguez, César García-Osorio, José I. Santos, José Manuel Galán

Abstract

This paper applies complex network analysis to unveil the informal structure of the knowledge area of business organization — Organización de empresas— in Spain. To do so, we use the TESEO database. We retrieve and statically analyze all the theses referred to the UNESCO academic field of Organization and management of enterprises. Our results reveal a degree distribution of the participation in thesis examining committees and thesis supervision compatible with a truncated power law. Community analysis of the projected network of co-participation in dissertation committees shows a clear modular structure. When we focus on the backbone of such network, we find that the patterns detected can be partially explained by homophily of scholars that interact in the same academic association.



PAPER NUMBER: 019

Multidisciplinary research in Spain. A network perspective.

Silvia Díaz De La Fuente, Virginia Ahedo, Jorge Caro, María Pereda, José I. Santos, José Manuel Galán

Abstract

This contribution presents a network approach to analyse the current situation of multidisciplinary research in Spain. To this aim, all coordinated projects funded by the Spanish Ministry of Science and Innovation in the 2013-2017 timeframe have been considered as a proxy for multidisciplinaryity. Two networks were built: the network of the interactions between institutions and the network of thematic areas. Both topological and structural analysis were conducted on the two. Preliminary results show a clear modular structure of the two networks and leave the door open for several future investigations on the topic.

PAPER NUMBER: 020

Trends and applications of machine learning in water supply networks management

Alicia Robles Velasco, Jesús Muñuzuri, Luis Onieva, Maria Rodriguez Palero

Abstract

This study describes the trends and applications of machine learning systems in the management of water supply networks. Machine learning is a field in constant development and it has a great potential and capability to attain improvements in real industries. The recent tendency of data storage by companies that manage the water supply networks have created a range of possibilities to apply machine learning. One particular case is the prediction of pipe failures based on historical data, which can help to optimally plan the renovation and maintenance tasks.

The objective of this work is to define the stages and main characteristics of machine learning systems, focusing on supervised learning methods. Additionally, singularities that are usually found in data from water supply networks are highlighted. For this purpose, eight studies which contain real cases from around the world are discussed. From the data processing to the model validation, a tour of the mechanisms used in each study is carried out.

PAPER NUMBER: 021

Disciplinas en dirección de operaciones, en búsqueda de una clasificación

Pilar I. Vidal-Carreras, Julien Maheut, Juan A. Marin-Garcia

Abstract

La era tecnológica en la que nos encontramos permite que recursos de la ciencia, como son los libros, revistas y artículos científicos, sean publicados en Internet (recursos electrónicos) siendo más rápidamente difundibles por las editoriales y accesibles por la comunidad científica y profesional. Este hecho, ha propiciado la abundancia de información que puede suponer un problema para recuperar la que es relevante para nosotros y distinguirla de la que no lo es. Una de las opciones para superar esta falta de eficiencia que afecta a la búsqueda de información es crear y mantener un glosario (o taxonomía) de términos en el área científica (thesaurus). Con ello se podría acotar términos y evitar bastantes de los problemas debidos a un etiquetado defectuoso o inadecuado de la producción científica, más concretamente en el área que nos ocupa, la dirección de operaciones. Esta trabajo es una aportación en dicha línea.

PAPER NUMBER: 022

Production scheduling of a vegetable packing machine with lack of homogeneity in raw material

Pedro Gomez-Gasquet, Pilar I. Vidal-Carreras, Shaofeng Liu

Abstract

Natural products such as vegetables can be influenced in their cultivation by many variables, some controllable and others not, which affect the homogeneity of the resulting product. This lack of homogeneity must be considered in all processes of the supply chain. Similarly, the degradation over time of these products, interpreted as shelf life for inventory policies, is another aspect to consider. In this work, this problem is considered for the production scheduling of a vegetable packaging machine, specifically broccoli and cauliflower, natural raw materials that suffer from said lack of homogeneity. In addition, the real case described in the paper suggests possible replacement of demand and different combinations of products. The full description of the problem and the framework in which it is located is assumed as one of the contributions of this paper. In addition to the presentation of two models that considering all the variables described that represent the complexity of the problem faced.

PAPER NUMBER: 023

A sustainable blockchain based supply-chain management

Simon Fernandez, Rafael Rosillo, Paolo Priore, Alberto Gomez, Jose Parreño

Abstract

Today, the more complex and demanding industrial needs face challenges related to distribution and production needs. This challenging environment also creates opportunities, which with the introduction of a disruptive technology such as blockchain, will enhance the emergence of the connected supply chain as an essential element in the industrial world. With blockchain, firms will have quicker access to data, such as sales patterns on newly commercialized products or interruptions in the upstream supply, with the guarantee that the data is verifiable, transparent and perfectly traceable. This paper offers an analysis of blockchain technology and smart contracts, and explores the capabilities and advantages of this technology in making traditional supply chain management a new and sustainable digital process.



PAPER NUMBER: 024

Gestión de proyectos aplicado a un juego de Logística

Pablo Aparicio Ruiz, Elena Barbadilla, Jose Guadix, Alejandro Escudero-Santana

Abstract

La transmisión de conceptos mediante juegos combina una aplicación práctica de la teoría junto con incremento potencial del interés y la motivación de los alumnos. Este objetivo en el caso de la transmisión de conceptos de la gestión de proyectos ágil, mediante la metodología Scrum, se consigue mediante un juego aplicado a la logística, que se propone en esta comunicación, en la que se explica la dinámica del juego, y cómo se reflejan todos los conceptos de esta metodología ágil.



PAPER NUMBER: 025

A double capacitated-VRP problem with time windows

Esther Fernández Bravo, Hugo Larzabal, Álvaro García Sánchez,
Miguel Ortega-Mier

Abstract

The problem we are addressing is a double capacitated-VRP with time windows (2CVRPTW), arising in a service provider company. The first VRP consists in scheduling team tasks. The second VRP refers to the optimal routes for the vehicles that carry the packages from the locations to the depot. Both VRP cannot be considered separately, as the service requires a careful coordination between teams and vehicles. A MILP formulation and a case study are presented.

PAPER NUMBER: 026

In-house additive manufacturing and its consequences into the purchasing process

Jesús Morcillo-Bellido, Jon Martinez-Fernandez, Jesus Morcillo Garcia

Abstract

Additive manufacturing (AM) is currently a major and very relevant manufacturing tool in many companies that seek to improve business competitiveness by adjusting processes to demanding customer requirements. This study seeks to deep-en the understanding of additive manufacturing adoption impact into purchasing process within aerospace companies. It had been analyzed the potential consequences that would happens, after the adoption of AM, on the aerospace companies purchasing process. There were identified potential relevant changes on people tasks, inventory management, integral cost and people knowledge. Those identified expected changes could be both an important organization opportunity and a serious threat for AM adoption at aerospace companies.

PAPER NUMBER: 027

Circular economy analysis at Spanish glass sector applying the Ellen MacArthur model

Jesús Morcillo-Bellido, Elena Santos-Iscoa, Luis Isasi

Abstract

Circular Economy has got a very relevant position on research studies nowadays as a key driver for long term organization supply chains sustainability. Several models have been developed trying to identify conditions that allow to define as “circular” a specific supply chain, from a sector or organization. One of those models were set by the well-known Ellen MacArthur Foundation (EMF). This study tries to analyse the fulfilment and applicability of EMF model, analysing real practices, to the Spanish glass sector. After the analysis it seems that this sector meets almost all the EMF model characteristics, nevertheless there is still some run for improve its circularity, since renewable energy use could be higher.

PAPER NUMBER: 028

Overview of dynamic facility layout planning

Pablo Pérez-Gosende, Josefa Mula, Manuel Díaz-Madroñero

Abstract

The facility layout design problem is significantly relevant within the business operations strategies framework. However, its wide coverage in the scientific literature has focused mainly on the static planning approach and disregarded the dynamic approach, which is really useful in real-world applications. In this context, the present article offers a preliminary literature review of the dynamic facility layout problem. A taxonomy of the reviewed papers is proposed based on the following criteria: problem type, planning phase, planning approach, number of facilities, number of floors, department shape, department dimensions, department area, material handling configuration and solution approach. Finally, some future research guidelines are provided.



PAPER NUMBER: 029

Organisational Innovation in Bureaucracies: An Impossible Mission?

Carlos F. Gómez Muñoz, Ana Moreno Romero

Abstract

As a response to the increasing demands for public sector reform, organisational innovation can be a source of improvement of public services. By analysing, within the framework of evolutionary organisations, the experiences of organisational innovation in four European public administrations and institutions, this research has found some common patterns that could be used as a reference by public sector practitioners concerned with introducing new ways of working in their organisations.

PAPER NUMBER: 030

Analysis of synergies in the supply chain with distribution to multiple types of clients

Nicolás Anich, Manuel Mateo

Abstract

It is very frequent that the distribution of a supply chain covers different types of clients. The managers may ask themselves if a separated flow for each one is the best solution or, otherwise, there are some common activities along the supply chain that may be shared and obtain scale economies. A methodology is pro-posed to evaluate the level of synergic supply chains among different sets of cli-ents. It is applied to a pharmaceutical distributor, which provides to three kinds of clients: pharmacies, public health centres and public health companies.

PAPER NUMBER: 031

Organizational Culture Transformation Model: towards a High Performing Organization

Asier Ipiñazar, Enara Zarrabeitia, Rosa Rio-Belver, Itziar Martinez De Alegria

Abstract

The design of Organizational Culture Transformation Models takes on special relevance and interest in the current ever globalized economic framework, where markets are increasingly competitive, dynamic, aggressive and changing. In this context, the main objective of this research work is the design of a prototype of Organizational Culture Transformation Model, in order to create a High Performing Organization (HPO). To this end, the research has been supported by experts and has analysed the scientific contribution in the field of re-search. The resulting model will serve as a reference framework for those companies that wish to carry out an in-depth re-structuring of their operations, focused on the people who form part of these companies.



PAPER NUMBER: 032

Artificial intelligence for solving flowshop and jobshop scheduling problems: A literature review

Pedro Gomez-Gasquet, Andrés Boza, Alberto Navarro Aláez, David Perez Perales

Abstract

This paper makes a review of the different contributions that the Artificial Intelligence (AI) field has made in recent years on the problem of the flowshop and jobshop scheduling. The work aims to see which are the AI methods that have been used, which have greater presence and what possibilities they offer in the future.



PAPER NUMBER: 033

A general outline of a sustainable supply chain 4.0

Hector Cañas Sánchez, Josefa Mula, Francisco Campuzano-Bolarín

Abstract

This article presents a literature review to identify the current status of supply chains 4.0 from the sustainability perspective. In this way, 54 articles were identified and re-vised, and were classified according to the three main aspects of sustainability: economic, social and environmental. The classification of articles indicated that more attention has been paid to the environmental aspect in the I4.0 context in the literature, while the social aspect has been paid less attention. Finally, reference frameworks were identified, along with the I4.0 conceptual models and technologies, which have enabled sustainability in supply chains.

PAPER NUMBER: 034

False Alarms Analysis of Wind Turbine Bearing System

Peco Chacon Ana Maria, Isaac Segovia Ramírez, Fausto Pedro
Garcia Marquez

Abstract

Wind turbines (TWs) are complex systems that use advanced condition monitoring systems for analysing the operation conditions. The gearbox is one of the most critical components due to the elevated downtime and failure rate, and it is necessary the analysis and maintenance of this element. Supervisory Control and Data Acquisition system is employed in wind farms for condition monitoring and control. The volume and variety of the data require novel techniques for analysis. The main objective of this work is to model the temperature curve of the gearbox bearing regarding to the wind speed. An approach based on data partitioning and data mining centres is proposed. The wind speed range is divided into intervals to achieve an increment the accuracy of the model. The centres are considered representative samples in the modelling. It is proposed a method based on the alarm detection, that will be studied together with the alarms report provide by the real case study.

PAPER NUMBER: 035

**Model based analysis of innovation in sustainable supply chains.
A case study**

Jesús Morcillo-Bellido, Alfonso Duran Heras, Luis Isasi

Abstract

Innovation supports the development of sustainability in the so-called innovative sustainable supply chains (SSCMI). This study tries to validate and further develop, through its practical application, an SSCMI framework model, which can serve as a benchmark. To this end, a case study has been carried out by applying a theoretical model, that has been proposed as a reference model that includes innovation mechanisms that support sustainability in supply chains, to the supply chain of a major Spanish retailer. While applying this model, some mechanisms found in the analyzed supply chain, but not included in the proposed model, have been identified, thus leading the authors to propose expanding the initial model with a new category of “transversal” mechanisms.



PAPER NUMBER: 036

**Multi-item Inventory Problem: Literature Review and a
Proposal for Practitioners**

Manuel Cardós Carboneras, María Victoria De La Fuente, Lorenzo
Ros McDonnell

Abstract

Inventory managers have to assign an inventory policy to each item seeking to satisfy a required global service level with the lowest inventory cost. This paper reviews the existing literature and, based on current research, the most appropriate options are proposed to be used by practitioners.

PAPER NUMBER: 037

Differentiating static and dynamic home care routing and scheduling problems: a framework to design a suitable model

Àlex Armadàs-I-Sabaté, Alberto Garcia, Amaia Lusa

Abstract

Routing and scheduling of caregivers or medical staff to provide care at patient's home has been widely examined in the literature. However, it is mainly focussed on the often-unrealistic static version of the problem. Transitioning from the static to the dynamic variant is not a trivial task. Furthermore, there is no widely accepted consensus on what differentiates dynamic from static problems. This paper pre-sents a clear distinction of static and dynamic models and proposes a framework to design models suitable for a wide range of problems.



PAPER NUMBER: 038

Applying the Materials Requirements Planning module of a cloud-based open source ERP to Industrial Organization learning

Sandra Ramos, Alfonso Duran Heras, Guillermo Castilla, Miriam Fernández, José Ignacio Ortiz González

Abstract

Within the framework of a wider program aimed at equipping Engineering Management students with the competences and skills required for the forthcoming Connected Industry 4.0, this paper presents a project aimed at extending this approach “upstream”, to earlier and more basic courses. Specifically, it is aimed at applying an open source, cloud-based ERP for teaching Materials Requirement Planning (MRP) production planning at a core Operations course taught in several undergraduate programs at the University Carlos III of Madrid (UC3M).



PAPER NUMBER: 039

A three-dimension strategic sourcing definition

Amaia Lusa, Imma Ribas, Albert Corominas

Abstract

Defining strategic sourcing options for items requires specifying three characteristics: (i) who and how many will make the item; (ii) in cases of outsourcing, the kind of relationship between buyer and supplier(s); and (iii) where the item is to be made. We describe the various possibilities for each of these characteristics

PAPER NUMBER: 040

Competitiveness limiting factors on the current project management approaches of the construction industry

José Ignacio Ortiz González, Alfonso Duran Heras, Guillermo Castilla

Abstract

The current construction project management methods have proved ineffective in enhancing the competitiveness of construction companies. Currently, a construction project is delivered under such conditions of variability and uncertainty that both efficiency and productivity are low. In particular, the current scenario that construction companies are facing in Spain is characterized by both systemic (globalization and effects of the financial crisis of 2008) and local factors (scarcity of subcontractors). This environment requires changing from a production approach based on the volume of sales to a new one based on competitiveness. The adoption of a new management paradigm is required: it should foster team member collaboration (owners, designers, constructors), but it should also address production planning and control assuming activities interdependence.

PAPER NUMBER: 041

Risk management through time and cost contingencies during the execution phase of construction projects: contractors' perspective

José Ignacio Ortiz González, Alfonso Duran Heras, Guillermo Castilla

Abstract

Time and cost contingencies are a tool to manage risks in construction projects. According to Laryea and Hughes (2011), professionals are not applying the methods proposed by literature to manage contingencies because those do not re-ly on actual construction company practice.

On those grounds, the corresponding author of this document carried out a research project whose goal was to describe how construction companies use contingencies to manage risks during the execution phase of projects. The results of that research show that construction companies manage risk by defining in a subjective manner time and cost contingencies (Ortiz et al. 2018).

This document's objective is to present the partial results of an ongoing research project that aims to increase the external validity of the results above. To that end, this new research effort intends to show the applicability of the results in scenarios different from those analyzed (Taylor et al. 2011).

PAPER NUMBER: 043

Equity crowdfunding: Main pillars and risks involved on the new funding scheme of collaborative economy

Manuel Holgado, Mercedes Grijalvo, Alberto Prada, Eduardo Ortiz De Lanzagorta

Abstract

Crowdfunding is a financing method that seeks to obtain funds from multiple participants to finance a business initiative or project. Still, this new form of fund-ing, mostly web-based, has problems that hinder its expansion and regulation. In this research, first an extensive review of literature has been carried out to identify the risks involved in a specific crowd model, equity crowdfunding. These risks have been then evaluated using the crowdsourcing pillars theory (Hosseini et al, 2014) and their effects have been examined through a case study analysis of dif-ferent entities within the crowd ecosystem. Finally, and based on the findings, a matrix of risk generators/takers is proposed; intending to provide an approach to the pillars through their exposure to risk and how mitigation or elimination can impact the experience of each of them. In addition, it was possible to identify a transversal pillar, which had not been considered in the crowdsourcing pillar theo-ry, namely the verification and validation of the project. The research showed that this new approach helps to identify risks not previously detected, highlighting the role of regulators and technology in risk mitigation and aligning the business strategy with the most risk vulnerable pillar: the funder.

PAPER NUMBER: 044

Integration and application of BSC with ANP-Fuzzy in SME in the manufacturing

Rosa Galleguillos-Pozo, Marcelo V. Garcia

Abstract

Balanced Scorecard (BSC), when used as a strategic evaluation tool, has some shortcomings in terms of implementation on a quantitative basis. This study aims to determine the level of performance of a Small and Medium-sized Enterprises (SME), based on its vision and strategies, by integrating the BSC approach with the Analytical Network Process and Fuzzy technique (FANP), covering the measurement and evaluation dimension of the BSC. The proposed model has shown that different units of measure related to performance indicators under the BSC approach, and performance indicators of different structures, can be consolidated with the FANP. In addition, the proposed model takes into account the business performance based on its vision and the strategies applied to achieve this vision. In this way, it is possible to evaluate from a strategic perspective the business performance in accordance not only with the previous results, but also with the main indicators. The proposed model in the scope of this study was related to a production business, however, it can also be adapted to different businesses.

PAPER NUMBER: 045

A comprehensive environmental analysis of the environmental performance of the valorisation of the bottom ash from municipal solid waste incineration (MSWI)

Alicia Lopez-Rodriguez, Ana Rodríguez-Olalla

Abstract

The objective of the study is to offer a comprehensive analysis of the environmental impacts of the valorization of bottom ash from the perspective of its treatment and use, compared to other alternatives.

The main result is the evidence that MSWI bottom ash valorization has greater environmental benefits than the other alternatives: landfilling and natural aggregates use. In addition, it is a type of waste treatment that improves the environmental results of the activity to which it complements, the energy recovery by incineration of USWs, because it transforms a residue into a continuous product that is reinserted in the economic and productive cycle.

PAPER NUMBER: 047

Does the efficient use of intellectual capital influence the company's sustainability?

Roberto Alcalde Delgado, Lourdes Sáiz Bárcena, Miguel Ángel Manzanedo Del Campo, Ricardo Del Olmo, Carlos Alonso De Armiño

Abstract

Intellectual capital has great relevance for the operation and valuation of companies, since it involves intangible resources and capacities that are difficult to value, but which represent a competitive advantage for the economic sustainability of companies. Bankruptcy of a company means that the company is not economically sustainable, which may be due to factors internal or external to the company. In both cases, it is possible that the company has not been able to adapt to the changes required to be sustainable and that the intellectual capital of the company has not found its way to sustainability (Valaskova et al., 2018).

Although the relationship between intellectual capital and company profitability has been studied extensively, studies on intellectual capital and the sustainability or economic failure of a company are considered very scarce (Cenciarelli et al., 2018).

PAPER NUMBER: 048

Modeling Logistics Costs for Subscription Business Models

Miguel Rodríguez García, Iria González Romero, Carlota Hernández García, José Carlos Prado Prado

Abstract

Subscription boxes have become one of the most innovative and fastest-growing subscription business models in e-commerce. However, many of the companies that have decided on this model have gone bankrupt when they were still in their early days. One of the main reasons for this was the difficulty of controlling logistics costs. To respond to this problem, we developed a cost model for the logistics operations of a subscription box model, based on a real case study. The model analyzes the evolution of monthly logistics costs, as these businesses expand their market to new populations, increase their number of customers and vary their offer of products with new subscription boxes. In addition, more specific features are included, such as the components that make up each type of subscription box on sale and the reverse logistics of the boxes. Thus, our model represents a great contribution for companies considering establishing a subscription box model, or even for those already in the market.

PAPER NUMBER: 050

**Mixed Integer Programming model for telecommunications
network planning**

Esther Fernández Bravo, Álvaro García Sánchez, Miguel Ortega-
Mier, Tamara Borreguero Sanchidrian

Abstract

This paper presents a Mixed Integer Linear Programming model to decide how to locate communication equipment for meeting the demand of a target area with the minimum cost (taking into account both capital expenditure and operational expenditure). Randomly generated instances of different sizes have been used to test the efficiency of the model.

PAPER NUMBER: 051

Using spatial data to correlate pedestrian activity and built environment

Juan Carlos Gomez Sanchez, María Victoria De La Fuente, Lorenzo Ros McDonnell

Abstract

Since the 1990s, the pedestrian is already important in the mobility plans of the cities. Since then, there is an extensive bibliography where the relationship between the volume of pedestrians in an area and the characteristics of the environment is established, giving rise to multivariable models that are difficult to calculate. The purpose of this article is to reduce the number of variables through a stepwise linear regression model. It is concluded that connectivity and urban mobilization in primary areas, the presence of bars and offices in secondary areas and connectivity, residential density and mixed-use areas in tertiary areas are key factors that must be taken into account in future urban planning.

PAPER NUMBER: 052

Diseño Adaptativo mediante Lógica Difusa de un Sistema de Acondicionamiento en un Edificio No Residencial

Elena Barbadilla, Pablo Aparicio Ruiz, Alicia Robles Velasco, Jose Guadix

Abstract

El aumento de la dependencia energética, la creciente preocupación por el cambio climático y el hecho de que los edificios representen un porcentaje importante del consumo mundial, pone de relevancia la necesidad de desarrollar acciones sostenibles en dicho sector. El presente trabajo expone una metodología a implementar en los sistemas de acondicionamiento que persigue dicho objetivo sin detrimento del confort térmico de los usuarios. Se propone para ello el ajuste de los límites de confort estáticos tradicionales y el uso conjunto de la teoría adaptativa y la lógica difusa. Los resultados ponen de manifiesto una previsible mejora en el consumo, tanto para una temporada estival como invernal, siendo esta más significativa durante la primera.

PAPER NUMBER: 053

Parameter Calibration with Response Surface Methodology of a Genetic Algorithm used in the optimization of a Flow-Shop Scheduling Problem

Jorge Armando Ramos Frutos, Javier Yañez Mendiola, Ricardo Pérez Rodríguez

Abstract

Genetic Algorithms (GA) are specific metaheuristics for the solution of the Flow Shop Scheduling Problems. To apply the GA in the Flow Shop Scheduling Problems it is necessary to code the vectors of possible combinations with positive integers, this type of coding is permutation. By having the coding defined, the selection, recombination and mutation operators that adapt to this type of coding are chosen. In this case, a GA with tournament selection is shown, with a Partial Mapping Recombination (PMX) and a Swap Mutation. An objective function is proposed; in this case, it is the completion time of all tasks (makespan). For the optimization of the parameters of the GA, the Response Surface Methodology (RSM) is used with a central design composed and at the ends in which the response variable is the makespan. In conclusion, with a level of -2.0 in the initial population, 1,949 in the cycles, a 2.0 in the recombination and a 1,189 in the mutation, a makespan of 6258.09 is obtained. Below show the objectives, methods, results and conclusion of the investigation.

PAPER NUMBER: 054

Situation of food waste in the hostelry sector in San Sebastian

Amalia Etchart, M. Jesús Alvarez

Abstract

The main objective of this research is studying the situation of food waste in the restaurant and hostelry sectors in San Sebastian, exploring how the initiatives carried out are making impact on this problems' reduction and identifying the points of the value chain where the food waste is higher.

The principal result from this research will be a document drawing the actual situation of food waste in San Sebastian and showing the impact of the different initiatives that are being carried out in the city. The study also aims to give new ideas of initiatives inspired on those that are being successful in other countries.

PAPER NUMBER: 056

Choosing free data visualization tools within the design of a Business Intelligence (BI) learning activity

Miriam Fernández, Alfonso Duran Heras, Guillermo Castilla, Sandra Ramos

Abstract

Business Intelligence (BI) platforms are increasingly being deployed by companies in their quest for competitive advantages. However, their complexity and cost of implementation hampers both their adoption by many companies (especially Small and Medium Enterprises - SMEs), and the highly desirable inclusion of real-life hands-on BI learning activities in university syllabi. This paper addresses how these hindrances might be overcome through the comparative analysis, in the context of the development of BI learning activities within Engineering Management programs, of three easy-to-use and free software applications that could enable an initial exposure to the realm of Business Intelligence through data visualization.

PAPER NUMBER: 057

The role of environmental practices and technologies in the impact of Lean Manufacturing on industrial performance: a comprehensive analysis using fsQCA.

Josep Llach, Fernando León-Mateos, Lucas López Manuel, Antonio Sartal

Abstract

Este estudio examina las principales prácticas y tecnologías medioambientales que, de acuerdo con la literatura, podrían reforzar la capacidad de Lean Manufacturing (LM) para mejorar el rendimiento de la planta. Alejándonos de los estudios existentes que típicamente manejan esta pregunta a un alto nivel, optamos por un análisis comparativo cualitativo difuso (fsQCA), que permite identificar múltiples antecedentes y sus combinaciones para determinar el resultado. Se obtuvieron los datos necesarios de una muestra multisectorial de 339 plantas de fabricación (códigos NACE 15–37) de tres países europeos. Los resultados respaldan el argumento de que las diferentes rutas causales entre la fabricación ajustada y las prácticas y tecnologías medioambientales mejoran el rendimiento de la planta; sin embargo, contrariamente a las expectativas iniciales, los resultados revelaron que tanto las prácticas como las tecnologías medioambientales parecen ser, por sí mismas, condiciones suficientes que pueden mejorar los resultados.. De hecho, en contraste con el conocimiento convencional sobre principios lean, nuestros hallazgos sugieren que ciertas prácticas lean (sobre todo las relacionadas con el JIT), pueden ser contraproducentes en plantas de producción verde.

PAPER NUMBER: 058

Artificial Neural Networks in Management Science: Scientific visualization

Maite Jaca-Madariaga, Enara Zarrabeitia, Rosa Rio-Belver, Izaskun Alvarez

Abstract

The use of Artificial Neural Networks (ANN) for different applications is growing significantly. Thus, in this study the data of publications about ANN in the field of management science through the Scopus database is going to be analysed and interpreted. Text mining and networks analysis software have been applied with the objective of making a scientific visualization and analysis of the subject from 2000 to 2019. The study carried out allows to conclude that in the management science research area ANNs are used generally to predict and forecast; to make classifications and regressions; to discover patterns in large data through data mining; and to make great optimizations, among others. In addition, it has also been found that the most used neural network is the convolutional (CNN).

PAPER NUMBER: 059

Uncertainty Management: A Review of Tools and Techniques

David Curto, Juan De Antón Heredero, David Poza, Fernando Acebes

Abstract

Risk Management is an emerging topic of interest in Management literature in general, and especially in the Project Management discipline. But there is no con-sensus about the concept of risk. A broad review of the literature let us identify four types of uncertainty: stochastic, aleatoric, epistemic and ontological. Suc-cessful Risk Management requires applying the appropriate techniques and tools. The aim of this paper is to present a synthesis of the tools and techniques, which must be applied to each type of uncertainty

PAPER NUMBER: 060

Conceptual framework for the integration of tactical and operational decisional levels

David Perez Perales, Faustino Alarcón Valero, Pedro Gomez-Gasquet, María Del Mar Alemany Díaz

Abstract

The need to adapt to increasingly competitive markets, adapting to new organizational forms, and pursuing greater flexibility, forces companies to make decisions more agile. To face current dynamism, it is necessary to provide information systems for planning with sufficient flexibility to achieve the proposals established in the traditional operations planning and control system (OPCS) scheme. This is possible due to the introduction of new Industry 4.0-based production technologies that give decision making more flexibility and efficiency. In this paper, a conceptual framework for the integration of the tactical and operational planning is proposed, doing more emphasis in the expert system that integrates and coordinates the specific decisions of both levels.



PAPER NUMBER: 061

Adopción de prácticas e iniciativas de Economía Circular en organizaciones registradas EMAS. El caso de España

Alexandra Barón, Gerusa Gimenez, Rodolfo De Castro

Abstract

El presente artículo pretende analizar la información contenida en las declaraciones ambientales públicas de empresas u organizaciones que han implementado un Sistema de Gestión Ambiental según el Reglamento EMAS en España con el objetivo de identificar la adopción de estrategias o prácticas relacionadas con los principios de la Economía Circular a nivel micro.

PAPER NUMBER: 062

Aggregated Risk Score: a multi-level model for supply chain

Alina Díaz-Curbelo, Angel Gento, Fernando Marrero Delgado

Abstract

This paper proposes a holistic model for supply chain risk assessment that considers the impact on multiple performance objectives, the relation between risk agents, and the risk event interdependencies. An Aggregated Risk Score is proposed to capture the cascading effects of common risk triggers and quantify the aggregated score by risk agent and objective. The approach also uses fuzzy logic to allow for the treatment of vague and ambiguous data as input parameters to the model from different domains and scales according to knowledge and criteria nature.

PAPER NUMBER: 063

El problema de asignación de alumnos a clases en una escuela infantil inclusiva trilingüe

Julien Maheut, Pilar I. Vidal-Carreras, Jose P. Garcia-Sabater

Abstract

Cada verano, los centros de educación, como es el caso de los alumnos de escuela infantil, tienen que asignar los alumnos de nuevo ingreso en diferentes clases. Este problema de asignación es de naturaleza compleja y variable en función de los centros. En general, una buena solución podría consistir en repartir los alumnos equilibrando la presencia de un determinado género entre las clases dentro de la capacidad del aula. Sin embargo, una escuela inclusiva implica considerar co-mo asignar de manera adecuada los alumnos con necesidades especiales. El problema se vuelve más complejo cuando el centro imparte su docencia en un idioma extranjero que se suma a los dos idiomas oficiales de la comunidad autónoma dónde se encuentra. En este artículo, se presenta el problema particular de un centro de la comunidad valenciana que tiene más de 120 alumnos por nivel, el modelo de programación matemática que lo define y una metaheurística para su resolución.

PAPER NUMBER: 064

Methodology for deploying sustainability through employee participation. A case study

Jesus Garcia Arca, A. Trinidad Gonzalez-Portela Garrido, Arturo J. Fernández González, José Carlos Prado Prado

Abstract

The role that structured employee participation plays in deploying sustainability in its three pillars (economic, social and environmental) has scarcely been dealt with in recent literature. This paper has a two-fold objective: first, to propose a justified methodology for deploying sustainability based on structured employee participation; second, to test that methodology in a food-industry manufacturer. The proposed methodology feeds on the systematics adopted by the company for implementing continuous improvement and innovation programmes and, furthermore, employs an “Action Research” approach.

PAPER NUMBER: 065

**A framework for manpower planning and scheduling
considering people with functional diversity in a multi-site
environment**

Jose P. Garcia-Sabater, Julien Maheut, Julio J. Garcia-Sabater, Angel Ruiz

Abstract

This paper presents a framework for manpower planning in a sheltered work centre that manages people with mental disabilities that can be assigned in different locations for different customers. The sheltered centre needs constantly to assess how the workers must be (re)assigned in function of the requirement of the customers production centres during the regular working calendar and also the abilities needed.

PAPER NUMBER: 067

A Methodology for Including Risk Factors into the Supply Chain Network Design

Ernest Benedito, Carme Martínez Costa, Sergio Rubio

Abstract

Supply chains aim to provide products to the final customer at a certain service level. However, unforeseen events occur that impede supply chain objectives. Supply Chain Risk (SCR) has been comprehensively studied in the literature, providing frameworks and methodologies to manage supply chain failures. Nevertheless, more efforts are needed to prevent hazardous and disruptive risks and their consequences. These risks must be considered during the process of designing a supply chain. The goal of this research is to propose an extension of a Supply Chain Network Design (SCND) methodology by including risk considerations in order to improve the performance of the supply chains.

PAPER NUMBER: 068

Reuse of components between virtual, b-learning and face-to-face courses. A case study in Management Information Systems

Guillermo Castilla, Alfonso Duran Heras, José Ignacio Ortiz González

Abstract

The integration between virtual and face-to-face (ftf) classroom learning is increasing. This is leading to an increase in mixed learning or blended-learning. Due to this growing trend there is a need to reuse course components between these strategies in the interest of efficiency. Additionally, the wide availability of open source software facilitates the construction of learning activities without incurring in expenses; activities which can then also be included in other courses. The reuse of these learning activities between virtual, ftf and mixed education may require significant efforts to adapt them if this possibility has not been considered in advance. Adoption of certain architectures and methodologies, that facilitate flexibility and reuse, can simplify this process, as proposed in this paper. A case study is presented on reusing learning activities on Management Information Systems (MIS) developed for either ftf instruction or for an edX MOOC, that are reused in courses in various learning modes: online, blended learning and face-to-face.

PAPER NUMBER: 069

A Reverse Combinatorial Auction Mechanism to Improve 3D-Printing Cloud Market Efficiency

Juan De Antón Heredero, Adolfo Lópezparedes, David J Poza, Félix A Villafáñez

Abstract

The additive manufacturing (AM) market is not developed enough. Cloud manufacturing (CMfg) provides a suitable environment for the integration of AM resources. However, trading mechanisms must be reviewed to achieve higher efficiency. This paper aims to develop a market mechanism to enhance the efficiency in the allocation of AM resources in a CMfg platform. An integrated procedure that harnesses the benefits showed by the optimization of production layouts in AM within a combinatorial auction market protocol is devised, and expected outcomes are discussed.

PAPER NUMBER: 070

**A System of Systems approach to supply chain competition:
distinctive features and sustainability issues**

Miguel Gutiérrez, Luca Urciuoli

Abstract

Several works have shown the applicability of the System of Systems (SoS) paradigm to supply chain management (SCM). We propose a SoS framework that extends the existing approach to incorporate supply multi-chain market competition. The framework leads to an illustrative example of an uncommon SoS with competitive constituents as well as to the elicitation of sustainability relevant issues. The framework can be used as a descriptive tool to provide better understanding of market dynamics, and as a prescriptive tool to identify ways to improve efficiency of the participants as well as to implement sustainable policies.

PAPER NUMBER: 071

**Trends in scientific research in Industry 4.0 and Advanced
Manufacturing: A Bibliometric Analysis**

Jon Borregan Alvarado, Izaskun Alvarez, Ernesto Cilleruelo, Gaizka Garechana

Abstract

During the last decade different concepts, methodologies and technologies have appeared that have made the industry evolve towards what we know today as the fourth industrial evolution or Industry 4.0. Along with this new terminology, today another terminology called Advanced Manufacturing is once again relevant to the manufacturing sector, thanks to the evolution and adaptation of Advanced Manufacturing Technologies to the current era. The combination of both concepts and their characteristics is a great tool with which to improve business competitiveness. Therefore, the objective of this research work is to analyze the tendencies of research work related to new technologies of Industry 4.0 and Advanced Manufacturing within the time span 2010-2019 by conducting a bibliometric and network analysis. The results obtained show that the number of publications in the last four years is growing exponentially and the main active countries are Germany, US and China. In addition, international collaborations are located in Europe, America and Asia-Pacific, with the powerhouses at the core of the network. The analysis of keyword networks allows us to conclude that three main research fields are defined, relating to Industry 4.0 technologies, Advanced Manufacturing and 3D printing, and Process Control.

PAPER NUMBER: 072

Overall Introduction to the Framework of BIM-based Digital Twinning in Decision-making in Safety Management in Building Construction Industry.

Juan Antonio Torrecilla-García, M^a Del Carmen Pardo-Ferreira, Juan Carlos Rubio-Romero

Abstract

This paper aims to study the Building Information Modelling (BIM) and digital twin technology integration within the decision-making processes related to safety management in building construction industry. Originally designed to facilitate technical information of the construction project, the BIM-based digital twinning heads to become the key factor for more collaborative and efficient risk evaluation and safety management during all construction phases of a building's life-cycle and at all organizational levels. This collaborative safety planning and pre-dictive risk awareness within the construction projects are to become the starting points to combining general technical planning with novel safety management functions. The main finding of this research is a proposal of BIM-based digital twins framework able to enhance strategic developments of pro-active solutions of safety planning and management in the construction industry. Through scoping literature review the study of emergent technologies application for the occupational health and safety in BIM-related construction projects has been carried out. As well as, the BIM-based digital twin framework for decision-making of safety management has been outlined applying the Research through Design.



PAPER NUMBER: 073

An Analysis of the Application of Lean Manufacturing in the Mining Industry

Itziar Luján Blanco, Patxi Ruiz-De-Arbulo-López, Jordi Fortuny-Santos

Abstract

This paper explores how lean manufacturing is used in the mining industry, taking into account factors such as country, ore and company size. The document also explains drivers, enablers, barriers, leadership and results of the implementation.

PAPER NUMBER: 074

**Internal Surface Optimization of DMLS Manufactured Parts.
Economic Impact.**

Luis Isasi, Manuel Antonio García García, Luis Ignacio Suárez Díaz,
Taodan Kaptan Abood

Abstract

Nowadays, it is quite clear that additive manufacturing (AM) technologies are extremely useful for manufacturing various and complicated shapes. However, most of the different techniques that are grouped under AM denomination, have still some important aspects to be improved, such as surface excessive roughness, unmelted particles or dimensional variations. As it is very well known within this sector, this is one of the key aspects to optimize when additive manufacturing, since it is directly related to post-processing time and cost. In this work, a deep experimental analysis on DMLS manufactured parts surface finishing is presented, comparing the results of different post-processing techniques, both in finishing quality and cost.

PAPER NUMBER: 075

Supply Chain Response: Proposal of a new definition

Raúl Antonio Díaz Pacheco, Ernest Benedito

Abstract

This research on supply chain response (SCR) is a topic of interest to academics and professionals that help to meet customer expectations in a timely manner and contributes to the achievement of supply chain (SC) objectives. Various definitions of SCR are found in the scientific literature, each valid for the purpose of the research that proposes it. The diversity of definitions prevents from establishing a framework for analysis and improvement of the SCR that can be applied to any type of SC. In this work a qualitative analysis of the literature on SCR has been carried out to study the definitions of existing SCR. The common characteristics of the various definitions, the differences between them and the shortcomings of each have been determined. The main contribution of this research is the proposal of a new definition of SCR that has the common elements of existing ones and is useful for any type of SC. A general definition will allow addressing the supply chain response with a common framework for any type of supply chain and not only those mentioned in the academic literature.

PAPER NUMBER: 076

Smart Production Planning and Scheduling in the Industry 4.0 era. A proposal for tactical-operative levels

Andrés Boza, Pedro Gomez-Gasquet, Llanos Cuenca, Faustino Alarcón Valero

Abstract

The Production Planning and Control System (PPCS) proposes a hierarchical system in which decisions follow an (almost) unidirectional flow for coordination between the objectives, plans and activities of the strategic, tactical and operational levels. Despite the advantages, they also have drawbacks due to their rigidity in decision making. The Industry 4.0 paradigm promotes, among other things, autonomous decision making, interoperability, agility, flexibility, efficiency and cost reduction. This paper proposes the adaptation of the instruments available in the tactic and operational scope of the PPC system so that they are able to take advantage of the real flexibility and current information in their environment to provide solutions, with and Expert Sys-tem, which are more adjusted to the reality of each moment.

PAPER NUMBER: 077

Introducing a Multi-Actor Approach in Massive Open Online Courses for Sustainability

Miguel Soberón, Valentina Oquendo, Teresa Sánchez-Chaparro,
Francesca Olivieri

Abstract

Universities are key players in the development of new models of collaboration and interdisciplinary knowledge to meet the challenges of the 2030 Agenda. In the field of education, universities need to find new learning environments and experiences to respond to the increasing demands for lifelong training. MOOCs (Massive Open Online Courses) have demonstrated to be an efficient tool for lifelong training due to their capacity to gather a wide range of people and foster virtual learning communities. Based on the experience of an educational project developed by the Technical University of Madrid (UPM), we have analysed the strategies developed to encourage multi-actor and multi-disciplinary collaborations during the design phase and characterised the implication of diverse actors. We focused on demonstrating the fortresses of incorporating multiple disciplines and external actors into an online learning itinerary that aims to prepare students to work towards the 2030 Agenda. We shall describe in this paper the impacts of this project in two organisational contexts: the decarbonisation strategy at the UPM, and the design phase of a blended learning programme at the Spanish Agency for International Development Cooperation (AECID).



PAPER NUMBER: 078

The challenge of Digitalization. E-learning implementation at Universidad Politécnica de Madrid from a student's perspective.

Pedro Garrido Gutierrez, Teresa Sánchez-Chaparro, Raúl Perona Madrigal, Gerardo Querol Valverde, Luis Catalan

Abstract

The current economic and competitive context puts high pressure on organizations to implement digital technologies. The aim is to create higher value for the consumers or customers through the advanced technologies and to manage the giant digital flow of information around us (included social networks).

Universities are also affected by this trend which impacts all facets of higher education- teaching, research, and administration. The digitalization process in the higher university sector is often referred to as a revolution (Biddix, Chung, & Park, 2015). This shift particularly challenging in higher education institutions with a strong heritage and traditional governance structures, such as Universidad Politécnica de Madrid (UPM), where lecturers, managers and even students are particularly reluctant to change (Trowler, 2008).



PAPER NUMBER: 079

Does sustainable culture within small-sized companies foster proactivity towards innovation?

M. Jesús Álvarez, Ormazabal Marta, Rincón John, Jaca Carmen

Abstract

Sustainability and the circular economy are the answer to the challenge of today's resource depletion and waste generation. The transition to circular economy re-quires technological and process innovations. The need for innovation has often been pointed out as a difficulty in this transition. The problem is worse in small-sized companies because of the scarcity of resources. Our research question is: Does sustainable culture within small-sized companies foster proactivity towards innovation? We used a case to examine how sustainability as a cultural asset can act as a driver.

PAPER NUMBER: 080

**Analysis of the Latin American Scientific Contribution About
Electric Vehicles**

Willmer Guevara Ramirez, Rosa Rio-Belver, Ernesto Cilleruelo,
Alejandro Rodríguez-Andara

Abstract

Electric vehicles (EVs) have been an opportunity to mitigate polluting gases. Even though this technology has been in use for several years, its implementation has been slow, especially in Latin American countries, compared to other geographical areas such as Europe, North America, and Asia. The aim of this work is to evaluate, by means of a bibliometric analysis, its scientific contribution in the field of EVs, considering the research published in journals indexed in the Web of Science (WOS) in the period 2001-2019. The results show little contribution from Latin American countries, little collaboration among their organizations and authors and low focus on lithium battery research. This allows us to conclude that the organizations and agencies of scientific financing in the region should promote research on the subject, favoring the projects that propose broad networks of collaboration that allow a rapid transfer of knowledge.

PAPER NUMBER: 081

Assessing the impact of pumpkins planting, harvesting and storing decisions on conservation time using Big Data tools

David Perez Perales, María Ángeles Rodríguez Sánchez, Cécile Guyon, Angel Ortiz

Abstract

Successful pumpkins production requires the use of varieties that jointly with other factors yield well and produce pumpkins of the size, shape, color, and quality demanded by the market. But not only these issues are important. The perishable nature of pumpkins makes other issues such as how to prevent deterioration after harvest to become also relevant. In this paper the pumpkins planting, harvesting and storing (PHS) process is described and how decisions affect certain performance indicators, and in particular, to the conservation time. Data from a real case is analyzed using Big Data tools. Results provide guidelines to make decisions on PHS depending on the performance indicators to be optimized.

PAPER NUMBER: 082

**Dynamic path planning problem of mobile robots in-door spaces:
A review**

Eduardo Guzmán Ortiz, Beatriz Andres, Raúl Poler

Abstract

The problem of dynamic path planning of mobile robots, used in indoor spaces such as hospitals, shopping centres or museums, poses great challenges, due to the environment characteristics in which they move. Commonly, this environment consists of corridors, work areas, rooms, multiple doors, areas with a high concentration of humans, and static and dynamic elements. During the last years, approaches to deal with the mobile robots' path planning and obstacle avoidance have been emerging. This paper presents the main concepts related with dynamic path planning in the mobile robots' context. A review on the algorithms developed in the literature to address dynamic route planning is carried out, analysing the applications of such algorithms in mobile robots that operate in real in-door spaces.

PAPER NUMBER: 083

**Fleet Management System for Mobile Robots in Healthcare
Environments: ENDORSE Project**

Eduardo Guzmán Ortiz, Beatriz Andres, Francisco Fraile, Raúl Poler

Abstract

This paper describes the implementation of a Fleet Management System (FMS) that plans and controls the execution of logistics tasks by a set of mobile robots in a real-world hospital environment. The FMS consists in a routing engine and a task scheduler, which enable to (i) interpret of geo-referenced data; (ii) calculate and recalculate dynamic path plans and task execution plans, through the implementation advanced algorithms that take into account dynamic events; (iii) track the tasks execution; and (iv) fleet traffic control. The proposed FMS has been developed under the scope of ENDORSE project that seeks to develop safe, efficient and integrated indoor robotic fleets for logistic applications in healthcare and commercial spaces.

PAPER NUMBER: 084

Indicators for sustainable circular economies

Carmen Avilés-Palacios, Ana Rodríguez-Olalla

Abstract

The aim of this research is to show that there is a need to complement sustainability indicators for CE, while not focusing on one of them specifically. It is also necessary to include other aspects in CE, such as eco-design and waste management. In particular, for the carbon footprint indicator, the Sustainable Based Activity Model (SBA) could be worth to ascertain the GHG emissions of activities involved in the management of residues and include these emissions to the product obtained in each of the phases of waste management.

Promoting business models that contribute to the development of the circular economy by integrating sustainability criteria is positive for the organizations. There is a current need for waste management until the circular transformation of linear industrial processes occurs. For this reason, the SBA model has proven to be an efficient tool for quantifying impacts. This model identifies resources, activities and impacts in such a way that it facilitates the traceability of the impacts generated in the development of the activities involved in waste management. It is necessary to in-depth research regarding the environmental footprint in order to compare the impact of circular processes in terms of sustainability as a whole.

PAPER NUMBER: 085

**A REVIEW OF WHAT HAS BEEN RESEARCHED ON
METHODS FOR MEASURING THE TECHNOLOGICAL
MATURITY**

Rodrigo Arturo Meza Ortiz, Gaizka Garechana Anacabe, Rosa Rio-Belver, Ernesto Cilleruelo

Abstract

This paper aims at giving a brief review of the main methodologies used for measuring the technological maturity. These methodologies are used by companies, specially, companies that rely strongly on technology. These types of companies might set up a technology management office to manage the technology they use. In this way, the tracking and evaluation of all the relevant technologies in a company may be more easily carried out than without this centralized approach (Freeman, 2013). The application of these methodologies allows managers to obtain a competitive advantage. The methodology to develop this work consists in searching the data in the databases Web of science and Scopus. A query was launched in each database. Once obtained the records, the most quoted papers were selected to do this work.

PAPER NUMBER: 086

Analysis of impact funds with a classification proposal.

Maria Dolores Storch De Gracia, Maria Angeles Huerta Carrascosa, Celia De Las Heras García, Jesica Rodríguez Martín, Noelia Cruz Pérez, Juan Carlos Santamarta Cerezal

Abstract

It is possible to affirm that the creation of a solid impact intermediation infra-structure, by connecting both sides of supply and demand, is a critical aspect for the development and good functioning of the impact market; giving special importance to impact funds, capable of attracting private capital. In order to categorise the different impact funds according to the most relevant aspects, the proposal form for the characterisation of impact funds has been drawn up.

The Sustainable Development Goals present a great opportunity for impact investors to support this global agenda through the placement of capital in projects that address these critical challenges we face (Global Impact Investment Network, 2018). Therefore, based on the previous information, it is proposed as a main recommendation that the different funds unify and align their efforts in the same direction of work as the Agenda by including in the impact considerations, integrated throughout each of the stages that make up the investment process, the Sustainable Development Objectives: objectives, targets and indicators.

PAPER NUMBER: 087

Exploratory factor analysis for the design of a model of sustainable production. Case: Industrial SME Sabana Centro - Colombia.

Abraham Gonzalez, Camilo Calderón Casallas

Abstract

This work aims to carry out an exploratory factor analysis that allows the design of a model of sustainable production, applicable to industrial SMEs Sabana Centro - Colombia. The methodology and design of the instrument set off a previous study by the same authors but applied to SMEs in Cundinamarca, of which the proposed variables were the result of a two-lap modified Delphi. The questionnaire used had fourteen questions estimation, which allowed obtain the opinion of a sample of 59 small and medium enterprises industrial located in the Province Sabana Centro, Who was asked to point to the application that makes the variables proposed by experts. With the results obtained after employing statistical technique factor analysis, it was known that three factors are the minimum to reproduce satisfactorily the correlations between the variables and explain the model.

PAPER NUMBER: 088

Theory of constraints case study in the make to order environment

Aitor Orue Irasuegui, Aitor Lizarralde Aiastui, Itxaso Amorrortu Gervasio

Abstract

Several studies have shown that the theory of constraints (TOC)-drum-buffer-rope (DBR) methodology is appropriate when managing a production plant in complex environments, such as make-to-order (MTO) scenarios. However, other studies have detected some difficulties in implementing this methodology in such changing environments. This document analyses an MTO company with the aim of identifying the key factors that influence the execution of the third step of TOC to evaluate the research started by Lizarralde, Apaolaza, & Mediavilla, (2020) more deeply. It is concluded that the capacity margin of non-bottleneck (BN) resources is the key factor when subordinating the system to a BN.

PAPER NUMBER: 089

**Synergic Sustainability Implications of Additive Manufacturing
in Automotive Spare Parts. A Case Analysis**

Luis Isasi, Jesús Morcillo, Alfonso Duran Heras

Abstract

Triple bottom line (3BL) approaches to sustainable supply chain management (SSCM) often involve trade-offs between their three dimensions (economic, environmental and social), thus curtailing its application and leading to goal un-alignment among stakeholders. Under some circumstances, however, synergic approaches (typically involving disruptive innovations) might allow simultaneous improvement in one or more dimensions without compromising the others. This paper analyzes one such case: the potential of properly designed additive manufacturing approaches in the automotive spare parts industry to simultaneously boost profits and reduce environmental impact. It is based on the systematic analysis of the real spare parts business of a mid-size automotive brand in Spain. Its results suggest that such synergic, self-reinforcing opportunities do indeed exist, and might even be further developed by strategically integrating sustainability constituents such as circularity

PAPER NUMBER: 090

**Sustainable distributed operations planning, shared resource
with a coordination mechanism**

Gregorio Rius Sorolla, Julien Maheut, Sofia Estelles Miguel, Jose P. Garcia-Sabater

Abstract

Nowadays, supply chains are forced by their stakeholders to consider sustainability as key drivers in their operations management. This sustainability implies a constant search for tools to make better use of scarce resources that must respond to market variations. Surplus capacities have a negative impact on economic, social and environmental sustainability. Different entities in a supply chain cluster or within multi-location organizations could have spare capacitated resources that could be better managed with centralized planning. However, as entities are reluctant to share all their information with a third party and face their own objectives and limitations, viability of centralized planning is limited. This paper presents and analyses a proposal for a coordination mechanism for distributed operations planning with asymmetric information, where each entity has its own mathematical programming model that decides, without a situation of power disequilibrium, to share its spare capacity to improve their sustainability. The proposal allows alignment of the different planning given a sustainable use of scarce resources, based on Lagrange's relaxation in a Generic Materials and Operations Planning formulation on a rolling horizon. Available resources are shared in a sufficiently broad instances repertoire of multiple situations to allow conclusions to be drawn.

PAPER NUMBER: 091

Measuring handcraft. Can craftsmanship be proven?

Silvia Soler, M. Jesús Alvarez

Abstract

Nowadays the world craft is also used to refer to low volume production, skills involvement or simply to make the product description more appealing. As a consequence, real crafters cannot use the word craft to distinguish their production methods from the industrial ones.

The objective of this analysis is to assess if it is possible to measure the amount of craft an article contains, and to propose a realistic way to do it, aligned with the heterogeneity and resources of the artisan & crafters collectives.

It is suggested to develop a quantitative, multi-sectorial self-assessment tool. The analysis focuses on the process of making, and considers time as unit of measure. Several concepts are considered, from type and difficulty of the tasks to development time and materials input. The tool could potentially be a first step to create a certification system for artisanal goods. Additionally, this self-assessment enables the artisans to take decisions related to sales and marketing communication, cost analysis, preservation of skills and processes modernization without reducing the craft value.

PAPER NUMBER: 092

Building and development of an organizational competence for digital transformation in SMEs

José Manuel González-Varona, Adolfo Lópezparedes, David Poza, Fernando Acebes

Abstract

En la investigación realizada hemos identificado los retos más importantes a los que se enfrentan las PYMES para su TD y cuáles son las capacidades organizacionales de TD más relevantes que han de poseer las PYMES para avanzar en su madurez digital. A continuación hemos identificado las dimensiones clave y elementos de competencia necesarios para desarrollar una competencia organizacional de TD. La competencia organizacional de TD deberá formar parte de las competencias centrales (core competence) de la organización.

PAPER NUMBER: 093

Methodology to calculate the potential rooftop solar photovoltaics using QGIS and GRASS free software

Itziar Martinez De Alegria, Alvaro Campos, Jon Olascoaga, Naiara Pikatza

Abstract

In this study, a methodology to estimate the potential rooftop solar photovoltaics (PV) of a determined geographic area using Geographical Information System (GIS) is developed. The novelty of the proposed methodology is that: a) it is based exclusively on free software (the Geographical Information System QGIS, GRASS and CloudCompare), b) it offers the possibility of obtaining hourly/daily or annual data (depending on our needs), and c) it allows the subsequent data to be treated and corrected in many different ways. This is of help when determining the physical and technical potential of PV electricity generation of different building rooftops or other surfaces. The methodology is flexible enough to be easily extended to wider geographical areas, i.e., a town, a city or region. This paper could be also considered as a first step to estimate some other relevant indicators (such as the Embedded Energy Payback Time (EPBT) and Energy Return on Energy Invested (EROI), etc.) of a solar photovoltaic system.

PAPER NUMBER: 094

**Indicadores de Sostenibilidad en la cadena de valor alimentaria.
El caso de la industria láctea.**

Alicia Duran Heras, Alfonso Duran Heras, Jesús Morcillo

Abstract

Este estudio analiza los elementos de la cadena de valor en la industria alimentaria (concretamente en la industria láctea) que tienen una mayor repercusión en la Sostenibilidad, y los Indicadores de Sostenibilidad que se están utilizando para conocer su evolución. Como metodología, se han estudiado las 3 fases del proceso de producción (granjas, industria y comercial), y se han comparado con los Indicadores de Sostenibilidad utilizados por las empresas. Se ha utilizado una muestra de 10 empresas del sector que comunican su política medioambiental. La mitad son organizaciones de producción e industrialización de productos lácteos y la otra mitad comercializadoras al detalle, para abarcar la cadena de valor completa.

De la comparación de los dos pasos del estudio, se concluye una utilización generalizada apropiada de los Indicadores de Sostenibilidad. Sin embargo, en la Fase Granjas la medición está acotada a sólo una parte de la cadena de valor, esta visión parcial del proceso puede inducir a decisiones erróneas sobre el real balance ecológico y la vida sobre la tierra.

PAPER NUMBER: 095

Motor Vehicle Mobility Patterns in the City

María Victoria De La Fuente, Juan Carlos Gómez Sanchez, Lorenzo Ros McDonnell, Diego Ros McDonnell, Manuel Cardós Carboneras

Abstract

The growing concern for sustainability in urban areas, and in accordance with European directives and Spanish legislation, seeks to reverse this situation, a path begun with the development of Sustainable Urban Mobility Plans in Spanish cities, since most of the public space is intended for motorized vehicles. In this context, the research team has carried out a study on urban mobility in the city of Cartagena, developing behavioral models that explain the flow of traffic in the city. With these results, it is sought that the local authority reconsiders the planning of the city, identifying specific aspects of utility for urban mobility.

PAPER NUMBER: 096

**Equivalent Inscribed Polygon of a Euclidean Travelling
Salesman Problem tour and modified problem formulation**

Alvaro Herraiz Solla, Miguel Gutiérrez, Miguel Ortega-Mier

Abstract

We define a transformation of the classic Euclidean Travelling Salesman Problem (TSP) that leads to a new formulation of the problem. For every Euclidean TSP n -city tour it is possible to construct an inscribed n -polygon (Equivalent Inscribed Polygon, EIP) such that its edges have lengths equivalent to the corresponding TSP tour links and follow the same sequence order. Geometric properties of the EIP define a new objective function and a set of additional constraints. The modified TSP formulation as well as a heuristic method to eliminate links are tested yielding to promising results.



PAPER NUMBER: 097

Towards supply chain 4.0 for circular economy

Luisana Dávila, Josefa Mula, Raquel Sanchis

Abstract

The main theme of this literature review is supply chain models that focus on circular economy industry 4.0 and green operations with the natural environment. Special in-terest is shown in optimisation models and in intelligent and digitalised supply chains to achieve a balance between economic growth and environmental concerns.



PAPER NUMBER: 098

A general vision on blockchain applications

Erick Ponce, Josefa Mula, David Peidro

Abstract

This paper presents a general review of blockchain applications. It addresses financial applications that are the origin of this recent technology, IoT (internet of things) applications and also logistics and supply chain areas. Additionally, other application areas are reviewed as reference models for further research.

PAPER NUMBER: 099

**Analysis of the Value Chain and Supply Chain of the
Pharmaceutical industry in Spain**

Francisco Amaro-Martinez, Rodolfo De Castro

Abstract

El presente artículo es sobre un trabajo de investigación de la Cadena de suministro del sector farmacéutico en España.

En concreto se centra en la distribución de fármacos (medicamentos) desde los Laboratorios Farmacéuticos a las Oficinas de Farmacia (OOF) en España, en base a los diferentes tipos de fármacos. Mediante la investigación bibliográfica realizada se ha visto que existe una falta de estrategias concretas en integración colaborativa en la Cadena de suministro en este sector. De este modo, se presentan los primeros resultados de la investigación fruto de la revisión bibliográfica y de las primeras fases del trabajo de campo que se está llevando a cabo. Se aspira a contribuir a mejorar tanto el servicio prestado a los pacientes, como la rentabilidad de todos los agentes de la Cadena de suministro de este sector (Laboratorios Farmacéuticos, Mayoristas, y OOF).

PAPER NUMBER: 101

Struggling with servitization? A classification framework for the challenges in the transition process

David Hidalgo, Ruth Carrasco-Gallego, Gustavo Morales

Abstract

Shifting from purely transactional models for products towards providing services around a product requires facing different challenges. This is the process known as servitization, and although it is not a new concept, its understanding and implementation is more recent, receiving increasing attention from both academia and practitioners, and from different business perspectives. In the present study, a systematic literature review has been conducted allowing identification and classification of the main different challenges represented in the literature. Our findings show an evident lack of standardization in the terms used to describe particular challenges. Additionally, results suggest that challenges can be classified as “hard” or “soft” based on similar characteristics. The results highlight the growing importance of the topic and provides the scientific community working on the topic with a common language.

PAPER NUMBER: 102

Fiscal Policy as a Regulator of Flows of Human Resources and Flows of Items in Supply Chains

Marija Bogataj

Abstract

The supply chains (SC), of which activity cells are located in the local area being a net importer of human resources (HRs), has to pay higher average wages than the SC, of which facilities are located in the district from which the labour is exported. In order to keep the workforce in the region, regional authorities should modify this contingency by adequate taxation and investments in amenities in the central places where the activities are running, for attracting the global SC activities in the region. If the net wages and purchasing power of these HRs are not high enough, they create incentives for HRs to commute into other functional areas. The edges of the functional regions are the lines from which human resources are indifferent regarding in which region to be employed. Taxation influence the edges. We are developing a model to support (a) SC investors in planning the location in work-intensive activities and intensity of work in the nodes of an SC, and (b) the local authorities to consider the taxation rate. Based on the gravity models of migration and commuting, and MRP theory of flows in an SC, we are developing the interaction model to analyse the impact of taxation on these interactions and investments in capacities as a regulator of growth. These indifference curves move when the relative net wages, modified by fiscal policy, change.

PAPER NUMBER: 103

Integration of sustainable development skills into higher education: a proposal for the engineering subject of "Design, Planning and Management of Production Systems"

Beñat Landeta, Patxi Ruiz-De-Arbulo-López, Naiara Uriarte, Ruben Jimenez

Abstract

Education for Sustainable Development (SD) in higher education is becoming increasingly relevant. Most universities have introduced a catalogue of transversal SD competencies in their degree courses. However, there is a lack of concrete curricular strategies for the implementation of sustainability in a transversal way within the different undergraduate and graduate subjects. This paper focuses on how to develop competencies for sustainable development in engineering degrees. To this end, a review of the literature is carried out, based on the transversal competences defined by the University of the Basque Country, a catalogue of DS competences in engineering is proposed and a curricular proposal is made in the subject of "Design, Planning and Management of Production Systems".

PAPER NUMBER: 104

University entrepreneurship: the role of universities' research, teaching and social capital capabilities in spin-offs and start-ups

Virginia Hernández, Belen Usero, Cooper Sarah

Abstract

Universities are expected to be drivers of entrepreneurship. The academic literature, however, is inconclusive on how they should achieve this. This study analyses the impact of activities related to research, teaching and university-industry collaboration on the quantity and quality of spin-offs and start-ups created in universities. The preliminary results, obtained via an analysis of UK universities for the period from 2014 to 2016, indicate that research and teaching activities present different relationships with entrepreneurial outcomes. However, activities related to university-industry collaboration are crucial for generating more and high-quality entrepreneurial results. The main practical implications of this study include the importance of a market-oriented approach and the key role of academics in constructing high-quality entrepreneurial universities.

PAPER NUMBER: 105

Users or taxpayers? Drafting a Pay-As-You-Throw program for Madrid's districts

Rocio Del Amo, Ruth Carrasco-Gallego

Abstract

Most Spanish municipalities, including Madrid, cover the costs of their waste management programs through fixed fees or directly from taxes, regardless of the amount of waste generated in each household. In this study we investigate the features of variable fee schemes for municipal solid waste services and we identify two successful European case studies of pay-as-you-throw systems. Next, we set the foundations for the design of a variable-rate pricing system in Madrid, complemented with a survey capturing some key aspects required to gain citizenship acceptance. The results show that approaching waste services design from an usage perspective, just like other utilities, such as electricity or gas, provides economic incentives for waste prevention and recycling in-creased rates, and it is aligned with the European objectives of diverting waste from landfills.



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