

# **APMS 2010** International Conference Advances in Production Management Systems

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# Welcome at APMS 2010

Dear Madams and Sirs,

welcome to the International Conference on *Advances in Production Management Systems* (APMS 2010), held from 11<sup>th</sup> to 13<sup>th</sup> October 2010 in Cernobbio, Lake Como, Italy. The conference is co-organised by three Italian universities, Politecnico di Milano, University of Bergamo and University of Florence.

Since several decades, APMS is the official conference of the IFIP Working Group (WG) 5.7 on *Advances in Production Management Systems*. In the years, thank to its members, IFIP WG 5.7 has highlighted, underlined and often anticipated the most relevant topics for the Industrial Engineering community. APMS2010 aims at continuing such tradition, with its title “**Competitive and Sustainable Manufacturing, Products and Services**”. Such a title synthesizes the most relevant trends of the modern industrial and production engineering: the need for a more sustainable growth, which might be obtained through manufacturing approaches that able to support global competitiveness and relying on the paradigm of servitization.

APMS 2010 has attracted more than 320 submissions, which have been selected by 110 international reviewers. The selected papers are 216, presented by authors from 32 countries, in 54 parallel sessions. Also, the third edition of the APMS Doctoral Workshop is organized jointly with the Conference, backed up by 33 research plans, 21 of which have been selected to be presented on 9<sup>th</sup> and 10<sup>th</sup> of October. The abstracts of all the contributions are reported in this booklet, while all the full accepted contributions are available in the complementary memory stick. After the conference, all the authors of the scientific papers will be asked to provide a final version of their work, for publication in an international editor.

We are really grateful and owe our heartfelt thanks to all the people who have made APMS2010 possible: a special thank is due to the authors and presenters (especially the keynote presenters), to all the International Reviewers that diligently reviewed all the submissions, to the Conference Chairs and Co-Chairs, to the Scientific Committee members for their support, and to the Local Organizing Committee for its hard work.

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IFIP Working Group (WG) 5.7, *Advances in Production Management Systems* (APMS), belongs to the Technical Committee (TC) 5 of the International Federation for Information Processing (IFIP). It was established in 1978, revised in 1986 and 1989.

The aim of WG 5.7 is to promote and encourage the advancement of knowledge and practice in the field of Integrated Production Management and to maximize global dissemination of this knowledge. This broad aim is achieved by a continuous development and refinement of an industry-based research agenda, focusing on industrial excellence for assessing best practices and stimulating young researchers seeking career in production management. WG 5.7 aims at developing a research culture that nurtures research that addresses industrial need whilst maintaining academic excellence and disseminating R&D results and best practices globally to both academics and practitioners through the group annual conference and the activities of its special interest groups.

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Doctoral Workshop: Session DW 1.1

ID	Title	Authors	Abstract
411	The Role of Organizational Practices in Sustainable Operations Management	Longoni, Annachiara	Sustainability is increasingly an essential element of companies' strategies but one still open issue regards the way strategies are implemented to reach at the same time higher economical, environmental and social performances. The aim of this research project is to study if it is possible to identify organizational practices that impact on sustainability, considered as a unique construct concerning all three dimensions, achieving higher performance and if sustainability action programs (e.g. ISO 14000, total quality environmental management) are more effective on sustainability performances when companies jointly adopt advanced organizational practices, such as teamworking and training. Preliminary results show that sustainability action programs and advanced organizational practices have a positive effect on sustainability performances and have stronger effects when these are adopted together.
376	Closing the Loop: Competition and Cooperation in Remanufacturing	Caner, Serra	Firms are forced to manufacture products in an environmentally friendly way due to increasing consumer awareness, environmental activism and legislative pressure. Remanufacturing, the process of recovering the residual value of used products by reusing the components that still function, reduces both raw material and energy consumption. Operational and pricing decisions for remanufactured products are crucial. The aim of this study is to provide analytical tools to the firms for optimal pricing, manufacturing and remanufacturing strategies in the case of competition and cooperation.
385	Development of Communication Tools for SMEs	Winkler, Ondrej; Valas, Martin; Osadník, Petr; Landryová, Lenka	This research deals with a development of standardized communication model for data transmission between MES and ERP systems for small or medium size companies. It's a part of FutureSME project. We are not focused on a classical MES and ERP system (big companies), but on a system, which is supporting the production of small or medium size companies and open ERP systems. This research was supported by the CP-IP 214657-2 FutureSME, (Future Industrial Model for SMEs), EU project of the Seventh Framework Programme in the Nanosciences, Nanotechnologies, Materials and New Production Technologies – NMP area.
405	Sustainable Product Service System: A Conceptual Framework	Resta, Barbara	This work aims at contributing to research in the field of Product Service System (PSS), which is a still a quite relatively new topic, not yet consolidated. More in detail the aim of the research is to develop a conceptual framework of a sustainable PSS business model in order to support companies in designing and implementing a PSS solution, from a strategic to a more operative perspective. Based on an extensive literature review, a sustainable PSS business model ontology is built through the definition of theoretical constructs, their relationships and the relevant measurement variables. The theoretical model is then validated following a case-based method. Afterwards a survey is carried out to deeply investigate the relations among the PSS value proposition, the organisational aspects and the sustainability dimensions through statistical analyses. Finally, conclusions are drawn and some directions for future research are pointed out.
244	Supply Chain Quality Management: Analysing Service-Based Relations within a Supply Chain in the Manufacturing Environment	Baban, Pinar; Zhang, David; Howard, Mickey; Childe, Stephen; Lamming, Richard	This paper examines the potential that service-based relations in the manufacturing environment offer for achieving supply chains' pre-determined performance measures. With regards to this potential, Quality Management and Supply Chain Management approaches are simultaneously adapted in constructing the conceptual model. A main purpose of the research is to transcend the quality concept of an organisation to the supply chain level with reference to this model. The case study method is used to test the conceptual model. Data collected is to be analysed in order to verify the model so that practical implications and guidelines for firms operating in various fields ranging from manufacturing to service sectors could be formulated.

Doctoral Workshop: Session DW 1.2

ID	Title	Authors	Abstract
391	Fuzzy Hierarchical Production Planning and Scheduling	Arica, Emrah	The aim of this study is to develop a hierarchically integrated multi-level production planning and scheduling model, incorporating with the fuzzy set theory in order to cope with inherent uncertainties and complexities in real world cases. A hierarchical production planning and scheduling model is mainly structured in three-levels. The tactical level is referred to aggregated production plan where aggregated decisions (production rates, inventory levels, etc.) are made regarding product families on long-term. The next level is the master scheduling where the aggregated production plans are disaggregated for each end-item in the product family. At the final level, the works are scheduled in the shop-floor on a short-term basis. Due to high rate of uncertainties and complexities in real-life as well as unfeasibility and inconsistency pitfall when disaggregating the plans in this hierarchy, this planning method fails in flexibility and practicality. This research contributes to overcome this challenge through developing the model inspired by vagueness and dynamism of the real life.
383	Eco-efficient and Highly Productive Machine Tools by Means of an Holistic Eco-Design Approach	Zulaika, Juan Jose	Machinery manufacturers are facing the challenge of increasing the productivity of their machines while assuring at the same time high levels of accuracy and reliability. This increase in the productivity is being achieved anyway at the expense of increasing also the consumption of material and energy resources. In view of this, this paper presents a methodology for designing machine tools that achieve high levels of productivity while reducing their material content for the production phase, reducing thus also the energy consumption during their use phase. Following this methodology, a complete milling machine has been designed and produced which, combining different technologies (light materials, active damping etc.), has reduced the inertias involved in servo-drives by over 50%, with a corresponding reduction in energy consumption, whereas the productivity of the machine has been increased by 100%, in such a way that productivity and eco-efficiency have been combined in a single machine: the eco-productive milling machine.
379	Enhanced Production Management Approaches – Integrating Energy Efficiency Performance in Companies Decision Making Processes	Bunse, Katharina	This thesis focuses on controlling, monitoring, and improving activities for energy efficiency while simultaneously considering other important performance areas of industrial companies, such as cost, flexibility, delivery time, and quality. Therefore, the dissertation will contribute to a more energy efficient manufacturing. Different Key Performance Indicators (KPI) will be considered and controlling and improvement methods will be outlined. Moreover, case studies demonstrating the implementation and integration of energy efficiency performance in productions management will be conducted to validate the proposed concept. The concept will be discussed within the larger context of an Energy Management System (EnMS) and will support an enhanced coordination and a long-term operational anchoring of energy efficiency in production management. By applying the concept industrial companies will establish an increased transparency of and awareness for the corporate interrelations with regard to energy efficiency performance.
365	Advancing Lean Production: The Role of ICT	Powell, Daryl John	This Research plan provides a description of the PhD research project Advancing lean production: the role of ICT. Theoretical background of both subjects is covered, aims, research questions and objectives of the project are stated, and the chosen research method is explained.

**Doctoral Workshop: Session DW 2.1**

ID	Title	Authors	Abstract
388	Facilitation of Collaborative Knowledge Construction in Business Process Development Groups	Hirvensalo, Antero	Knowledge of business processes are by nature fragmented or dispersed within the actors and activities of the process. The key question becomes then, how to reclaim the multi-level perspectives of various stakeholders during a group workshop in order to develop the process as a whole. In other words, the overall problem on the group level is how to create a group situation that enables discussing the practices of individual stakeholders, and leading to collaborative construction of knowledge. My research approaches this question from the facilitators' viewpoint. The facilitator is in this case a researcher-facilitator, who guides development workshops. From this perspective it is central to understand the facilitator's influence in bringing out the multi-level perspectives of collaboration to form a coherent basis for development.
397	How to Decide End of Life Route in the Early Stages of Design	Doyle, Kirsty	End of Life (EOL) is can be defined as the moment when a product finishes one life cycle and is introduced into a new life cycle via an EOL strategy. The EOL route should be determined in the early stages of design to increase the productively of the EOL stage. There are four main issues surrounding existing EOL decision making models; firstly incomplete criteria in which EOL decision making is based on, secondly integrated too late into the product lifecycle, not all EOL routes are considered and finally the theory is often too difficult for designers to understand. The aim of this research is to enable designers to improve their effectiveness of EOL decision making during the design process. Consequently this will increase the productivity of products' End of Life phase as the EOL route is already determined.
384	Investigating the Relation between Organizational Context and Knowledge Creation	Maalouf, Malek	In this paper, I intend to focus on the gap in both knowledge creation and ambidexterity literatures and investigate the relationship between contextual ambidexterity and knowledge creation taking the constructivist approach for knowledge conversion. The study of organizational context and knowledge creation is particularly important because a context does not dictate specific types of action; rather, it creates a supportive environment that inspires an individual to do "whatever it takes" to deliver results and this supportive environment turns out to be crucial for knowledge creation and the "justification of true beliefs". As for the unit of analysis, innovation and organizational knowledge creation is often temporarily organized in project teams composed of people who represent various functions, units, groups, or organizations. Having this in mind, the purpose of this thesis is to investigate the relationship between contextual ambidexterity and the four knowledge conversion phases - socialization, externalization, combination and internalization - of Nonaka's model at the project team level.
398	Investigation of Remanufacturing Issues in Product Design	Hatcher, Gillian Deborah	Remanufacturing is the process of returning a used product to like-new condition, with a warranty to match. Whether a used product is suitable for remanufacture or not greatly depends upon decisions made in the design process. Activities such as disassembly and cleaning cannot be carried out efficiently and effectively if the product has not been designed to accommodate them. However, current literature would suggest that little design for remanufacture is carried out in industry. This research aims to improve designers' ability to design for remanufacture by uncovering new knowledge that will aid them in carrying out the task with greater ease.
389	Development of the Reverse Logistics Process for Automotive Remanufacturers	Stewart, David Graham	Remanufacturing is an industrial process where worn-out/failed/used products are restored to a "like-new" functional state and given a warranty to match. It has been put forward as an economical and environmentally friendly approach to tackling the present resource consumption and waste production patterns of the manufacturing industry. One of the main barriers to its widespread uptake and consequent success is due to the paucity in knowledge and understanding surrounding the subject area, especially as a business practice. Furthermore, the highly uncertain environment involved in the acquisition and recovery of end-of-life products presents significant problems in the management of the Reverse Logistics process. In this paper, we will address these issues and present gaps in existing knowledge. This will lead onto a discussion of the proposed research where the chosen aims, research questions and methodology will be presented.

Doctoral Workshop: Session DW 2.2

ID	Title	Authors	Abstract
390	Service-Oriented Analysis of Companies in the Manufacturing Industry - Constructing a Cost Model for Services	Seiringer, Wolfgang	A manufacturing company offers services to the customers, but also needs services for the own production processes. The offered prices must be competitive, but should not exceed the own production costs. Due to the increasing importance of services, also for manufacturing companies, these businesses need a solution to calculate the own production costs including the internal and external service costs. In the following sections, a research plan is described that extends a method for production cost calculation, using a Cost Model for Services (CMF) to get more accurate calculation results for the products and thus, reduce the amount of unclassified overhead costs.
382	Mastering Global Sourcing: Transactions and Organizational Structures	Schneider, Christian	Two drivers have significantly increased the importance of global sourcing in manufacturing. One the one hand, concentration on core competencies has diminished the degree of vertical integration and lowered the share of value added in-house. On the other hand, trade barriers have been reduced which curbed the proliferation of global markets and the corresponding infrastructure such as transportation capacities. Companies nowadays do not only need to purchase more, but also have to cope with a more global and heterogeneous environment. This task becomes even more challenging, when considering that in manufacturing companies usually a small number of purchasing professionals decide over a considerable share of total costs. Methods to advance global sourcing decisions are therefore not only needed, but also bear great potential to improve overall firm performance. This thesis aims at supporting procurement managers by looking at the topic from the point of view of transaction cost economics. More precisely, four issues are addressed: (1) Sourcing transactions are analyzed. (2) Organizational structures processing sourcing transactions are examined. (3) The alignment between transactions and organizational structures as well as its impact on performance is studied. (4) Special attention is dedicated to investigating sourcing transactions between Asian buyers and European suppliers. Data to empirically asses the research questions are gathered through several different methods including a survey, multiple case studies, and expert interviews. This thesis contributes to theory and practice by expanding the understanding of the interaction between sourcing transactions and corresponding organizational structures which ultimately shall enable better sourcing decisions that increase overall firm performance.
380	Inter-organisational Information Sharing for Physically Efficient and Market Responsive Fresh Food Supply Chains	Romsdal, Anita	Lack of information sharing is recognised as an important contributor to the bullwhip effect, and a variety of inter-organisational information sharing arrangements have evolved that aim to create a transparent, visible demand pattern that paces the entire supply chain. The PhD project described in this research plan focuses on differentiated production and inventory planning and control in fresh food supply chains. The research looks specifically at how the supply chain can apply a combination of information sharing arrangements to support differentiated planning and control. The objective of the work is to develop a conceptual framework and practical guidelines for information sharing, where the goal is to make fresh food supply chains both more efficient and market responsive – i.e. capable of supplying customer demand quickly, with focus on flexibility, delivery precision and minimal inventory. The research combines a multiple case study approach with action research, working closely with a manufacturer of dairy products, two grocery wholesale – retail dyads, and two suppliers of packaging equipment and material.
399	Evaluation of Benefits of Harmonized Product and Process Data in the Order Processing of Contract Manufacturers	Oedekoven, Dirk	What is the competitive advantage of interoperable information systems? Taking this research question as a guideline the paper discusses how to approach the challenge of assessing the benefits of integrated systems. The main focus is laid on the direct and indirect effects of standardization projects which aim at continuous and homogenous order processing data. The knowledge based approach starts on data level and takes care of the interdependencies between the subsequent levels of aggregation. The problem immanent complexity is caused by the variety of heterogeneous product and process describing attributes. The application of management cybernetics in order to handle this challenge constitutes the focal point of this paper.

NS 1.1 Strategy for Sustainability - I

ID	Title	Authors	Abstract
420	Proposal of a Reference Sustainability Framework	Rosa, Paolo; Kerga, Endris Temam; Cammarino, Bartolomeo Pio; Terzi, Sergio	Since several years, the word <i>sustainability</i> has earned relevance within different backgrounds, with its meaning dominantly related to environmental and social issues. In fact, environmental changes and a higher awareness about social issues and poverty moved international institutions and different countries to take astute care of sustainability. As it expatiates several definitions have been proposed, in order to define specifically its meaning and to face its main dimensions. This work aims at better understanding the actual state of sustainability practices within industrial companies. To pursue this, an explorative research has been implemented through the use of a questionnaire, responded by 20 companies. Afterwards, all the results have been analyzed and classified in a Reference Sustainability Framework.
260	Pursuing Sustainability Synergies in Global Operations Networks	Jensen, Peter Meulengracht; Wæhrens, Brian Vejrurn; Johansen, John	The paper explores the corporate pursuit of establishing sustainable production within a global operations network. It introduces and describes a number of capability phases, which draws our attention to the increasing importance of moving beyond the technical regime and thus approaching sustainability as an organizational problem. It draws on a single retrospective case study in a Danish MNC with a long sustainability track record. There are clear indications in the case study, which is also supported by the literature reviewed, suggesting that companies are experiencing problems with lifting their sustainability efforts to an organizational level and, thereby, fail to obtain results, which are in line with the strategic ambitions. We propose that research efforts should be directed towards applying program management techniques in the sustainability problems sphere, in order to meet this demand.
268	Methods for Competence Development for Sustainable Manufacturing	Vigtil, Astrid; Rolstadås, Asbjørn; Fradinho, Manuel; Carpanzano, Emanuele; Brondi, Carlo	This paper presents some results from a survey concerning the need for new methods and approaches for competence development to support a sustainable manufacturing industry. 360 persons from 43 countries worldwide participated in the survey conducted by the project IMS2020 (IMS group and EU-FP7-NMP). The overall aim of the project was to identify topics within key research areas for the future EU research agenda, one of the survey dimensions was to identify the importance and relevance of emerging competences to sustainable manufacturing. New methods for competence development are needed because we see increased globalization of manufacturing education, becoming multidisciplinary, involving more than technology to encompass business and management perspectives. The analysis yielded nine new methods for competence development found relevant by industry. This work is expected to influence future research on methods for competence development as current methods have shortcomings and are ineffective with long time-to-competence.
296	Towards to Operational Sustainable Business Development Concept	Da Silva, Sergio Luiz; Pacheco Júnior, Waldemar; Loch, Márcia do Valle Pereira; Coelho, Antônio Sérgio; do Valle Pereira, Vera Lúcia Duarte; Lezana, Alvaro Guillermo Rojas	The purpose of this study is to propose a sustainable business development concept. For such purpose a research was developed of the literature on the several discussions that are focused on the approaches. It sets off from an approach exposed by Jabareen (2008) that relates the existence of seven different concepts. Despite the effort of that author be considered consistent in the sense of establishing a new “conceptual framework” for sustainable development, it is assessed that there are many “lacks” for the concept to be rendered in a univocal manner by the business organizations. Such impossibility in handling the issue implies in perpetuating distortions that result in a situation that is considered to be critical: the inconsistent use of the concept. In this sense, this paper seeks to develop a conceptualization from approaches that, in a strict sense, lean towards divergence. Thus, this paper proposes to assess the converging and diverging points and develop a synthesis that could be used by the production systems.

NS 1.2 Strategy for Sustainability - II

ID	Title	Authors	Abstract
141	Sustainable Operations Supported by Information and Communications Technologies: A Pilot Study in SMEs	Hernandez Pardo, Ricardo Javier; Bhamra, Tracy	Information and Communications Technologies (ICTs) have been identified as an important tool to improve firm's productivity and achieve competitiveness. Product Service Systems (PSS) also has been described as a way to improve business practices, reduce costs, increase productivity and develop new markets. This paper reviews the literature in both fields to identify opportunities for the integration of these two areas that suggest potential benefits in terms of environmental sustainability. The paper highlights the importance of the role that competences in product design and development plays in a firm that wants to adopt ICTs as well as more innovative business solutions such as PSS. Finally, the paper presents the results of a pilot study with a group of SMEs illustrating the opportunities and barriers to integrate ICT and PSS principles to achieve sustainable operations.
146	Development of an Embedded RFID Tag for End-of-Life Management within an Electronics Manufacturing Supply Chain	Bindel, Axel; Justham, Laura; Conway, Paul; Lugo, Heinz; Viret, Julien; West, Andrew	According to the Waste Strategy for England 2007 the UK is continuing to consume natural resources at an unsustainable rate. Short product life cycles and growing demand has increased the amount of electronic waste being produced. There are different levels of recycling or waste management that exist to reduce the waste materials produced at the end of life of a product with the aim to recover the maximum value from waste and to consider the most practical environmental option for reusing, refurbishing, remanufacturing and recycling products. An industry-academia collaborative project that is currently being undertaken in the UK is concerned with the development of a novel product and process monitoring system. The system covers the whole electronic manufacturing supply chain from printed circuit board (PCB) fabrication to end-of-life management and recycling. It is focused on embedding wireless components (RFID tags) into PCBs, which can then be used to monitor and optimize manufacturing processes, track components, locally store life-cycle information and support dismantling and recycling. The focus of the current paper is on the use of this novel technology at the end of life stages of the product lifecycle to increase recycling efficiency and cost effectiveness. It is shown that this approach could lead to higher value recycling and also minimizes the overall total energy usage of electronic products.
269	Carbon Auditing for Transport Service Provider	Gabriel, Hanne Marie	The purpose of this paper is to suggest how emissions can be calculated for consignments transported with trucks, and what approach (top-down or bottom-up) are best suitable for calculating emissions on a consignment level. Two calculation models developed are presented in this paper, one based on a top-down approach and one based on bottom-up approach. The models are proposed based on the framework of ISO 14064 standards, reviewed literature and collected real time data, and illustrated in a case example from the transport service provider sector. The paper discusses factors that can affect the outcome of the calculations, and suggest whether a top-down or a bottom-up approach is best to utilize for transport service providers calculating CO2 emissions on a consignment level. The paper proposes with today's level of data availability, a top-down approach is most suitable for transport service providers quantifying CO2 emissions on a consignment level.
345	Investigation of Initiatives towards Sustainability: A Supply Chain Perspective	Melacini, Marco; Marchet, Gino; Perotti, Sara; Dallari, Fabrizio; Colicchia, Claudia	Supply chain sustainability has recently gained an increasing attention in the supply chain context both from the practitioners' perspective and as a research area. Given the relevance of the topic, the aim of the present paper is threefold: first, to investigate the strategies currently undertaken by companies in the supply chain sustainability arena, and, second, to find out which phase of the supply chain is at the forefront in the implementation of initiatives towards more sustainable supply chains. Finally, the criteria commonly used for priority-setting amongst different initiatives within the same supply chain phase are identified. As main result, the research offers a benchmark of primary multinational companies with respect to the supply chain sustainability initiatives and their level of adoption.

NS 1.3 Strategy for Sustainability - III

ID	Title	Authors	Abstract
272	Guidelines for Mass Customization Manufacturing	Alfnes, Erlend; Skjelstad, Lars; Arica, Emrah	The attention on Mass Customization (MC) as a viable manufacturing strategy is increasing in academia. Also, more and more companies report from successful implementations. However, the transformation process necessary to become a mass customizer (from the company's outset as a mass producer or a handcraft type industry) is still not fully developed, and research on practical implementations is needed to gain experience on how to proceed. The research presented in this paper is based on a case study in the Norwegian furniture industry. Efforts towards the new strategy are analysed related to central decision areas when implementing mass customization. The decision areas are extracted from literature. Three performance objectives; low cost, short delivery time and degree of customization are considered to be the order winning criteria's, and it is argued that enterprises need to balance these performance objectives in their effort to realize mass customization. The lessons learned from the case are structured in a set of guidelines for mass customization, which propose the necessary changes to undergo for a craft manufacturer as well as a mass-producer.
294	Improving Corporate Sustainability Management with Business Intelligence	Kröner, Fabian; Hollstein, Philip	During the last decade there was an increasing demand for Corporate Sustainability data from several institutions. One outcome of this raising information flow is that many organizations keep the question of fulfilling the external information demand separated from internal management information systems. As a consequence, this research paper aims to build up an adaptable and transparent closed-loop concept for bridging this informational gap with the use of Business Intelligence by focusing on the special demands of investors as one of the critical stakeholder groups of an organization.
313	The Link between Ecologically Sustainable Management and the Firm's Competitive Advantage – Differences in Performance through Incremental and Radical Innovation	Hinz, Andreas; Scherrer-Rathje, Maïke; Tribelhorn, Andrea; Skorna, Alexander	Ecological innovations are assumed to generate business opportunities by reducing resource consumption while increasing quality of life at the same time. This research seeks to address how a firm's strategy influences the development of innovations with emphasis on sustainability and how incremental and radical innovations differ upon achieving competitive advantage. Based on a literature review, a conceptual model is developed and propositions are derived. With the help of a case study, the conceptual model and the propositions are validated.

NS 2.1 Sustainable Manufacturing and Operations - I

ID	Title	Authors	Abstract
319	Environmental Sustainability Assessment: An Evaluation of Established Methods and Analysis of their Suitable Applications in Industrial Practice	Sproedt, Alexander Sebastian Benjamin; Plehn, Johannes; Vodicka, Matthias; Deitmer, Henning	The large number of different environmental assessment methods presents a challenge for industrial practice. They differ strongly in their characteristics, scope and the units measured. There is a lack of a comprehensive comparison of these methods, enabling industrial companies to choose a suitable evaluation method according to their specific needs and intentions. This paper aims at providing an overview and comprehensive description of the methods deemed most important. Further, an evaluation of methods against selected criteria is conducted. Conclusions for specific industry applications are drawn, highlighting their different requirements for environmental assessment methods. It is concluded, that the different methods are to be seen as complementary rather than exclusive, with LCA having a predominant role.
340	Evaluation of the Energy Consumption in Machine Tools: An Analytic Approach	Albertelli, Paolo; Bianchi, Giacomo; Bigliani, Alice; Borgia, Stefano; Matta, Andrea	Reducing energy consumption will play a fundamental role in companies success. Right now, this aspect begins to be an important theme thanks to the perspective provoked by the adoption of the EU Directive 2005/32/EC, that regulates energy-using product marketing and asks to set eco-design requirements for them. The industrial sector uses more energy than any other end-user sector. In this paper an approach for the appraisal of energy consumption in machine tools is presented. The aim is to offer an evaluation tool for energy consumption in order to compare, in the future, alternative production systems and develop energy saving criteria. Numerical models, able to estimate energy consumption in a machine tool, have been coupled to a kinematic simulation software. The developed system is able to produce a report on dissipated energy in the various machine components. The proposed approach has been tested and verified on two case studies.
363	Eco-efficient and Highly Productive Machine Tools by Means of an Holistic Eco-design Approach	Zulaika, Juan Jose; Dietmair, Anton; Verbeeten, Wilco; Campa, Francisco Javier; Lopez de Lacalle, Luis Norberto	Machinery manufacturers are facing the challenge of designing machine tools that are productive, accurate and reliable and that at the same time consume the least possible amount of material and energy resources. In view of this, this paper presents a multidisciplinary methodology for designing milling machines that achieve a high level of productivity while at the same time ensuring high machining quality and less energy consumption during their use phase. Following this methodology, an eco-productive milling machine has been designed and manufactured which, combining different technologies (light materials, active vibration damping system etc.), has managed to reduce the inertias involved in servo-drives by over 50%, with a corresponding reduction in energy consumption, whereas the productivity of the machine – measured in terms of metal removal rate– has been increased by 100% in such a way that productivity and eco-efficiency have been combined in a single machine: the eco-productive milling machine.
401	Overview of the Literature on Environmental Implications for E-Commerce	Carrillo, Janice; Vakharia, Asoo; Wang, Ruoxuan	The role of e-commerce as a viable marketing channel has been well established in the last decades. Many companies are recognizing the benefits of this important channel in reaching a targeted market of customers. Recent press has highlighted the environmental benefits associated with online shopping, such as emissions savings from individual drivers, economies of scale in package delivery, and decreased inventories. In this paper, we summarize the current state of research which analyzes the environmental impact of e-commerce. In particular, we compare and contrast the findings for disparate industries, such as electronics, books and groceries. Finally, we highlight significant factors addressed in these studies and identify key themes for future research.

NS 2.2 Sustainable Manufacturing and Operations - II

ID	Title	Authors	Abstract
115	Process Flow Modelling for More Environmentally Sustainable Manufacturing Operations	Despeisse, Mélanie; Ball, Peter D.; Evans, Steve; Levers, Andy	Pressures to lower environmental impact and to become more sustainable are leading manufacturers to adopt new approaches. These focus on technologies rather than on processes that link the technologies together. There is a need to better understand material, energy and waste process flows and the utility network from a systems viewpoint. This paper presents an approach using process flow modelling to help manufacturers identify improvements towards environmentally sustainable manufacturing operations. It is then applied to a case company and the insights gained through its application are discussed.
130	Improved Sustainability of High Precision Optics Production	Nollau, Sebastian; Schuh, Günther; Wellensiek, Markus	A new state of the art technology, Precision Glass Moulding, enables high precision, low cost and sustainability in production of demanding optical components. When correctly applied, this technology allows a cost- and resource-friendly sustainable production of optics. To support the technology's sustainable application, tools are developed and recommendations for a suitable optics design are given. It is shown how these can be used to ease the industrial users' access to the technology and to compare it's sustainability with different production options. The new technology in combination with the recommended methodologies can be used to realize a more sustainable optics production.
243	Simulation Model Driven Manufacturing to Support Engineering Process and Operate Manufacturing Cell	Hibino, Hironori	In our research, the simulation model driven manufacturing for manufacturing cell (SMDM-MC) is proposed. The purposes of SMDM-MC are not only to support the manufacturing engineering processes based on the simulation model, but also to directly operate the manufacturing cell while controlling and monitoring the manufacturing cell based on the simulation model in the manufacturing system execution phase. In the manufacturing engineering processes, the simulation model is mixed and synchronized with real equipment, real controllers, and management applications under a condition where parts of equipment, control programs, and manufacturing management applications are not provided in a manufacturing system. In the manufacturing system execution phase, when the simulation model acts in response to its behaviors, the manufacturing system is controlled by synchronizing the simulation model behaviors. In this paper, the environment of the simulation model driven manufacturing for manufacturing cell (E-SMDM-MC) is proposed. The necessary functions for E-SMDM-MC are defined and developed. E-SMDM-MC consists of our developed manufacturing model driven simulator (EMU), our developed soft wiring system, and the industrial network middleware which is one of the semi-standard industrial network middleware. The validation of E-SMDM-MC was carried out through a case study.
316	Tolerance Analysis of Mechanical Assembly Sets using Monte Carlo Model	Navas, Helena V. Guitiss	Tolerancing is an important issue in the quality evaluation of mechanical systems. Tolerancing of an industrial gear assembly set includes dimensioning and accuracy, fits and tolerances, clearances and interferences, accuracy of surface form, accuracy of orientation and location of component features. In this study, dimensional tolerancing of an elementary assembly unit that is part of an industrial gear assembly set was considered. A tolerances attribution was carried out aided by Monte Carlo Model and based on occurrence probability of assembled units acceptance by functional condition criteria. A JAVA program was created for this purpose.

NS 2.3 Sustainable Manufacturing and Operations - III

ID	Title	Authors	Abstract
121	Analysis and Modeling of Tacit Strategy for Teaching a Skilled Motion Taking Lacrosse Swing as an Example	Mizuyama, Hajime; Yamada, Kayo; Tanaka, Kazuto	Receiving advice from a good instructor often accelerates the process of mastering a skilled motion. Thus, taking a basic motion of lacrosse swing as an example, this paper observes several actual processes of teaching it to a beginner and analyses them each as a sequence of state transitions. As a result, it confirms that an experienced instructor chooses the set of advice elements to give in a strategic manner, and develops how to visually represent a part of the teaching strategy in an easy to interpret form. Further, it provides a dual loop conceptual framework for the teaching strategy. The outer loop corresponds to the task of planning and refining the teaching path. The inner loop on the other hand is in charge of choosing which advice elements to give and when to the learner in order to move how she/he performs the motion along the planned path.
270	Short-time Forecasting of Renewable Production Energy in Solar Photovoltaic Installations	Lazzerini, Beatrice; Cococcioni, Marco; D'Andrea, Eleonora; Volpi, Sara Lioba	In this paper we describe an automatic system that is able to perform real-time monitoring of a photovoltaic system and short-time forecasting of the production energy. By comparing the theoretical production energy with the real production energy one we can easily detect losses in efficiency. The proposed system was tested on data collected from a photovoltaic installation with two fixed arrays (each connected to an inverter) of solar panels. We made use of two types of least squares regression, the linear regression (LR) and the quadratic regression (QR). The best results were obtained by the QR algorithm using one week as training set for each inverter.
278	Towards the Factory of the Future in High-Tech Industries	Netland, Torbjørn H.; Strandhagen, Jan Ola; Buvik, Marte P.; Skjelstad, Lars; Ravn, Johan E.; Knutstad, Gaute; Nilssen, Tore	This conceptual paper explores design principles of the future factory. Knowledge-intensive high-tech manufacturing is expected to build the competitiveness of the Western manufacturing industry. Still, we largely lack a proper manufacturing concept and roadmaps on how to design and operate our most important future factories. By taking a socio-technical systems perspective this paper suggests seven design principles; (1) World-class organisational exploitation of technology, (2) Flow-oriented production and organisation, (3) Attractive for the attractive, (4) Rapid innovation based in production, (5) Customised mass production, (6) Knowledge organised, and (7) Integrated supply chain. The design principles are developed through several interdisciplinary academic work shops and ongoing interaction with high-tech industry over a period of two years in two large-scale Norwegian research projects funded by the Norwegian Research Council.
161	The Impact of Facilitation on the Quality of Communication in Virtual Collaborative Teamwork	Haukola, Timo; Pöyry-Lassila, Päivi; Salmi, Anna	This paper reports a case study that aimed to explore the effects of facilitation in the context of a global virtual collaboration project course. Empirical data was collected from the students through three online surveys. To detect the effects of facilitation, the respondents were divided into two groups for comparison: facilitated and non-facilitated. As a result, a couple of statistically significant differences were found with the help of t-test. In this case study it seems that facilitation has some positive effect on virtual team interaction and communication, but further research is needed on this topic.

NS 2.4 Sustainable Manufacturing and Operations - IV

ID	Title	Authors	Abstract
415	Life Cycle Simulation: A State of The Art Analysis	Rosa, Paolo; Garetti, Marco; Pozzi, Francesca; Terzi, Sergio	The present paper discusses the current state of the art about life cycle simulation. The perspective of life cycle is more and more relevant in the current society, which calls for a more sustainable approach to design, engineering and production of every-day things and products. To answer to such a need, designers, planners and engineers might have access to new techniques, methods and tools which are able to integrate in a proper way the life cycle perspective. In such a context, simulation – in its wider meaning – could play a relevant role. This paper conducts a state of the art of existing approaches and solutions able to support life cycle simulation, in order to identify the main trends and prioritize the next steps.
162	Gantt chart Simulation based Job Change Planning for LCD Industry	Kim, Taedong; Choi, B.K.; Kang, Donghun; Lee, JunYoung; Lee, Duckwoong; Kim, JaeHee	Minimizing job change leads maximizing utilization. To minimize job change, the efficient job change plan is needed. But the process of job change is very time-consuming and hard to consider various constraints such as job change crew, work in progress (WIP), tool and availability of equipment. In this paper, the simulation of constructing the Gantt chart for efficient job change planning in LCD industry is proposed as it is called Gantt chart simulation (GCS).
250	Sustainable Storage Assignment in AS/RSs	Meneghetti, Antonella	Picking time reduction has been the traditional perspective for warehouse optimisation. When sustainability is considered, optimisation of warehouse operations should be read in terms of energy efficiency other than response time. In an AS/RS it can be imagined to associate to each location in a rack the value of energy consumed by the crane to reach it, other than time. Since picking performance strictly depends on storage location assignments, a time based full turnover strategy is compared to an energy based one. Three models of energy consumption are considered for traditional and new generation cranes. Assignments are then compared in terms of dedicated zone shapes, time and energy performance within a given time horizon. Different shapes of the rack and product ABC curves are analysed.
359	Potential of Electrolytic Equipment for Treatment of Standing Waters with Focus on Removal of Cyanobacteria	Sebo, Dusan; Sebo, Juraj; Fedorčáková, Monika	The paper deals with the design of equipment for disposal of cyanobacteria in standing waters by non-traditional method of electrolytic treatment. On the base of research, which is performed on Technical University in Košice, the Faculty of Mechanical Engineering, Department of Environmental Studies and Control Processes, experiences with electrolytic treatment of waste water and laboratory and real water experiments are proposed stationary and float equipment for revitalization of standing waters.

NS 3.1 Sustainable Supply Chain Management - I

ID	Title	Authors	Abstract
180	The Challenge of Being both Cost Efficient and Responsive: Analysing the Supply Chain Design of Ericsson, the Telecom Equipment Maker	von Haartman, Robin	Literature suggests that supply chains should be designed based on the characteristics of products, including their technological maturity and the predictability of demand. The advantages of doing so are indisputable, but may be more difficult to achieve in practice. The aim of this paper is to, based on a single case study, analyse how a leading technology-based company solves the problems of conflicting supply chain demands. The company sells multiple products with varying degrees of technical maturity and predictability of demand. The study finds that technological maturity is driving a change towards a more efficient supply chain. The efficient supply chain is, however, not suitable for all products. The case company's solution is a dual-speed supply chain: a responsive one when demand is uncertain and an efficient one for standard products with predictable demand. The paper concludes that the supply chain will by necessity be a compromise as well as segmented based on the characteristics of the company's many products.
206	International Supplier Networks and Supply Chain Integration: Lessons from a Survey on Their Impact on Delivery Performance	Danese, Pamela; Formentini, Marco; Romano, Pietro; Bortolotti, Thomas	This research aims to investigate the impact of supply chain integration (SCI) on delivery performance and the moderating effect on this relationship played by the adoption of an international supplier network. The results of our analysis based on the High Performance Manufacturing (HPM) data set confirm the positive relationship between SCI and delivery performance and also show that the impact of SCI is higher when relying on international suppliers. Therefore, it is relevant to lever on SCI especially when sourcing from an international supplier network to decrease the high level of uncertainty tied with unreliable suppliers' deliveries in such complex context.
347	Supply Chain Game: Development of an E-learning Tool for Skills Training of Supply Chain Operations Management	Umeda, Shigeki; Hata, Takahiro	This paper proposed a web-based supply-chain business process game. The objective of this game is to support students to learn operations management in supply chain systems. The game system uses embedded supply chain process simulators. Game players can learn both mechanisms and operations in supply chain management. The game system also uses embedded system dynamics models representing relations between investments and system performances. The paper describes a game configuration, simulators, investment models, and practices of the game. Further, results of trial experiments are also reported.
202	Green Supply Chain Practices (GSCP) Adoption: Understanding Motivations and Barriers among 3PLs	Perotti, Sara; Micheli, Guido J.L.; Cagno, Enrico	Over the last decade, logistics companies have experienced a significant pressure to adopt green processes. Meanwhile, the research community has started to show an increasing interest towards the issue of Green Supply Chain Management (GSCM). However, little studies have included logistics activities within the analysis so far. The present paper tries to fill this gap and illustrates the results of a case-study-based research performed with 15 third Party Logistics (3PLs) operating in Italy. The study provide insights on motivations and barriers to Green Supply Chain Practices (GSCP) adoption. The findings are of interest to logistics managers to benchmark the adoption process of such practices, and understand the potential hurdles and advantages coming from adoption.

NS 3.2 Sustainable Supply Chain Management - II

ID	Title	Authors	Abstract
201	Green Supply Chain Management: A Case Study Analysis of the Automotive Industry	Azevedo, Susana Garrido; Carvalho, Helena; Machado, V. Cruz	Green supply chain management (GSCM) was emerging in the last few years as an important management paradigm. Companies have looked to their supply chains (SC's) and seen areas where operational improvements can produce best performance levels. The aim of this paper is to propose a theoretical framework to explore the relationship between green practices and SC performance. A case study methodology is developed in the automotive industry to explore the framework proposed and refine it according to the companies' perspective on this topic. It was found that the type of GSCM practices adopted influences the SC performance. Furthermore, the research found out that the critical green practices to a SC be considered green are: reverse logistics, minimization of waste, and ISO 14001. Also, the performance measures considered the most important to reflect the influence of green practices on SC performance were environmental cost, efficiency, and quality.
219	The Disruptive Innovation in the Automatic Warehouses Industry: Empirical Evidence from an Italian Company	Palmieri, Antonio; Baglieri, Enzo	This paper investigates how a small company performs the disruptive innovation. We use the Christensen's theory of disruptive innovation to undertake this analysis. The results of our analysis based on a single case of an Italian company support Christensen's theory and at the same time suggest some insights that can be useful to better structure the theory. The ability of a company to pursue the disruptive innovation depend on its factors (resources, processes and values). Our study goes in depth identifying the key factors of a small company.
111	Cooperation in Supply Chains: From Practical Problems to Conceptual Models	Grabot, Bernard; Hémont, Florian; Mayère, Anne	Improving the performance of supply chains is a critical issue in nowadays industry. In that purpose, cooperation between partners motivates a great attention. Technical aspects of current cooperation procedures as promoted by large companies are firstly described, and compared to some real problems identified after interviews in the aeronautical industry. Technical issues are in our opinion insufficient for fully explaining the described situations. Therefore, behavioral concepts suggested in the literature of management and sociology of organizations are explored and conceptual models linking the selected concepts are suggested, allowing to have a deeper understanding of real cooperation situations.
334	How Green is the Automotive Supply Chain? – An Assessment from within the Industry	Von Cieminski, Gregor Alexander	The automotive industry is slow in adopting the principles of Green Supply Chain Management or Green Logistics as this assessment from within the industry shows. It is based in an investigation of industrial association policies and of publicised company strategies coupled with a case study of an automotive supplier. These analyses reveal that, while “being seen to be green” is an important facet of the automotive industry's competitive strategies, this has little impact on the SCM practices adopted by the industry. As yet, the costs and effort of implementing Green SCM exceed the perceived utility that automotive companies gain from doing so. The paper reflects on future research activities and practical actions that could be undertaken to improve this situation.

NS 3.3 Sustainable Supply Chain Management - III

ID	Title	Authors	Abstract
242	Supply Chain Quality Management: Analysing Service-Based Relations within a Supply Chain in the Manufacturing Environment	Baban, Pinar; Zhang, David; Howard, Mickey; Childe, Stephen; Lamming, Richard	This paper examines the potential that service-based relations in the manufacturing environment offer for achieving supply chains' pre-determined performance measures. With regards to this potential, Quality Management and Supply Chain Management approaches are simultaneously adapted in constructing the conceptual model. A main purpose of the research is to transcend the quality concept of an organisation to the supply chain level with reference to this model. The case study method is used to test the conceptual model. Data collected is to be analysed in order to verify the model so that practical implications and guidelines for firms operating in various fields ranging from manufacturing to service sectors could be formulated.
127	Improving Productivity through the Development of Indicators and Classification of Milk Producers	Okano, Marcelo Tsuguio; Vendrametto, Oduvaldo; dos Santos, Osmildo Sobral	Dairy production in Brazil is an important activity of the agricultural sector and it has a vital role in the economic and social development process of the country. After half a century of little change, largely explained by strong government intervention in the dairy market, milk production chain begins in the early 90s, to experience significant changes in all market segments, from production to consumption. The lack of vision and understanding of the production chain as a whole, eventually led to an asymmetric behavior, in some situations, resulting in losses along the production process, often justifying the dissatisfaction of farmers. The objective of this research was to develop indicators of productive efficiency of dairy farms, to classify them on a table with five levels and the study of inter-organizational relationships that influence the productivity of this chain. The results of the analysis of field research data pointed to the best practices that producers can take to evolve in the league table, and, to increase the efficiency of production.
343	A Model-driven Diagnostic Tool and Approach for Enterprise and Supply Chain Optimisation	Eriksen, Thomas; Steger-Jensen, Kenn; Hvolby, Hans-Henrik; Nielsen, Peter	The paper discusses the need for improved performance in enterprises and supply chains including identifying Key Performance Indicators and Key Business Measures. A developed diagnostic tool is presented allowing a more precise monitoring of the performance.
306	Green SCM Pressures, Practices and Benefits – A Survey in Italy	Cagno, Enrico; Micheli, Guido J.L.; Zorzini, Marta; Sarkis, Joseph; Perotti, Sara	This paper investigates green supply chain management (GSCM) practices in Italy. The general framework focuses on the relationship between pressures to adopt, the level of adoption, and performance outcomes of the GSCM practices. Results show that some similarities do exist between prior studies in other regions and countries and those in Italy. Also, some differences exist from the sample of Italian organizations used in this study. Some of these differences and similarities are highlighted in this paper. Implications and future research directions are also delineated.

NS 4.1 Sustainable Product - I

ID	Title	Authors	Abstract
261	Roadmapping for the Virtual Production	Schuh, Günther; Orilski, Simon; Schubert, Johannes	Nowadays, manufacturing companies from high wage countries are facing many challenges. To achieve sustainable competitive advantages it is important to resolve the so called Production Polylemma, which describes two important dimensions – namely the contradiction economies of scale versus economies of scope and the contradiction panning versus value orientation – that have to be considered for the configuration of a production system. Therefore, a roadmap for the Virtual Production has been developed based on questionnaires and discussions with technology experts. The roadmapping process covers six major sections of application: factory planning, product planning, technology planning, machinery and control simulation, material and process simulation and information management. Within these fields, the developed technology roadmap can be used to support the identification of complementary or alternative research directions as well as needs and future trends in the field of Virtual Production Systems, which give further starting points to resolve the Production Polylemma.
266	Development of Innovative Roadmaps for a Sustainable Product Development in the Furniture Sector	Cordero, Pilar; Poler, Raúl; Pacenti, Elena; Tubito, Christian; Agresta, Simona; Brenna, Ilenia; Pellizoni, Roberto; Di Gilio, Rodolfo; Peverelli, Silvio; Martinelli, Guido; Núñez, María José; Boquera, Patricia; Vavallo, Michele; Biel, Carmen; Bernardo, Paulo; Alves, Paula; Beja, Rodrigo; Vargas, Gonçalo; Sanchis, Raquel	The environmental impacts caused by the current production and consumption patterns bring necessary changes in the industry towards new business models based on sustainability issues and eco-innovation concept that will contribute not only to improve their environmental performance of businesses but also their competitiveness and economic growth. Considering these approaches, the aim of this paper is to show the results obtained in the research part of the project Planet Design which aims to promote eco-innovation in the furniture sector with the proposal of innovative roadmaps indicating potential innovation paths addressing environmental issues and opportunities to differentiate their offers and to maintain competitiveness by achieving sustainability.
276	Life Cycle Assessment of a Photovoltaic-thermal Micro-cogeneration System	Mora, Cristina; Accorsi, Riccardo; Bortolini, Marco; Gamberi, Mauro; Manzini, Riccardo; Ferrari, Emilio	Nowadays the urgency in reduction of emissions and of depletion of resources makes the employment of renewable energy necessary for encourage a sustainable development. The paper presents the results of a Life Cycle Assessment (LCA) of an innovative system for the production of renewable energy. The environmental and social impacts of a prototype of a sun tracking system of distributed micro-cogeneration, producing electric and thermal energy from the solar energy, are analyzed. Particular attention is paid on the impact of the end of life of the system and of its components, such as the Photovoltaic (PV) cells. Different design alternatives of the micro-cogeneration system are evaluated in order to individuate the best configuration from environmental and social point of view.
314	Sustainability as Requirement in System Engineering Approach	Messaadia, Mourad; Vallet, Flore; Eynard, Benoit	Preserve the environment becomes an important requirement. For this, different tools are used by designers in order to limit environmental impacts, but it is not quite sufficient to consider the environmental task completed. One of the problems in this approach is the communication between engineering designers and manufacturing engineers through environmental inputs and outputs. As a result, product design might proceed without a real integration of manufacturing requirements from engineering designers. Our hypothesis is that the supplier's participation in the requirement management, especially their definition could facilitate the innovation process. Also, the Eco-designer can be seen as a new skill, which could facilitate the innovation process.

NS 4.2 Sustainable Product - II

ID	Title	Authors	Abstract
134	Increasing Efficiency of Concurrent Engineering by Multivariate usage of KBL	Stjepandic, Josip; Hechler, Jochen; Nast, Volker	The number of electric and electronic devices in vehicles is increasing at a high rate. This leads to complex harness designs for vehicles, especially if customer specific harnesses are used. To enable concurrent engineering for such a complex product with different development packages and high varieties, a standard for data exchange is extended increasing the efficiency of concurrent engineering.
184	Sustainability Information in Product Development – The Case of Automotive Supplier Industry	Aschehoug, Silje Helene; Boks, Casper	Access to and use of sustainability information in product development is important for sustainable product development. In this article, a sustainability information resource base (SIRB) based on stakeholder theory has been customized to the automotive supplier industry in two case studies. Information fragments ranked with high importance have been identified in the SIRB. It is expected that the use of SIRB as guidance and decision support in product development will enhance a firm's ability to develop of more sustainable yet commercial viable products.
303	Parametric Design Rules Approach to Implementing Modular Construction in Large Land Based Structures	Storch, Richard Lee; Komendur, Sashihadran; Walsh, Kenneth; Moreno, Nelson; Bashford, Howard	This paper is based on two research projects that sought to identify means to increase the use of modular construction techniques in large land based structures. The techniques are based on approaches used in the shipbuilding industry, especially in Asia. The objective is meant to support adaptation of shipbuilding methods to the construction industry by providing context for use of a key component of the shipbuilding process, modularity of work, in the construction industry. The specific objectives for this assessment were to (1) determine the drivers for use of modular methods in construction, that is, the actual and potential advantages, (2) understand the general rules for how modular construction is done at the prefabrication, transportation, and assembly level, (3) report on assessments of outcomes of modular construction, and (4) identify reasons why modular approaches are not used in a subsequent project of the same type for which a modular solution has once been developed.
346	From 2-D Engineering Drawings to 3-D CAD Models: Issues and Challenges of Solid Model Dimensioning, Tolerancing and Annotation	Kaisarlis, George; Diplaris, Stefanos; Sfantsikopoulos, Michael	Even in the 3D digital industrial environment of today, 2-D engineering drawings continue to maintain their role as the major means for technical documentation. The lack of a competent, fully standardized and consistent system for dimensioning, tolerancing and annotation of solid CAD-3D models is currently considered a vital issue to manufacturing companies all around the world. The aim of the paper is to present the current status and discuss the main issues and challenges of the CAD-3D model dimensioning, tolerancing and annotation as they stand today. Taking into account that eventually all design data will be developed, communicated and stored in 3D format, the practical implementation of the Model Based Annotation concept on commonly used CAD/ CMM inspection software tools is evaluated through an industrial case study.

NS 4.3 Sustainable Product - III

ID	Title	Authors	Abstract
421	Set Based Engineering and Eco-efficient Design Selection at Conceptual Phase of Product Design and Development Process	Kerga, Endris Temam; Terzi, Sergio; Taisch, Marco	Growing concerns regarding the environmental impact of industrial activities, coupled with consumer demands for environmentally sound products have forced manufacturers to scrutinize carefully the environmental friendliness and economical prosperity of their products during the design process; a domain called eco-efficient product design. To design an eco-efficient product, related requirements must be considered during the conceptual design phase, where the cost of incorporating changes is relatively low, and different feasible concepts of the product should be evaluated as such. However, at this early design stage, life cycle data and information are subject to severe uncertainties that make the selection of the most favourable eco-efficient product concept arbitrary based on incomplete information and knowledge. In this paper we rationalize Set Based Engineering (SBE), Toyota way of conceptual product design, to be used early in a design process, premising elimination of inferior designs and subsequently delaying the selection of the best eco-efficient design till sufficient information and knowledge being acquired to do so.
215	A Framework for the Design of Sustainable Product-Service Systems	Brissaud, Daniel; Lelah, Alan	Product-Service Systems (PSS) seek better and fuller satisfaction of customer needs, to be profitable and to develop their high potential to lower environmental pressure. They want to be the three-win solution that they are known for. The main advantage of PSS is to enhance the design of systems that fulfill the final customer needs while using few material products with more immaterial services. However initial studies showed that the three-win solution is not automatically reached without necessary conditions for sustainability. The paper aims to define a framework for designers that would provide evidence of the sustainability of their newly designed solutions. PSS designing includes design of an offering that creates value supported by a business model, the system that balances customer satisfaction and engineering efficiency and the processes that support the delivery phase. All three elements must be simultaneously designed. The paper focuses on the conditions for a PSS to end up being sustainable and highlights the main design drivers.
348	The Role of Human Aspects in Design for Sustainability Strategies and Approaches	Verhulst, Elli; Boks, Casper	Implementing sustainability criteria within the product development of a firm is more than a mere theoretical process. Factors related to employees influence the success of this process. In this paper, we studied this implementation process of sustainability criteria in the design process with a focus on human related factors. Empirical data has been collected within Flemish and Dutch firms. A factor that is studied is resistance from employees against changes towards sustainability. Our data suggest that this resistance varies significantly throughout the incorporation process and between different departments. Empowerment is observed and recognized as a possible way to lower this resistance and to raise participation and enthusiasm with employees.
406	Concurrent Assessment of Value Proposition in Early Innovation Phases	Westphal, Ingo; Seifert, Marcus; Thoben, Klaus-Dieter	Companies that develop innovative, complex products take in many cases a serious risk: Usually it is not certain that the new product will be accepted by the potential customers and that the sales will provide an adequate return on investment for the development. Therefore it is crucial to evaluate the prospective value that the new product should provide to potential customers. This supports conclusions regarding the product's marketability, its possible future price and the corresponding budget for the development. In addition it could provide input for the further development process, in particular for adjusting the general concepts for the product. This paper analyses the challenges to do such an evaluation of potential value proposition in the early phases of an innovation process. It suggests an approach for this evaluation that can be done concurrently to the early development steps.

NS 5.1 Sustainable Healthcare Services

ID	Title	Authors	Abstract
144	Sustainable ICT-based Services for Healthcare	Copani, Giacomo; Molinari Tosatti, Lorenzo; Marvulli, Silvia; Bosani, Roberto; Marchetti, Fabio Massimo	Sustainability is not only an industrial environment-related issue, but it is a mission to be pursued also in other sectors like the healthcare, where the monitoring of costs, the management of resources and the guarantee of safety for patients are key objectives to be achieved. Unfortunately, very often it is still an open issue especially because of internal financial restrictions. In addition, national governments are strictly controlling healthcare structures' costs and investments to reduce wastes and to manage resources in a more prudent way. The present paper presents the results of the "Lean Healthcare" project, founded and carried out in the frame of the "Metadistretti Lombardia" Regional Program. The preliminary idea of such project was to provide a set of ICT-based solutions in order to bring in the healthcare sector the Lean Manufacturing Paradigm, which was originally addressed to the improvement of efficiency and quality of management industrial processes.
195	Factors that Hinder the Implementation of Process Flow Solutions Related to the Existing Knowledge Paradigm in Healthcare	Jacobsson, Torbjörn; Åhlström, Pär	This paper investigates factors that hinder the implementation of process flow solutions related to the existing knowledge paradigm in healthcare. There is a prevailing view of the knowledge areas that healthcare should master. Medical science is, of course, in focus but in order to create efficiency in production of care, there is a need of widening the traditional approach and being open to knowledge from the operations management field. Physicians play a significant role when implementing process flow solutions and they have a severe impact on how knowledge in operations management is developed and established in healthcare organizations. There is a challenge in having both physicians and nurses involved in patient flow improvement projects that are not explicitly connected to their research or specialist areas.
209	Collaborative Purchasing in Healthcare System	Gobbi, Chiara; Hsuan, Juliana	The paper represents an exploratory study aimed at developing a theoretical framework that supports the elaboration of efficient collaborative purchasing (CP) strategies in the healthcare system. We identify prerequisites for developing an efficient CP approach in the healthcare system. A case study of Danish National Healthcare system is presented. The case indicates that trust and stakeholders' commitment are key elements for successful CP initiatives. Moreover, simplifying procedures for collaborative sourcing and service management is crucial in sourcing of complex medical equipment.
228	A Proposed Framework to Introduce Lean Thinking in Healthcare Services	Davoli, Giovanni; Govoni, Andrea; Melloni, Riccardo	Healthcare services need, in all industrialized countries, an important part of the economic resources and ensuring sustainable healthcare services is critical for governments. Lean Production and Lean Thinking practices and concepts proved to be useful to improve performances and reduce costs in many industrial sectors. Lean Thinking generates positive results in services too, with some experiences even in healthcare. The present paper proposes a framework to introduce Lean in Healthcare Services. In the first part a literature review about Lean Thinking in healthcare is provided and a work in progress experience of Lean implementation in healthcare services in Italy is described. The Lean practices adopted, the intervention areas and the results are analyzed to point out positive and negative aspects of each case study. In the second part the proposed framework is explained according with the studied experiences.

NS 6.1 Performance Management and Sustainability - I

ID	Title	Authors	Abstract
102	Performance Analysis of the Compliance to Delivery Dates of Enterprises operating in Production Networks	Jähn, Hendrik	This contribution introduces an integral part of a comprehensive approach for the performance analysis in networked production structures by giving priority to the delivery date as one performance parameter. That approach is primarily based on a value-added process-related perspective. This fact implies a sophisticated analysis regarding the causers of delivery date deviations. In order to realize that approach, it is necessary to consider the structure of the network. This article first explains some details concerning the conditional framework including the performance analysis approach. Afterwards, general requirements are described and the results of literature research are presented. In the main part, the approach is explained in detail. The paper concludes with some final remarks.
419	Sustainability Metrics: an Evaluation Methodology for Warehousing	Taisch, Marco; Tessarolo, Daniele; Morganti, Manuel; Cassina, Jacopo; Sala, Lorenzo	Sustainable Development is a new deal and a new competition arena for countries and enterprises. Customers aims at sustainable products and services, countries funds sustainable businesses as well as enterprises takes sustainability in account to select suppliers and partners. This requires clear and well defined metrics to measure and compare sustainability issues, but existing standards allows only a rough evaluation of them. The work described in this paper is the first step toward the creation of a sustainability metrics model, able to give a score and improvement indications. For this first model logistics and specifically warehousing has been selected since most companies have warehousing activities in production as in logistics.
148	Measuring Performance in Knowledge Intensive Healthcare Services	de Pablos, Carmen; de la Puerta, Enrique; López, David; Valentin, Maria O.	When Drucker coined in 1959 the term knowledge worker, he was referring to individuals adding value by applying knowledge to the firm's products and services. Knowledge workers offer their professional and previously acquired knowledge to the firm in which they work at. According to Drucker each knowledge worker in an organization is a manager according to her position in relation to knowledge being responsible for contributing to the organization's objectives. Professionals working in this modality require of a differentiated managerial style due to their capacity to decision making when executing knowledge-intensive tasks. In the present paper we describe knowledge workers by making use of a relevant case of study in healthcare, the Spanish Organ Donation System (ONT). This organization, a worldwide reference in healthcare servicing, has managed to integrate disparate resources into a single system. We also describe how the process is managed and its final performance is measured.
274	A Structured Approach to Implement Performance Measurement Software Tools based on Reference Models	Vicien, Guillaume; Ducq, Yves; Vallespir, Bruno	Nowadays, performance improvement in order to reach the economic, technical and social objectives has become essential for all enterprises whose want to stay competitive. For this reason, enterprises should set up an executive information system which will give them their performance's level at every moment through different performance indicators. The development of those systems is long and difficult and different problems can occur especially during the system design. Those problems can disturb the system and the aggregation of the different performance indicators. This article aims to propose a new approach for Executive Information Systems development and implementation based on the results of Performance Indicator System development methodologies. In this paper, we present this new approach that could facilitate EIS development and implementation, and allows the enterprise to have a coherent and global PIS and help deciders to take the best decisions.

NS 6.2 Performance Management and Sustainability - II

ID	Title	Authors	Abstract
131	Key Performance Indicators for Sustainable Distribution Supply Chains: Set Building Methodology and Application	Bouchery, Yann; Ghaffari, Asma; Jemai, Zied	This paper aims at evaluating the performance of distribution supply chains (DSCs) in terms of sustainability. Addressing the challenge of sustainable DSCs requires an appropriate set of key performance indicators (KPIs) to support assessment. In our literature review, we did not identify any framework that perfectly evaluates sustainable DSCs. Our contribution is thus twofold. We propose a new insight in the literature suggesting a new classification of the existing KPIs sets for sustainability. Secondly, we present a new methodology for KPIs set building in the context of sustainable DSCs.
149	Supply Chain Sustainability Indicators: A Review	Mazzoldi, Laura; Zanoni, Simone	This paper provides a comprehensive review of the sustainability indicators literature, presenting a framework for the systematic classification of the wide set of indicators used for the supply chain sustainability assessment, considering economical, environmental and social aspects and combined indicators. The selected set of sustainability indicators is suitable for performance measurement related to sustainable supply chain management issues; such indicators could be used as reference in the development of a decision-making process support tool, and they could be used as single information for decision makers, as parameters to be included in many methodological tools and procedures, as well as variables in supply chains mathematical optimization models.
258	Best Practice of Performance Measurement in Supply Chain Contracts	Albrigtsen, Bjørn Ragnar; Dreyer, Heidi Carin; Strandhagen, Jan Ola	This paper presents a conceptual framework for performance measurement in supply chain contracts. Such contracts can be used as an instrument to make terms of a relationship explicit between actors in the supply chain. The framework has been developed based on a literature review followed by an exploratory case study. The framework is balancing the performance measurement system with the supply chain contract areas, and based on a real-time approach. It is proposing that measurements should be graded and seen over the whole contract period so that there is an incentive for continuous improvement. The framework has been guiding the implementation of KPI metrics in the case supply chain.
267	Is it Relevant to Evaluate "Sustainability" by using Aggregation Operators like Choquet Integrals?	Berrah, Lamia; Cliville, Vincent	This study deals with the industrial performance expression with regard to sustainability. Sustainability being multicriteria, our proposal is based on a mathematical aggregation model that allows decision-makers DMs to express the sustainability degree, knowing the satisfaction degree of the involved criteria (economic, environment and social ones). Sustainability performance is assumed as being overall while the performances with regard to the previously criteria are considered as elementary. These criteria are supposed to be characterized by subordination as well as preferential interacting relations. In order to take both these relations among criteria into account, our model is based on a fuzzy Choquet integral. With this operator, it is possible to consider on the one hand the relative importance of a criterion and, on the other hand, the mutual interactions between the criteria. As an illustration, the opinion of some manufacturers, such as ALCA TEL, FOURNIER and SNR is discussed.

NS 7.1 Production Planning & Control - I

ID	Title	Authors	Abstract
122	A Study on Integration of Interdivisional and Divisional Manufacturing Scheduling Systems	Yao, Yoshihiro; Kaihara, Toshiya; Fujii, Nobutada; Fujii, Susumu	In this paper, we propose an optimization method of interdivisional schedule which consists of two parts, interdivisional scheduling part using Lagrangian decomposition coordination method and divisional scheduling part using real-time scheduling and simulation method, in order to respond flexibly to dynamically changing manufacturing situation. Additionally we propose an interface method which integrates these two systems so that an effective schedule across all divisions can be obtained continuously under the fluctuating manufacturing environment.
135	Controlling Shifting Bottlenecks in Manufacturing	Schuh, Guenther; Fuchs, Sascha; Franzkoch, Bastian; Potente, Till; Kampker, Achim	The dilemma of production planning and control is to achieve high process efficiency, low throughput times and good planning confidence in spite of a turbulent environment with short product-lifecycles, an increasing variety and a growing individualization of demands. Today's solutions in production control are numerous and leave the decision maker with an insolvable amount of choices. Since Goldratt's novel "The Goal" in 1984 the importance of bottlenecks has first been published, it is the subject of several research activities in the field of production control. Although these recent effort the configuration of production control considering bottlenecks is still an up-to-date topic in many companies despite the financial crisis. Particularly shifting bottlenecks are causing many problems as no sufficient concept for practical use has been developed so far. Within this paper such an approach will be introduced and tested within an industrial case.
166	A Hybrid Approach to Cognitive Production Systems	Ewert, Daniel; Mayer, Marcel; Kuz, Sinem; Schilberg, Daniel; Jeschke, Sabina	Within the Cluster of Excellence "Integrative Production Technology for High-Wage Countries", a research project has been initiated to study cognitive automated assembly cells. The cell's control termed a cognitive control unit (CCU) is able to simulate human cognition to a certain degree, and plans and controls assembly tasks autonomously. An experimental assembly cell was designed where two robots carry out a certain repertoire of coordinated pick and place operations with small work pieces. To be able to accomplish complex construction tasks without impairing the actual assembly with extensive computations, the CCU's planning process follows a hybrid approach: Complex geometric analysis to derive assembly sequences are executed prior to the actual assembly by an Offline Planner, while an Online Planner uses the results off the Offline Planner to generate the actual plan that corresponds to the actual state of the assembly.
136	STEP-NC Compliant Approach for Setup Planning Problem on Multiple Fixture Pallets	Borgia, Stefano; Matta, Andrea; Tolio, Tullio	Given the current market dynamics, production system design plays a fundamental role in companies success. These activities are highly critical as many economical and technological issues must be considered. System configuration is a broad problem that involves different topics concerning workpiece, fixture and machine. In this paper an approach for the resolution of the Setup Planning problem on machining centers based on a STEP-NC compliant data structure is presented. The aim of the approach is to shorten the time needed for the process planning activity, automating some time-consuming activities without losing solution accuracy. In the proposed approach a CAM software tool is used for setting geometric and technological data regarding the product. Using this structure a method for the solution of the setup planning problem based on kinematic analysis and mathematical programming is proposed. The proposed approach has been tested on real cases.

NS 7.2 Production Planning & Control - II

ID	Title	Authors	Abstract
140	Capacity-filtering Simulator: Finite-Capacity Planning System for the Fabrication Factory	Lee, Ho Yeoul; Chun, Young Geun; Choi, Byoung Kyu; Suh, Jung Chul	This paper shows how to develop a practical finite-capacity planning system for a fabrication factory by expanding an existing Capacity-filtering algorithm that provides fundamental planning operations under capacity constraints. To achieve this, we represent the fabrication factory's modeling requirements and how to logically implement them in accordance with the Capacity-filtering algorithm. As a case study, we developed a Capacity-filtering simulator targeting a TFT-LCD fabrication factory, and the success of the performance evaluation is presented.
170	Evaluation of Organic Matter Influenced by Complex Noise Factors using Inverse Analysis of Taguchi Methods	Tanabe, Ikuo	A new system using inverse analysis of Taguchi methods is developed for evaluation of organic matter influenced by complex noise factors. This system uses the previously developed perfect simulation system using CAE and Taguchi methods without trial manufacture, then all the results in the ordinary calculation are used in the new system. In the new system, the influences of control and noise factors regarding the organic matter are clarified. The new system is evaluated by a single experiment using a paper craft named the "Kami-copter". When the optimum environment for the worker is properly prepared, both the flying time and the total profit are improved. Digital evaluation of a human with and without influences of the several complex noise factors was performed by the new system. The optimum worker and the optimum environment were decided using the new system. It is concluded from the results that the new system was effective for digital evaluation of the organic matter with and without influences of the several complex noise factors.
190	Design and Implementation of a Hybrid Knowledge-based Process Designer Model for a Robust Multi-objective Parameter Optimisation	Sibalija, Tatjana; Majstorovic, Vidosav	The paper presents a hybrid knowledge-based process designer model for a multi-objective process parameters optimisation, based on Taguchi static off-line design. The developed intelligent and generic model for the multi-objective process design could incorporate customers' specifications for several (possible correlated) characteristics and could be used to optimise various types of manufacturing processes. The goal of the model implementation is to find the optimal process parameter settings and reduce the influence of noise factors, to ensure the achievement of the specified product characteristic values and reduce variations. The model is given in a form of an intelligent system for the process design (optimisation, modelling and/or simulation), providing the possibility for learning features (learning from the experimental or from the historical data). The effectiveness of the proposed process designer model is illustrated with two case studies.
150	A Semi-automated Approach to Support Process Planner during Sequencing of Pallet Operations on 4-axes Machine Tools	Pellegrinelli, Stefania; Tolio, Tullio	Process planning is an important and time-consuming activity that highly depends on the experience of process planners. In order to reduce the required time and to support the planner, CAPP systems are getting central feature of setup planning, operation sequencing and pallet configuration. This paper fits in CAPP approach for the definition of the operations optimal sequence to machine all workpieces mounted on a pallet on a 4-axes machine tool. An algorithm and a mathematical model yield a user-friendly, quick and repeatable method for the definition of the operations sequence on the basis of a non-productive times minimization criteria. Three post-processors analyze the proposed solution to reduce the gap from optimality. A real test case is presented.

NS 7.3 Production Planning & Control - III

ID	Title	Authors	Abstract
169	Batch Cyclic Scheduling with Setups. A Multi-objective Approach	Martínez Ortiz, Jorge Arturo; Garcia Sabater, Jose Pedro; Andrés Romano, Carlos	This paper deals with the problem of scheduling with setups of two types due to a closed loop configuration with a given quantity of positions. This is typical of closed painting facilities where products are scheduled in different loops. Products are defined by its geometry and its colour. When a change of colour is to be scheduled a setup -horizontal setup- is to be paid (either in terms of cost or in terms of lost capacity). But when in successive loops but in the same position a different geometry is going to be scheduled, a setup cost is also to be paid –vertical setup-. The paper models three variants of the problem. Moreover a greedy heuristic is proposed and it is evaluated through the resolution of a set of problems that covers many aspects of the reality considered.
221	A Facility Layout Formulation and Hybrid Particle Swarm Optimization for Resource-Constrained Project Scheduling Problem	Jia, Qiong; Seo, Yoonho; Seo, Minseok	The resource-constrained project scheduling problem (RCPSP) is to schedule the activities of a project to minimize the total completion time satisfying with the resource constraints and the precedence relationships. This study firstly proposes an innovative formulation for solving the RCPSP to get the optimal solution easily. In the new formulation, constraints, which lay out the activities in the space of resource constraints and time, without violating the precedence relationships and overlapping the activities, are introduced. They transform the non-linear programming formulation into the linear programming formulation. Then the optimal solutions can be obtained easily throughout the new formulation. However, obtaining optimal solutions in the new formulation is difficult since RCPSP is NP-hard. This paper proposes hybrid particle swarm optimization (PSO) algorithm. Finally, an experiment is performed to compare this model with other PSO search techniques. The proposed algorithm provides better performance in the test problems than the traditional ones.
223	The Relative Stability of a Product Mix	Nielsen, Peter; Nielsen, Izabela; Steger-Jensen, Kenn	This paper addresses the issue of product mix stability. First, a brief literature review illustrates how current state has focused exclusively on product mix flexibility, rather than the stability of product mix. Product mix stability is however an important design parameter. Based on the literature review, a number of Key Performance Indicators for the stability of a product mix are presented. These indicators are generic and comparable across product groups/families and companies. The proposed Key Performance Indicators are tested on a real data set and it is established that they are able to accurately describe the stability of a product mix. Further research is proposed focusing on linking the proposed indicators to other indicators and using these as input to the design of Manufacturing Planning and Control systems. The research presented in this paper is funded by the EU Union via the ValuePole project.
249	Automating and Optimizing Production Planning with a Two Level Multi-Criteria-Lot Sizing Method	Brodkorb, Daniel; Dangelmaier, Wilhelm	Within this document, a method is described which calculates operative production plans taking several practical conditions into consideration and is therefore interesting also for practice. Results are cost optimal plans for shifts , lot sizes and schedules for production. Improvements of capacity utilization of related resources can be achieved. The method combines known optimization models CLSP and DLSP. Established optimization software eases development and reduces significantly times and resources needed for implementation and integration of the method.

NS 7.4 Production Planning & Control - IV

ID	Title	Authors	Abstract
191	A Decentralized Approach for Coordinating Production and Transportation Planning	Jia, Zhen Zhen; Deschamps, Jean-Christophe; Dupas, Rémy	In third party logistic (3PL) context, it's important to coordinate the manufacturer and the 3PL provider for successful supply chain planning. This paper proposes a negotiation based approach to coordinate production and transportation in decentralized decision making architecture. Two independent planning models, production model and transportation model, are formulated based on the local private information and the sharing information of delivery plan and pick up plan. The negotiation process achieves final planning solution by a series of information exchange iterations.
192	Remanufacturing System Scheduling based on a Multi-agent Approach	Kim, Young-Seok; Kiritsis, Dimitris	Individual handling of each used product in a remanufacturing system is preferable for system performances because of their uncertain and dynamically changing quality characteristics. Hence a multi-agent approach can be a good solution for remanufacturing system scheduling. This paper proposes a scheduling mechanism for a remanufacturing system based on a multi-agent approach, where each resource, used product, and disassembled subassembly/part is defined as an agent. They communicate with each other and pursuit maximizing system performance: remanufacturing cost in this paper. A case study shows the proposed scheduling mechanism can contribute to system performance enhancement.
259	Why is there a Mismatch between Operation Times in the Planning Systems and the Times in Reality?	Almström, Peter Martin; Winroth, Mats	There is often a substantial difference between operation times in reality on the factory shop-floor and in the company's planning and control system. This difference has several severe consequences for the company's daily operation in terms of meeting delivery dates and utilizing the available resources in an efficient way, as well as more long term and strategic consequences for the company's business. Offers to customers and investment decisions are based on the operation times in the planning system. There are three principal causes for the gap: Operation times are not set in a correct way from the outset, extra allowance time to handle temporary disturbances tends to become permanent and accumulate, and the fact that operation times once set in the planning system seldom are updated. The root cause for these three deficiencies is quite likely the management's unawareness of the situation.
308	New Trends and Challenges in Transfer Line Balancing	Essafi, Mohamed; Delorme, Xavier; Dolgui, Alexandre	Transfer lines have evolved with advanced technology, requirements and challenges imposed by the economic globalization. For mass production with fixed and known demand, manufacturers used to develop Dedicated Transfer Lines (DTL). For varied demand, the proposed solution consists to Flexible Transfer Lines (FTL). Flexible transfer lines (FTL) have then been proposed to permit a customized product. However, FTL have quickly appeared deceiving and expensive facing to large variations or uncertainty of the demand. In this case, FTL can become obsolete. Reconfigurable Transfer Lines (RTL) have been proposed as a response to these disadvantages. Some authors judge them more flexible than the FTLs because they allow hardware reconfiguration in addition to software reconfiguration of FTL.

NS 7.5 Production Planning & Control - V

ID	Title	Authors	Abstract
222	Practical Integration of APS with an ERP System	Nielsen, Izabela Ewa; Olesen, Bo; Steger-Jensen, Kenn	Advanced Planning and Scheduling (APS) Systems have attracted increased attention as a tool for enhancing the accuracy of delivery dates, improving the scheduling process and performance and also reducing costs. It directly links the available resources, including both finite material and finite capacity, with customer order and therefore supports improved order promising especially critical in make-to-order (MTO) environments. In this paper general guidelines for APS implementation and a framework for ERP-APS integration are deduced from a literature review and a case study. Theoretical issues are linked with real life problems and this provides the background for the developed guidelines, which aim to support practitioners in future implementation projects.
286	Stability Analysis of One Balancing Problem of Simple Assembly Lines with Parallel Workplaces	Gurevsky, Evgeny; Guschinskaya, Olga; Dolgui, Alexandre	A balancing problem of simple assembly lines with the possibility of a parallel workplaces installation is considered. It consists in assigning a given set of operations to a number of workplaces subject to line cycle time and precedence constraints. Such assignments determine feasible line configurations or feasible balances. The goal is to find a feasible balance with the minimum number of installed workplaces, i.e. to find an optimal balance among feasible ones. In this paper the behavior of feasible and optimal balances under small possible operations processing time variabilities is evaluated. Structural properties of balances preserving their feasibility and/or optimality (stable balances) under such variations as well as a measure of stability are suggested and analyzed. A technical decision for unstable balances repairing their stability is proposed.
324	Flexible Assembly Technology for Highly Customisable Vehicles	Makris, Sotiris; Michalos, George; Efthymiou, Konstantinos; Georgoulas, Konstantinos; Papakostas, Nikolaos; Eytan, Amit; Lai, Manuel; Chryssolouris, George; Alexopoulos, Kosmas	This paper discusses key manufacturing technology enabling the production of highly customizable vehicles. It introduces the topic of flexible assembly in automotive. Furthermore, it addresses the aspects the Self-Adaptive Assembly Plant, methods and tools that permit the Virtual Assembly Plant, research in the topic of a Networked Assembly Plant as well as methods for achieving the Knowledge-Based Assembly Plant. The paper concludes with results from the research performed as well as with an outlook for future work.
271	Target Investment Approach in Factory Planning	Pflüger, Thorsten; Pedell, Burkhard; Westkämper, Engelbert	A turbulent environment, characterized by strong fluctuations of customers' orders and shortened product life cycles, is a great challenge for factory planning in manufacturing industries. In this paper investment planning and control processes in factory planning are discussed. Considering the paradigm "factory as a product", potential advantages of an adaption of elements of target costing in the field of factory planning are pointed out. In the following, a target investment approach for factory planning is presented. Target investment supports market orientated planning of target life cycle costs for a specific factory life cycle stage on the base of feed-forward information. The decomposition of target life cycle costs on factory component level, considering customer values, assists investment control of factory planners in early planning stages.

NS 7.6 Production Planning & Control - VI

ID	Title	Authors	Abstract
224	An Investigation of the Volatility of Volume and Revenue for Planning Purposes	Nielsen, Peter; Nielsen, Izabela; Steger-Jensen, Kenn	Manufacturing companies often focus on their ability to deliver on-time in-full. Some companies focus on the revenue on-time in-full, while some companies focus on volume on-time in-full. The more volatile the underlying behavior of revenue and volume is, the more the inherent cost by focusing on one of these parameters. This paper presents a method to analyze whether volume or revenue is the more volatile. The method is tested on data from a manufacturing company. The conclusion for this particular company being that the revenue is more volatile than the volume. The research presented in this paper is funded by the EU Union via the ValuePole project.
326	Holonic, Isoarchic and Multicriteria Control for Manufacturing Networks: Application to Integrated Logistics Support	Ounnar, Fouzia; Pujo, Patrick	We present an innovative approach related to Integrated Logistics Support (ILS), which is mostly focused on the agility of the control system, to avoid excessive sensitivity to events and get a better availability of relevant equipment. For this, we propose a holonic and isoarchic decision making approach, where decisions are taken in real time through an AHP analysis. This multicriteria analysis aims to increase the Quality of Services of ILS by reducing downtime of concerned equipment. A first bed test, using HLA distributed simulation, is described.
339	Minimization of Kilometric Cost on the Vehicle Routing Problem with Heterogeneous Fleet, Mixed Backhauls, and Time Windows using the Particle Swarm Optimization	Belmecheri, Farah; Prins, Christian; Yalaoui, Farouk; Amodeo, Lionel	The problem studied concerns the Vehicle Routing Problem with Heterogeneous fleet in adding Mixed Backhauls, and Time Windows. This rich VRP is solved by a Particle Swarm Optimization hybridized with local search. The aim is to minimize the total kilometric cost: the number of kilometers of routes weighted by the variable costs. The approach has proved its efficiency; the tests have been applied on several benchmarks then compared with our previous methods. The results show that this evolutionary approach improves the known results.
291	Innovative Production Control based on Decentralized Intelligence	Mertins, Kai; Rabe, Markus; Schallock, Burkhard	The management for the production of individual parts and components represents a difficult task. Traditional planning and control systems (Enterprise Resource Planning) create a fixed production schedule depending on the material and capacity resources. This schedule is kept even when disturbances and rush orders force a deviation. A completely future oriented approach is described in this article which allows to control production without using schedules. The decision about the next production step is made by local intelligent systems mounted to work pieces. This concept of self-organizing production can balance the capacity and optimize the speed of individual orders. The concept requires innovative micro computers and new agent network software.

NS 7.7 Production Planning & Control - VII

ID	Title	Authors	Abstract
232	Systematic Approach for Variability-Reduction as a Roadmap for Continuous Improvement in Flow Production	Lorentzen, Kai; Maschek, Thomas; Richter, Ralph; Deuse, Jochen	The paper discusses the newest findings about continuous improvement processes including the necessity of defining target states. Variability is identified as the root cause for deviating from targets in manufacturing and analyzed further with a focus on variability-in-time. An ideal state for flow production, which is required for defining intermediate targets, is derived using queueing theory. This coherent ideal state which is free of variability represents a truly lean production. Finally, a systematic procedure for continuous improvement of flow production is proposed. It identifies and eliminates the root cause variability by hierarchically decomposing flow lines and prioritizing the relevant subsystem via observational studies on each layer.
284	Improvement of Mixed Model Assembly Line Balancing Considering Mix Distribution Probability and Sequencing Logic	Corti, Donatella; Pozzetti, Alessandro	The adoption of mixed-model assembly lines is becoming widespread in order to follow product variations and diversities to cope with the emerging market scenarios. Balancing and sequencing phases are key tasks for the design and use of mixed-model assembly lines and managing them in an integrated way could lead to some benefits. Nonetheless, most of the models consider the two phases sequentially. Assuming that some form of integration lead to improved performance of the line, this paper aims at investigating the effect of anticipating information related to the sequencing phase (mix distribution probability and sequencing logic) during the balancing phase. A heuristic procedure is developed and its performance are compared against two reference models.
315	Dynamic Calculation of the Constrained EOQs for Multiple Products with Space Restrictions	Miranda, Salvatore; Iannone, Raffaele; Riemma, Stefano	The paper proposes an alternative method for the multi-item EOQ calculation in presence of space restrictions. The method, based on the Lagrange multipliers, consists of an iterative procedure which analyses dynamically, through the simulation, the effect of consumption rates and delivery times, and determines the real overlapping of the stocks in a fixed period of time. This makes possible a more effective exploitation of the warehouse space that brings the lot sizes nearer to their optimal values. The proposed approach has been compared with the traditional Lagrange method showing interesting results in terms of reduction of the total management cost.
287	Optimal Ordering Policy in a Closed Loop Manufacturing System	Nakashima, Kenichi; Kojima, Mitsutoshi	We consider a single-item remanufacturing system under stochastic demand and define the inventory levels of two quality types of the returned products, the transition probabilities between states under a policy and the costs associated with the transitions. The remanufacturing system is formulated into an undiscounted Markov Decision Process (MDP). Using MDP model, we can obtain the optimal ordering policy that maximizes the expected average profit per period. A numerical example is considered to illustrate the property of the control policy.

NS 8.1 Lean Thinking and Production - I

ID	Title	Authors	Abstract
123	Impact of Lean Production Systems Implementation on Labor Conditions	Mielke, Tim; Dombrowski, Uwe; Schulze, Sven	The widespread implementation of Lean Production Systems leads to fundamental changes in the design of work processes. In many cases the promised changes in worker's motivation and company culture do not come true. The desired improvements in labor conditions often do not take place which also affects the economic achievements of such systems. This paper analyses the impacts of Lean Production Systems on labor conditions in order to establish an understanding of the major interrelations.
154	Performance Evaluation for Lean Supply Chain: A Balanced Scorecard Framework	Duarte, Susana; Cruz Machado, V.	There are new business paradigms as lean and green to develop improvements on the supply chain performance. The performance evaluation has become an important subject getting competitive advantages in organizations and their supply chains. To get a balanced performance measurement system a balanced scorecard (BSC) may be develop. This study is motivated by the lack of evidence on the supply chain performance measurement; it pretends to explore the effect of lean and green supply chain through a BSC framework. To achieve this purpose a four perspectives BSC was developed based on cause-and-effect relationships. To identify how to develop the BSC for incorporating lean and green supply chain performance, a brief literature review is presented. This paper proposes a conceptual model to explore how lean and green supply chain performance may be studied, using a BSC perspective.
189	A Concept for Lean Manufacturing Enterprises	Nakano, Masaru	A lean manufacturing is desirable for sustainability of manufacturing sector in both developed and developing countries. Toyota Production System (TPS) is known as an efficient production system, but this paper proposes that the TPS can be extended to make the entire business process in the manufacturing enterprise efficient and value-added. A key issue is the production leveling or the smoothing of production that plays an important role in the Just-In-Time system. This paper discusses efficiency of the entire business process including marketing research, product design, production system design, production control, procurement, sales, and service by a view of the production leveling and value chain. In addition, the author differentiates the TPS from the Japan Production System (JPS) and the Lean Production System (LPS).
178	Critical Analysis of a Flow Optimisation Methodology by Value Stream Mapping	Lyonnet, Barbara; Pralus, Magali; Pillet, Maurice	Use of value stream mapping and the implementation of associated actions for improvement allowed businesses to make considerable gains. Nevertheless, several studies showed the low application of this tool by small and medium enterprises in different sectors. How to explain this result? This subject has seldom been discussed in the literature. Only a few paths have been proposed. Thus difficulty understanding the tool and adaptation by sector has been shown. Our study presents the different phases of the application of an approach to the elimination of waste by use of a value stream mapping in the electronic subcontracting sector. The objective of our study is to identify the difficulties encountered and the keys factors for success of an overall approach aimed at improving the flows.

NS 8.2 Lean Thinking and Production - II

ID	Title	Authors	Abstract
409	Assessing the Applicability of a Lean Model for the Supply Chain Management of Service Companies	Tantardini, Marco; Portioli Staudacher, Alberto; Lethbridge, Sarah	In a recent paper Portioli Staudacher and Tantardini have presented a managerial model in line with the Lean Approach for managing the settlement supply chain of insurance companies. Although the authors envisage the possibility to extend the use of this model to other supply chains, no work was carried out in that direction. Starting from the analysis of the managerial model proposed, supply chain characteristics required for its implementation will be defined and discussed in this paper. A classification of supply chains in service companies will be proposed in order to highlight the possibilities to implement the managerial model in the different supply chains typologies.
225	Modelling and Simulation for Lean and Sustainable Manufacturing System Development	Heilala, Juhani; Paju, Marja; Montonen, Jari; Hentula, Markku; Heikkilä, Antti	Environmental issues are becoming more and more important in manufacturing, sustainable production and environmentally benign manufacturing because of rising concerns regarding climate change, depletion of natural resources and pollution. Lean manufacturing, identification and elimination of waste and production losses, and environmental considerations are all needed during development of a sustainable manufacturing system. In the design phase a multitude of system dimensions must be jointly optimized and the engineers need holistic decision support, otherwise sub-optimization is more likely to occur. Modelling, simulation and digital engineering tools and procedures have had a positive impact on the manufacturing industry as decision-making support. This paper reviews some suitable modelling and simulation approaches for environmental impact analysis during manufacturing system development, shows a link between lean manufacturing, sustainable manufacturing and environmental impacts. A case study on method integration is currently under way.
139	Application and Validity of Lean Production in Non-serial Machine Tool Manufacturing - Pilot Case at a Spanish Grinder Manufacturer	Ricondo, Itziar; Serrano, Ibon; Uriarte, Arkaitz	Continuously growing world competition pushes European machine tool and equipment manufacturers to increase production efficiency, in terms of cost, order-to-delivery time and delivery reliability, while keeping its customer-driven focus. The main purpose of this paper is to study the applicability of lean production in the European customized machine tool industry. The paper describes the implementation project of the lean approach at a SME grinder manufacturing company, through the use of value stream mapping (VSM) as implementation guiding technique and action research as research methodology. Among the different lean techniques reviewed, VSM, takt time and flow concepts have been of high applicability and use. The main results can be summarized as follows: increase of productivity, reliability of lead time, simplification of management functions and the introduction of a continuous improvement culture.
295	Retrofitting Lean Manufacturing to Current Semi-Automated Production Lines	Bowler, Melissa; Kurfess, Thomas	Adopting lean manufacturing ideas of increasing productivity via waste reduction is critical for competitive companies in the global market. In their attempt to implement lean tools corporations are often confronted with varying amounts of internal resistance preventing the implementation of sustainable lean processes. This is extremely apparent in instances where older semi-automated manufacturing lines are retrofitted to make them "leaner." That is facilities originally designed without the use of lean principles. The reluctance stems from inherent issues in the production process and corporate culture that cannot be resolved in the short term. Therefore, it is necessary to adapt traditional lean tools and practices to address current production limitations. An effective driver in developing these adapted concepts is the holistic structure embodied in sustainability. This enables maintainable quasi-lean processes in the short term permitting a lean corporate culture to develop, leading to long term sustainable lean processes. This concept is expanded through a case study done in the body shop of a European car manufacturing company located in the United States. The case study is an example where a manufacturing line designed without lean principles is adjusted to embody lean without disrupting production.

NS 9.1 Maintenance Management - I

ID	Title	Authors	Abstract
410	Towards e-Maintenance: Maturity Assessment of Maintenance Services for New ICT Introduction	Fumagalli, Luca; Macchi, Marco; Pizzolante, Sergio; Crespo Marquez, Adolfo; Gomez Fernandez, Juan	The paper aims at investigating the relationship between the selection of e-Maintenance technologies and the features, in particular the maturity, of the maintenance service provision system. This is a step forward to understand whether the maturity influences or not the adoption of new ICTs for supporting maintenance activities. Initial empirical evidences are obtained thanks to a case study analysis in the industrial sector.
310	Planning and Control of Maintenance as a Strategic Dimension in the Development of Sustainable Production in Brazil: An Innovation in the 21st Century	Barrozo de Souza, José; Benedito Sacomano, José; Kyrillos, Sergio Luiz; Milreu, Francisco J. S.	This work is a delineation proposal of the basic characteristics of the planning and control of the maintenance as a strategic dimension in the development of the sustainable production in Brazil as an innovation in the 21st Century. The proposal was developed to strategically support the necessities of the changeable Brazilian industrial environment and also to provide formal ways through which the production function of the company can have an efficient dynamics in terms of the sustainable production.
233	Implementation of OEE – Issues and Challenges	Olhager, Jan; Sohal, Amrik; O'Neill, Peter; Prajogo, Daniel	An operations strategy should be based on a strong systematic and standardized way of working combined with empowered shop floor teams who drive continuous improvement in that standardized work. OEE data on machine performance is a key starting point for teams to understand there equipment losses and to establish improvement programs to eliminate them. We find that the implementation of OEE is typically based on the motivation to use a basic reference measure for analysing and comparing the utilization of resources at the plant. The use of OEE can also be transformed to a system for analysing production data to identify potential areas of improvement, and supporting lean initiatives. Thus, characteristically, OEE typically advances from a base measure for efficiency as the initial purpose, to being a tool to improve effectiveness for analysing data to support CI objectives via the identification and elimination of waste.
263	Predictive Maintenance Strategies for Sustainable Manufacturing	Gilabert, Eduardo; Conde, Egoitz	Maintenance should be a constantly improving activity that minimises the cost of production losses. It is very helpful to follow a systematic procedure in order not to get lost among these new tendencies and the analysis of their potential applicability and benefits. A systematic maintenance procedure naturally leads to a cyclical, continuous improvement methodology to reach excellence. The improvement model presented is based on different tools that are applied in a structured way. It focuses on selecting cost-effective strategies, especially predictive strategies, for achieving maintenance excellence. One of the pillars of the model is that the selected strategies should take into account the economical and environmental benefits achieved in order to demonstrate their potential.

**NS 9.2 Maintenance Management - II**

ID	Title	Authors	Abstract
147	Enhancement of the Serviceability in the Machine and Plant Industry	Lanza, Gisela; Behmann, Benjamin; Werner, Patrick	The provision of technical services in machine and plant engineering is a profitable field of business for the provider. However, if ambitious availability promises are made, the expenses required in future to deliver the technical service can only be projected with a high level of uncertainty. This paper presents an approach that shows how the serviceability of a service provider for the maintenance of technical components can be evaluated with low levels of uncertainty, and how the resources used to provide the service can be optimized. The result consists in the determination of a serviceability which represents the correlation between the required resources and the number of identical components in the field. It is derived from the times of service provision, which are adapted to the actual operating and load behavior of the components and takes the sustainable planning and optimization of resources for the respective times of service activities into consideration.
412	Condition Monitoring based on Incremental Learning and Domain Ontology for Condition-based Maintenance	Fumagalli, Luca; Emmanouilidis, Christos; Jantunen, Erkki; Pistofidis, Petros; Macchi, Marco; Garetti, Marco	This paper defines the main elements of a generic condition monitoring system, as an abstraction of data and services. The key target is how to facilitate asset self-awareness, to support production-level sustainable machinery operation. The proposed approach involves knowledge-rich computational elements, capable of performing incremental model building in order to capture the specific characteristics of the monitored asset behaviour. Coupled with adequate data and knowledge modelling, by means of dedicated ontology, this abstraction mechanism is envisioned to facilitate the rapid development of condition monitoring systems for diverse application needs.
329	A RFID Enabled Computerized Maintenance Management System in Aerospace Industry	Satoglu, Sule Itir; Baskak, Murat	The purpose of this study is developing a RFID-enabled maintenance management system for aircraft parts that is started at the production stage where the components are tagged and implemented through their all life-cycle that facilitates tracking and maintenance of the components; and developing the information management system that provides the basis for the computerized maintenance management. The authors interviewed with real practitioners from an aircraft/component maintenance company and an airline company located in Turkey, and learned how maintenance activities are currently implemented in Turkey. Later, it has been studied how the RFID technology can be implemented to maintenance activities of aerospace industry for enhancement, regarding the technical and legislative constraints. A preliminary RFID-enhanced computerized maintenance management system is proposed where the roles of manufacturers, airlines companies and maintenance companies are defined.
321	Advances in Kanban Tracking	Olesen, Peter Bjerg; Hvolby, Hans-Henrik; Steger-Jensen, Kenn; Nielsen, Izabela	This paper presents two case studies of kanban implementations. One case company spends quite some resources on recalculating and reprinting kanbans in response to demand variation whereas the other case company experience that kanbans are lost or queued up in the production. Based on these findings this paper further investigates different solutions to ease the identified problems and suggests the use of E-kanban and RFID.

NS 10.1 Technologies - I

ID	Title	Authors	Abstract
125	RFID System Project for Enhancing Blood Supply Chain Safety and Blood Transfusion Center Productivity	Orrù, Pier Francesco; Borelli, Gianluca; Pilloni, Maria Teresa; Zedda, Francesco	Aim of the study is to develop a project for enhancing blood supply chain safety and Blood Transfusion Centre productivity suggesting a RFID technology-based process reengineering, referring the experiences of G. Brotzu Hospital in Cagliari, Italy. The first part of the study consists on an analysis of the present blood transfusion chain processes. Through a FMEA/FMECA and ABC analysis criticalities and error sources were pointed out. Blood Transfusion Centre productivity has been analyzed, focusing on blood inventory management processes. In the second part of the study, a RFID technology solution, based on Passive ID Tags and mobile PDA computer readers, was designed. New processes Flow Charts were drawn, and then performances were evaluated. The application of the designed RFID-based solution will allow complete traceability and control for analyzed processes, sensibly reducing criticalities, increasing patient safety and Blood Transfusion Centre efficiency.
181	Demand-driven Supply Chains with RFID and EPCIS - Does IT matter?	Dreyer, Heidi Carin; Romsdal, Anita; Strandhagen, Jan Ola; Bjartnes, Ragnhild	This paper is based on experiences from eight pilots in the Norwegian grocery industry and discusses the role of RFID and EPCIS in supply chain collaboration. Overall, RFID and EPCIS were found to efficiently create reliable and high quality real-time information about products and their movement through the supply chain. However, instead of driving supply chain collaboration, RFID and EPCIS were found to be more enablers or tools for information capture and sharing. Thus, their dissemination and application is more dependent on how well the supply chain as a whole is able to utilise the technology to realise new and more intelligent logistics and collaboration solutions. The project participants concluded that the essential element for realising more efficient supply chain collaboration is related to increased information sharing among actors – something which can be realised simply by sharing already existing information.
237	A Product Traceability and Authentication Framework for Verifying Genuine Products in the Product Lifecycle	Abramovici, Michael; Flohr, Matthias; Krebs, Andreas	Due to the threat of product forgery, many companies are forced to take effective measures against product plagiarisms and counterfeits. This paper introduces a framework for a comprehensive supply chain and product lifecycle-spanning solution regarding product tracking & tracing and forgery-proof product authentication. Thereby the focus is laid on flexible adaptability to various company and product-specific requirements, which concern aspects like the combination of tracking/tracing and authentication elements, the required security level, the applicable ID technology and the need for stationary or mobile application scenarios.
251	Smart Flow of Goods: Experiences from RFID Pilots in Fresh Food Supply Chains	Bjartnes, Ragnhild; Romsdal, Anita; Dreyer, Heidi Carin; Strandhagen, Jan Ola	This paper presents findings from examining the potentials of RFID (Radio Frequency Identification) and EPCIS (Electronic Product Code Information Services) in fresh food supply chains. Results are based on eight pilots in the Norwegian grocery industry performed as part of the project Smart Flow of Goods. From these pilots, the most accessible potential is found to be related to automation of manual processes and improved data quality for existing processes. The most valuable effects are expected to be achievable when the technology is used to support increased supply chain collaboration and process re-engineering, but these changes are also accompanied by substantial challenges. Technologically, there were limitations in off-the-shelf solutions and implementation and phasing-in required considerable efforts. The pilots indicate that RFID and EPCIS can be used to support improvements in the supply chains, but the technology was not found to be a necessary prerequisite for all identified improvement measures.

NS 10.2 Technologies - II

ID	Title	Authors	Abstract
163	IT Strategies and Corporate Results: An Empirical Study	Masini, Andrea; Perona, Marco; Sicco, Alessandro	Various theoretical perspectives have been used in the literature to examine the relationship between IT strategy, competitive strategy and organizational performance. Yet, despite these efforts the nexus between IT, corporate strategy and performance remains still unclear. In this paper we develop and empirically test a stylised conceptual model that sheds further light on this nexus. Using a configurational approach on a sample of European companies from different sectors, we found that companies with stronger and more skilled IT departments adopt more focused competitive strategies and enjoy better performances in key functional areas compared to firms with weaker IT departments.
197	Designing and Managing Sustainable IT Service Systems	Fugini, Mariagrazia; Gangadharan, G.R.; Pernici, Barbara	This paper proposes guidelines for designing and managing IT service systems along the perspective of energy awareness, or, more generally, sustainability or greenness. By energy awareness we mean that the service system is enriched with Green Performance Indicators - GPI expressing which resources (data, CPU, as well as consumables, power for cooling the IT platform, and so on) the service systems employs and what energy it consumes. To exemplify our GPI, in the paper, we refer to an IT service scenario of e-commerce, where several services cooperate to deliver ordered items to customers, and present how our identified GPI can drive choices at the strategic, tactical, and operational level to obtain a sustainable or green process.
254	ICT Integration for Automatic Real-time Production Planning and Control: A Concept Note	Arica, Emrah; Powell, Daryl	This paper aims to develop a conceptual framework for automatic real-time production planning and control through integration of information and control technologies. Firstly, state of the art technologies necessary to develop such a framework have been discussed in the paper. These technologies are classified in two categories: automatic planning and control; and real-time data capture technologies. Enterprise Resource Planning (ERP) systems that integrate the value chain in an enterprise, Manufacturing Execution Systems (MES) that manage and control the production on shopfloor and Advanced Planning and Scheduling (APS) systems that develop solutions for complex planning problems are the automated planning and control technologies that have been analyzed. Radio Frequency Identification (RFID) has been emphasized as being the most advanced and promising real-time data capture technology. Having analyzed the features and shortcomings of the systems per se, and advantages that may come out by integrating them efficiently, a framework is proposed.
265	Value Added by Interoperable Information Systems in Spread Production Networks	Oedekoven, Dirk; Schuh, Günther	What is the competitive advantage of interoperable information systems? Taking this research question as a guideline the paper discusses how to approach the challenge of assessing the benefits of integrated systems. The main focus is laid on the direct and indirect effects of standardization projects which aim at continuous and homogenous order processing data. The knowledge based approach starts on data level and takes care of the interdependencies between the subsequent levels of aggregation. The problem immanent complexity is caused by the variety of heterogeneous product and process describing attributes. The application of management cybernetics in order to handle this challenge constitutes a focal point of this paper.

SS 1.1 Collaborative Innovation - I

ID	Title	Authors	Abstract
416	An Exploratory Study of UK-China Collaborative Innovation Practices	Mendibil, Kepa; Wang, Dan; Bititci, Umit; Lu, Libin	The purpose of this presentation is to identify and explain the key barriers and drivers for encouraging increased levels of collaboration and collaborative innovation between UK and China. To achieve this the authors first carried out a survey to explore the extend of UK-China collaborative initiatives. This was then followed by interviews with managers in 4 organisations involved in such initiatives. Initial findings suggest that there are several factors that are most influential on the performance of collaborative innovation initiatives.
246	Innovation: A Knowledge Transfer Perspective	Alexander, Allen Thomas; Childe, Stephen J	One means of innovation is the adoption of new knowledge from external sources. This paper describes research to improve the transfer of knowledge between universities and businesses. Using pilot studies and in-depth interviews based on real life case studies, the research identified and confirmed two hypotheses; that successful knowledge transfer comes from the transfer of tacit knowledge; and that tacit knowledge can best be transferred using rich media channels. The paper describes the research and goes on to assess a range of channels for their media richness and their ability to transfer tacit knowledge. It concludes that selection of the appropriate channel can improve the knowledge transfer resulting in improved innovation.
165	Enhancing Innovation Culture for Collaborative Innovation	Schulte, Kjersti Øverbø; Hatling, Morten	Collaborative innovation is considered a promising approach to strengthen innovation in manufacturing companies in high cost countries. Non etheless, collaboration as integrated design processes based on common understanding is difficult to achieve not least due to the companies' innovation cultures. This paper presents dimensions of innovation culture that are grounded in two case studies: a design team in a tools producer and packaging design agencies. The dimensions of behavior, communication and structure might influence the companies opportunities for collaborative innovation. For example, the individual designer's motivation to cooperate. Additionally, the designers prefer a balanced sense of urgency, such as time for individual concentration on one solution and joint team efforts. This balance can be difficult to achieve in collaborative innovation.
137	An Entrepreneurial Path to Market: A Systemic Modelling of Entrepreneurial Contracting	Galanakis, Kostas; Ehret, Michael	Modern service economies are driven by the transformation of integrated firms into intelligent enterprises that connect networks of world-class service providers. While there is strong agreement on the potential of such open business models, experiences are not straightforward. We propose entrepreneurial contracting as a guiding principle for the design of open business-models. We describe a generic approach of entrepreneurial contracting using a systems thinking concept. Entrepreneurial contracting highlights antecedents and consequences missed out in conventional approaches rooted in transaction costs or property rights theory.

SS 1.2 Collaborative Innovation - II

ID	Title	Authors	Abstract
156	Cross-Company Logistic Models for Regional Pooling of Transports - a Simulation Approach	Palm, Daniel; Prochazka, Margarethe; Meizer, Felix; Leitner, René; Sihn, Wilfried	Business networking strategies and especially co-operation in logistics is gaining momentum for individual companies in order to survive in competitive markets. As regional transport bundling is a powerful approach to optimize cost structures, this publication deals with the conceptual design and evaluation of cross-company logistics models. For this purpose, a simulation and evaluation model is presented that supports the development of new logistics concepts. Therefore models for the calculation of emissions, costs and logistics competitiveness, have to be created and combined to holistically validate and evaluate the new approach. This combination between the three different target values distinguishes the developed model from already published methods. Based on the sustainable approach, potentials for optimization in the areas emissions, costs, and logistic competitiveness can be detected and new sustainable and energy efficient logistics models can be designed.
353	Leveraging Innovation through Purchasing Involvement and Proficiency	Bengtsson, Lars J; Lakemond, Nicolette; Dabhilkar, Mandar	Competitive innovation processes are increasingly based on networks of suppliers providing unique competencies to the focal firm. The main purpose of this study is to explore how the contribution of innovative suppliers to firms' innovation may be leveraged through purchasing involvement and proficiency. The analysis is based on a cross-sectional survey of 675 firms in Europe and North America. The results show that having innovative suppliers contributes to firm's innovation performance in terms of time-to-market and the level of innovation in products/services. These findings validate previous conceptual studies and extend previous research by showing that purchasing involvement and proficiency in selecting, developing and involving suppliers in product and process improvements leverage innovation performance.
187	Business Model Innovations: The Case of Intelligent Goods	Bakás, Ottar; Hoff, Annette	The emerging concept of 'Intelligent goods' involves goods that can communicate with different users to exchange transport-related information along the supply chain. The intelligent goods concept involves technologies for goods identification, status tracking, and embedded logic. Technological architecture for intelligent goods are an emerging field of research, but research on potential new services and business models to exploit the benefits from intelligent goods is poorly represented. The papers studies how the intelligent goods concept can enable actors in the supply chain to innovate in their business models. The paper presents prospects for unique value propositions that can be offered by main actors within the transport and logistics domain: 1) Transport users; 2) Transport providers; and 3) Infrastructure owners. Implications for managers are presented in the form of factors enabling and inhibiting business model innovations in transport networks.
133	Investigating the Relationship between Organizational Context and Knowledge Creation: The Knowledge Creation Creation Ambidexterity	Maalouf, Malek	The purpose of this paper is to demonstrate how and why an organizational context based on the four contextual attributes - Discipline, Stretch, Trust and Support – contribute for the emergence of the “knowledge creation ambidexterity”. By adopting the Social Capital theory as theoretical bases, this paper shows that the four contextual attributes do activate simultaneously the four modes of knowledge conversion of (Nonaka, 1994)'s theory through the motivation of both the combination and exchange of intellectual capital and knowledge.

SS 2.1 Transformations to Servitized Organizational Forms - I

ID	Title	Authors	Abstract
262	Sustainable Product Service System: A Conceptual Framework	Resta, Barbara; Gaiardelli, Paolo	Although the increasing concern of society about the issues of sustainability has driven industrial systems to expand their traditional perspectives including environmental and social dimensions, economic and business literature reveal that understanding of sustainable business models is still limited. A first attempt to fill this gap has been the development of the Product Service System (PSS) concept, a comprehensive business model able to fulfil users' requirements through the provision of more dematerialised systems. Since current literature on PSS fails to provide and explain its peculiarities with a sustainable perspective, this paper attempts to overcome this lack, through the development of an ontology. Based on an extensive literature review, the sustainable PSS business model constructs and variables are provided. Then causal relationships among constructs are explained, defining their nature and direction. Finally, some managerial implications and directions for future research are pointed out in order to overcome the limitations of this work.
203	Conceptual Transformation Framework for Servitization	Vladimirova, Doroteya; Evans, Stephen; Martinez, Veronica	This paper presents a Conceptual Transformation Framework for Servitization. The challenges experienced by manufacturers on their journey to servitization are investigated in order to develop our understanding of the transformation that traditional manufacturers undergo to become servitized manufacturers. Three change theories are applied to develop the Framework: Lewin's force field analysis, Senge's system thinking and Pettigrew and Whipp's framework of strategic change. The Framework includes the dimensions of the change that takes place and the elements of change when transforming towards Product-Service Systems.
322	Challenges for Integrating Suppliers into Product-Service Systems Design	Cakkol, Mehmet; Johnson, Mark; Martinez, Veronica; Shehab, Essam	Servitizing manufacturers engage into long-term relationships with suppliers for the provision and support of the Product-Service Systems (PSS) offerings. Through-life support thus calls for a transformation for manufacturers as to how suppliers are integrated within the offerings. An example of this is the involvement of strategic suppliers early in the design stage. The aim of this practice is to realise the benefits of innovative ideas earlier in the development phase and access the technical expertise of suppliers'. This study contributes to extant literature as being one of the first attempts to explore this issue empirically, by conducting semi-structured interviews within six different servitizing manufacturers. The preliminary findings suggest that managers are aware of the importance of suppliers in the design and delivery of PSS, however many important decisions are still made based on past experience only, which shows the lack of systematic approach to the whole process in the industry.
311	Exploring the Linkage between Servitization and Financial Performances: Evidences from the HVAC Industry	Visintin, Filippo; Rapaccini, Mario	Based on previous research we identified 5 variables to measure the degree of servitization of manufacturing companies. Subsequently, we submitted a questionnaire to assess the value of these variables to 250 companies operating in the Italian HVAC industry, receiving 54 answers. Using the aforesaid 5 variables as clustering variables, we conducted a hierarchical cluster analysis. The cluster analysis produced three clusters (highly, medium, low servitized companies), between which the variables were significantly different in the mean. In order to test the effect of servitization on the firms' financial indexes (ROS, EBITDA margin), we conducted a one-way ANOVA considering the financial indicator as dependent variable and the cluster to which companies belongs to as factors. The ANOVA revealed a significant effect of the level of servitization on both the financial indexes. Finally, we performed a contrast analysis thereby demonstrating that companies highly servitized perform better than those medium and low servitized.

SS 2.2 Transformations to Servitized Organizational Forms - II

ID	Title	Authors	Abstract
318	The Outsourcing of Industrial Maintenance Capabilities: Espoused Intentions and Experienced Reality	Raja, Jawwad; Martinez, Veronica	Increasingly the literature espouses manufacturing organizations to provide associated services for products. This trend has been termed the 'servitization of business'. Within this trend there are cases of organizations outsourcing their maintenance capability to such providers. This paper reports on one such case, in which a pharmaceutical manufacturer has outsourced its maintenance capabilities to a servitized organization. More specifically, we describe in detail the reasons for outsourcing and the experiences of the customer organization.
229	Linkages between Servitization Strategies and Sourcing Decisions: A Preliminary Study	Rapaccini, Mario; Visintin, Filippo; Saccani, Nicola	This paper develops a conceptual framework for ensuring the sourcing decisions are compliant with the servitization strategies of manufacturing companies. We argue that the choice of a servitization strategy, and the development of the PSS offering, should be driven by the customer's perception about the product's complexity and criticality. The sourcing decisions to configure the supply network, and the typology of relationships to be established with the supplier, should be taken accordingly.
227	A Theoretical Framework for Pricing Product-Service Systems	Rapaccini, Mario; Visintin, Filippo	Using case based research, we developed a framework to devise the pricing practices for product service systems. We discussed the contextual factors that drive the adoption of a given pricing practice. We used the servitization level of a manufacturing company to explain why different practices are adopted by firms that servitized their business in different ways.
193	A Decision-making Model to Drive the Servitization Process in the Capital Goods Sector	Roscio, Sylvie; Corti, Donatella; Portioli Staudacher, Alberto	Nowadays, offering PSSs (Product Service Systems) has a significant potential value for capital goods manufacturers, but several challenges arise in undertaking the servitization process. So there are some open research questions that call for further studies to fill the literature gap ([14]; [4]). This paper aims at answering the question: "how can traditional manufacturing firms make the transition to servitized organizations?". A decision making model that could support Italian capital goods manufacturers to identify the right strategy to choose to achieve the desired level of transition has been presented. The model has been developed by matching literature models with data collected by means of an empirical investigation involving a sample of 22 Italian manufacturing companies belonging to this sector.

SS 3.1 Sustainable Initiatives in Developing Countries - I

ID	Title	Authors	Abstract
320	A New Responsibility for the Brazilian Water Industry in the Era of Privatization: Dynamic Plant Management for the Treatment of Storm and Waste Combined Urban Waters	Reda, André Luiz de Lima; Mendes, Marcel; Ferreira, Paulo	In Brazil, sanitary sewage must go to sewers separated from the drainage system. Yet, increasingly common illicit stormwater connections into sewers, allied to the ageing process of both systems, are causing relevant stormwater infiltration into sewers – thus, also into wastewater treatment plants. Consequent plant overloads may induce combined sewer overflows (CSO, onto rivers or public and private areas) and disturb treatment, often yielding effluents of insufficient quality and affecting receiving waters likewise. Environmental impacts like these are quantitatively reported here for urban areas of São Paulo State. Inspired by solutions developed in northern countries where, due to climatic and historical reasons, wastewater traditionally joins the stormwater in combined sewers, regulatory and engineering tools are suggested which may help operate plants, and plan, design, monitor, operate and manage complex wastewater systems. Finally, the role of river water-quality models in assisting dynamic treatment plant operation is envisaged, and quantitatively exemplified.
301	Searching for Energetic Sustainability in Distant Areas through a Solar Powered Battery Charger with Self-Oriented Panel	Prado, Alvaro Andre Colombero; Nogueira, Marcelo; Amaral, Fábio Vieira do; Abe, Jair Minoro; Vendrametto, Oduvaldo	The increasing demand for simple, but high-technology devices, bringing solutions to problems faced by people in diverse situations, has led many to an ongoing effort to improve techniques and processes, trying to achieve the expected requirements of those particular devices. In the same way, an important attempt to develop self-sustainable and low environmental impact equipments, with improved performance, can be easily seen nowadays. At this point, an important matter is the supply of electric energy in places where it is unavailable, due to the distance from the power grid, or even in places where the ecosystem is of great importance, preventing the construction of any type of distribution network. One solution, frequently employed in these cases, is the use of internal combustion engine generators or even archaic lamps for illumination, resulting in a high environmental impact, due the burning of fossil fuels and consequently carbon emission. Through Bibliographic and Experimental research, as well as seminars and interactions with specialists of the area, it was possible to develop the idea of a device that fits within the proposed requirements. This paper aims to introduce the idea of a Solar Powered Battery Charger with Self-Oriented Panel, completely independent of a power grid, with efficiency as close as possible to the commercial chargers which, otherwise, depend on an electrical socket to work.
282	Agriculture in Brazil: the Challenge of Soybean Production and Cerrado' Deforestation	Vendrametto, Lilian Patricia; Bonilla, Silvia Helena	Brazil is the world' second largest producer of soybean (grain) and one of the largest exporters. Brazilian competitiveness is due to low production costs, resulting from the use of high technology, the scale and applied capital, and also inexpensive labor cost. These elements were considered within the scenario of soybean production in the county Lucas do Rio Verde, which is a stage of the project's action named Lucas do Rio Verde Legal, which was carried out in 2006-2010 in a partnership of private and government entities whose objective was to make the municipality, in Mato Grosso state, the first to have all its rural properties regulated in accordance with the National Forest Code and labor legislation. This study aims to present the ongoing studies for environmental compensation due to deforestation from crop planting, mainly soybean, corn and cotton in the municipality.
110	Development and Implementation of a Computerized Yarn Production Management Tool	Borgen, Eirik; Gran, Erik	Production of yarn can be managed in different ways. We faced a challenge from a yarn producer in Macedonia which had to re-think the management of the yarn production to meet new requirements from the market, after the split-up of former Yugoslavia. The task was to design and implement a new information technology based production management system for yarn production, after analysis of the current production and management system. Basic requirements for the new implementation were low-cost and simplicity. We solved the task during use of the programming environments of Excel and two production management techniques; OPT (Optimised Production Technique and PBC (Period Batch Control). This paper shows how the two methods were combined together and discuss the benefits of this combination and the challenges uncovered during the work which lead to the realization of the tool.

SS 3.2 Sustainable Initiatives in Developing Countries - II

ID	Title	Authors	Abstract
213	The Drywall Non-sustainable Disposal and Disability Qualification of Human Resources for Technological Innovation	Botelho, Wagner Costa; Vendrametto, Oduvaldo; Neto, Mario Mollo	The Brazilian Civil Construction Industry (CCI) undergoes into deep Technological Innovations processes. New materials, new equipment, modern management systems, new labor profile and the processes industrialization are breaking traditional methodologies. This sector has always used intensive and low professional qualification labor, undergoes changes that bring significant alterations, with consequent increase of unemployment. Another aspect to be considered due to innovation of this sector, is the constant use of materials such as Drywall - cardboard plaster plates, in use in this work since the sales stand up to its end generating, this way, a waste until then very little treated, however a generator of environmental impact which opposes the productive sustainability.
208	Corporate Social Responsibility in Brazil as an Element to Sustainability	de Oliveira Costa Neto, Pedro Luiz; Rodrigues Sacomano, Aline	This paper discusses the importance of social responsibility as a base for sustainability and tries to provide an overview of this relationship in Brazil nowadays. It is recognized as necessary the existence of three classes of sustainability, economical, ecological and social, and the big challenge of reconciling these three elements. After discussing the importance of social responsibility towards sustainability, we present the normative, legal and policy aspects related to addressing the problem in Brazil, which are part of an ongoing research, designed to better understand this issue and its actual development in the country.
174	Virtualization: The Advantages of this New Paradigm in the IT Landscape and the Positive Environmental Impact of this Technology	Martins Criatovao, Andrea; Costa, Ivanir	IT brings benefits to companies that, with its adoption, reduce costs, increase productivity and improve the quality of their services. From this need arises Virtualization provide flexibility and optimization in the utilization of IT. Virtualization has highlighted the so called green IT because it reduces waste and environmental impact, besides reducing considerably the rates of electricity. In this sense, the corporate world begins to embrace and, especially, create actions to meet the needs of sustainable business. The aim of this study is to assess the importance of virtualization in the reduction of pollutants and high levels of energy spent by companies, analyze the impact of Virtualization on the concept of Green IT and the advantages that this technology provides to organizations, especially for the Brazilian ones. The study includes literature review and results draw a parallel about the real advantages, benefits, costs and environmental impacts that Virtualization produces.
186	The application of 100% Ecological Gas on the Brazilian Home Appliances	Boschi, Alexandre Arnaldo; Mollo Neto, Mario; Fusco, José Paulo Alves	Since the 1980s, the world community started to discuss the ozone depletion and the global warming effect due to the use of CFC's gas on the industry. Although Brazil was considered a developing country, and there was the possibility to extend the deadline to change this gas, the process started before that, when some intermediary action was performed. Initially, the implementation of the gas R134a decreased the impact over the ozone depletion but the warm effect was still kept. On the European market, the application of hydrocarbon gas was being developed, with good results. To be used on domestic appliances, some action had to be performed in the safety conditions instead of the ambient sustainability. The target of the article is to discuss the safety of the Brazilian companies over the manufacturing conditions and the after sales service.

SS 3.3 Sustainable Initiatives in Developing Countries - III

ID	Title	Authors	Abstract
304	Automating the Flow of Mineral Oil Insulating Fluid within the Treatment Plant from the Analysis of Physical-chemical Conditions of the Oil	Pires, Izabel Cristina; Nogueira, Marcelo; Amaral, Fábio Vieira do; Abe, Jair Minoro; Vendrametto, Oduvaldo	Manual control of the contaminants fluids flow of and the absence of their analysis, results in a low performance process with a high environmental risk. Based on these facts, this paper presents an automated system of flow control through analysis of the conditions of mineral insulating fluid inside a treatment unit. The objective of this system is to optimize the fluid's movement, turning it safe, minimizing environmental risks and waste of natural resources, ensuring the delivery of a reliable product.
238	Commitment of World-class Companies with the GRI Model for Environmental Sustainability	Acquaviva Neto, Nicola; de Oliveira Costa Neto, Pedro Luiz	The concept of world class company is directly associated with awards for excellence management among which the Brazilian National Quality Award – PNQ. This award is based on a set of criteria of excellence covering the main aspects relating to the management and results of organizations including the aspect of sustainability. The model GRI – Global Reporting Initiative, in turn, presents a comprehensive set of guidelines for sustainability, which can be accessed on the basis of indicators carefully defined for this purpose. In this work is performed an analysis of a group of companies winners of the PNQ compared to the model of GRI indicators, pointing out several shortcomings with regard to sustainability, which certainly are opportunities for improvement even in companies considered world-class.
188	Selection of Indicators of Sustainable Development for Supply Chain using the Multi Criteria Analysis	Nääs, Irenilza de Alencar; Yemal, José Alberto	This paper uses the analytical hierarchy process for selecting indicators of sustainable development for supply chain. Three companies that are organized in a supply chain were studied and a questionnaire was answered with questions related to items which indicate relationship with environmental issues. Results indicated that the use of AHP was adequate in selecting the indicators.
159	Supply and Reverse Supply Chains in the Brazilian Electro-Medical Equipment Industry: A Multiple Case Study for Compliance with WEEE and RoHS Directives	da Silveira, Marco Antonio; Gardesani, Roberto; Bueno, Ana Karina da Silva	The Ambientronic Project was launched in October 2009, bringing together the Ministries of Science and Technology, Environment, Development, Industry and Foreign Trade, the academic and business sectors and the Renato Archer Information Technology Center (CTI). This project aims to cultivate an understanding of the processes involved in the supply and reverse supply chains in the Brazilian electronics industry that could enhance alignment of production activities, technological development and the provision of technology services so as to enable companies to conform to RoHS and WEEE directives. Initial results were gathered from a pilot-study of companies in the electro-medical equipment sector. These results are an important contribution to the government program which seeks to provide the necessary technological support to companies in the electronics industry in Brazil.

SS 3.4 Sustainable Initiatives in Developing Countries - IV

ID	Title	Authors	Abstract
275	Competitive Advantage based on Technological Innovation - The Case of Marcopolo	Monteiro Junior, Jorge; Vendrametto, Oduvaldo	The industry of the bus body has gone through a process of intense technological innovation. These innovations affect the strategies of companies in the industry, and establish a strong competition between them. Marcopolo, the market leader has developed throughout its history while maintaining a competitive company edge technology including units outside the country (Colombia, Argentina, Mexico, Russia, India, Egypt and South Africa). Therefore, this study attempts to identify the competitive advantages that are being generated and the fact derive directly from the technological option of the company. Using the adaptation model proposed by Vasconcelos (1992) and also the "Manual of Diagnostic Innovation - FIVE" concluded that Marcopolo developed a competitive advantage based on technology innovation. A historical analysis of technological development of the company was done under this scenario.
177	Dealing with the Substitution of Tin-Lead Solders in Developing Countries	Madureira, Marco Antonio; Giannetti, Biagio Fernando; Bonilla, Silvia Helena; Almeida, Cecilia M.V.B.	Tin-lead solders (Sn63-Pb37) are widely used in Brazil by manufactures of electronic assemblies, but there is an arising concern for their substitution by lead-free alloys. Regarding the use of lead, there are three aspects to consider: (i) the toxicity of lead leachate and the possibility of contamination of humans after the disposal of lead wastes from manufacturing or electronic products disposal; (ii) the inhalation of fumes of lead during the manufacture of products; and (iii) issues relates to mining and natural resources use. This study applies emergy evaluation in a manufacturer of soft solders based on tin, lead and other metals. The calculation of emergy per unit of three types of solder showed that more resources are used to produce one ton of lead-free solders than those used to produce tin-lead ones. Under this aspect, one can say that the tin-lead solder is the best option in terms of resource use efficiency. The DALY (Disability Adjusted Life Years) indicator was used to assess the emissions to air of Sn63-Pb37, Sn99-Ag0.3-Cu0.7 and Sn96.5-Ag3-Cu0.5 solders production process. The results point to the use of lead-free solders.
183	Is the Development of Brazilian Biofuel Network Sustainable?	Neto, Mario Mollo; Vendrametto, Oduvaldo; Waker, Robert Ari	With growing worldwide interest in the use of liquid biofuels in the transportation sector, ethanol is considered as one of the best alternatives. Rising oil prices, environmental concerns and interests in energy security have driven Brazilian researchers to look for biofuels production as a potential solution. Other driving forces are the need to stabilize commodity prices and to cut down on agricultural subsidies. This paper describes the analysis of Brazilian large-scale network of ethanol production and lead to issues which are related to the sustainable development indicators by studying the structural characteristics of the production chain through social network analysis (SNA). The result showed two structural indicators that monitor the growth of the production chain and also indicates sustainability. The increasing power of distributors is noticed by the increase of the degree of centrality and the strengthening of the chain, which is perceptible through the density evolution.
240	An Assessment Model for Hydrogen Production Technology and Application in Taiwan	Chang, Pao-Long; Hsu, Chiung-Wen; Hsiung, Chih-Min	The main objective of this study is to establish an assessment model for hydrogen-production technologies in developing countries and multi-criteria decision-making was chosen as the basis of the assessment model. Moreover, the evaluation criteria conforming to the policies and the mission of the government were adopted. Furthermore, by implementing the weighting assigned by experts as well as applying the method of posteriori weights, appropriate hydrogen production technology options were determined. This study performs an assessment on seven different types of hydrogen-production technologies in Taiwan. The assessment was based on the criteria such as CO2 emission, energy efficiency, cost, and technology potentiality. The results indicate that bio-fermentation is the most suitable for Taiwan, and therefore, it should be given top priority for further development to realize industrialization.

SS 3.5 Sustainable Initiatives in Developing Countries - V

ID	Title	Authors	Abstract
172	Comparative Analysis of the Application of Sustainability Concepts in Coffee Bean Production in Brazil	Nääs, Irenilza de Alencar; Reis, João Gilberto Mendes dos; Araújo, Hélio Corrêa de; Costa Neto, Pedro Luiz de Oliveira; Abe, Jair Minoro	This paper studied the coffee bean production in Brazil and analyzed three ways of reducing the impact in the environment during production. The chosen ways were to optimize the use of water, energy and to reduce the use of agrochemicals. AHP was applied and the selected criteria were chosen based on current literature which enhanced on-farm coffee production. The sustainability of coffee production was considered to be dependent of production cost, market, quality and social impact. Two scenarios were built with the first using the traditional coffee production scheme, and the second applying reduction on the use of energy, water and agrochemicals. Both scenarios were compared and the results indicated that reducing the use of agrochemicals it may represent the highest positive impact in making the Brazilian coffee bean production more sustainable.
173	Metrics for Achieving Optimized Mainframe Processing Capacity Utilization Aiming at Reducing Power Consumption	Sartoratto Dias, Antonio Cesar; Costa, Ivanir	It's becoming more expensive to run an Information Technology (IT) department, strictly from a power consumption standpoint. An alternative to prevent increased power consumption in data processing is to improve the efficiency of mainframes used in the corporate environment. Therefore, companies committed to streamlining the efficiency in their computer environments will be joining the fight against the waste of resources as well as the efforts for environmental protection. This work is aimed at demonstrating the metrics used for determination of data processing duration in mainframes based on processed data volume and equipment configuration. It also demonstrates that companies committed to maximizing the efficiency of their large-scale computers are aligned with the principles of Green IT and moving further towards sustainability of their services. This investigation demonstrates that certain parameterizations allow for shorter, more stable and less workload-dependent processing durations.
164	Building with Sugar and Corn	Pinto, Jorge; Paiva, Anabela; Costa, Ana; Tavares, Pedro; Fernandes, Lizete; Murta, Antonio; Varum, Humberto	Two alternative and highly sustainable building techniques are presented and described. The techniques are sugar reinforcement of earth based material and corncob based thermal isolation material. Some experimental results highlight the advantages and disadvantages of these two proposed techniques whose study is still beginning. The water resistance of earth based materials may be increased by adding a certain amount of sugar. On the other hand, corn cob material may have a similar thermal behavior as the common thermal insulation materials currently used in the building industry.
235	A Sustainable Energy Supply Model Applied to an Industrial Fishery in Laâyoune, Western Sahara	Setzpfand, Marc; Ockels, Wubbo J.; Melkert, Joris A.	In this study the design of a sustainable energy chain for an industrial fishery in Laâyoune, Western Sahara, was considered. This fishery requires large amounts of thermal energy that is presently supplied by fossil fuels. A sustainable energy supply (SES) model was developed, to determine the economic and ecological viability of alternative technology combinations to supply the required energy. Sustainability performance indicators were created and used to rate the combinations, comprising net present value, emission reduction and investment. The model has shown to be able to offer information that is clear to the policy maker to make a decision. It confirms the contradictory character of economic and ecological viability. For the Laâyoune case, it was shown that in the Laâyoune industrial fishery an emission reduction of 80% could be realized in an economically viable way.

SS 4.1 Product Service System Engineering - I

ID	Title	Authors	Abstract
317	A Methodology to Support the Development of Integrated Product-Service Solutions.	Visintin, Filippo	In literature, there is a paucity of previous work providing tools and techniques that can be used by companies to devise and deliver integrated product-service solutions. In order to fill in, at least partially, such a gap, in this paper will be presented a methodology to be applied by manufacturing companies selling capital goods in B2B markets to deliver integrated solutions. The paper is based on the case study of a leading company operating in the professional printing industry.
114	A Methodology for Generating Simulation Scenarios through Design of Experiments to Improve Emergency Department Processes	Kaner, Maya; Gadrich, Tamar; Dror, Shuki	The literature describes different problems and trends concerning emergency department (ED) operation. To handle these problems different scenarios are simulated and operational alternatives are evaluated before being applied in a real-life environment. However, defining broad possible simulation scenarios for ED operation is not schematic, and depends on the designer's experience. This paper suggests a framework for the schematic assigning of factors, their levels and interactions when designing simulation experiments for ED processes. A questionnaire was constructed as an instrument for selecting the important factors and interactions. Once these are elucidated, experimental designs consisting of a carefully chosen subset of possible scenarios and operational alternatives will reveal information about the most important aspects of the problem being studied and the improvements suggested.
300	ISIR: Informed Sensitised Intelligent Response - A Framework for PSS Characteristics	Hussain, Romana Salmah; Lockett, Helen; Kingston, Jenny; Alcock, Jeff; Vasantha, Gokula	This paper considers two dominant definitions of services in the service literature and then proposes a set of service characteristics which have been derived from Service Dominant Logic. These characteristics are then used to chart the differences and similarities between products and services and a case study shows how these characteristics could be applied to Product Service Systems conceptual design.
328	Product-Service Systems Development based on Project Management: The Definition Sequence	Alix, Thecle; Vallespir, Bruno	Many companies propose product-service systems (PSS) solutions to increase their competitiveness and reach objectives of profitability, satisfying customer's specific and evolving needs. The design of such solution requires managing four narrowly overlapping dimensions: the product, the service, the process and the organization dimension, having a customer centric focus. The development of a PSS can be based on a project management model which takes current requirements of quality (customer satisfaction), delay and cost into account and can cover the four aforementioned dimensions. The development of a PSS as a project can be split in four main phases: a definition, a design, a realization and a closing phase. The main performance indicators on which we focus are the ratio benefits over risks in the PSS definition phase and the value of the solution for all stakeholders in the design phase. In this paper are detailed the operational and support activities of the definition phase as well as the graphic tool that can be used to represent the benefits and risks of an IPS <sup>2</sup> development for a manufacturing firm. Others phases are briefly discussed.

SS 4.2 Product Service System Engineering - II

ID	Title	Authors	Abstract
413	A Methodological Approach to Engineer a Product-Service System	Pezzotta, Giuditta; Cavalieri, Sergio	Nowadays, the distinction which links goods to something tangible and services to something intangible is vanishing. In this context, the Product-Service System (PSS) concept finds its root. The profit generation and success of a PSS critically depend on its conceptualisation and design, even if this notion has been largely neglected for a long time. In particular, Service Engineering has been prevailing as a technical discipline dealing with the systematic development and design of product-service solutions by using an appropriate set of models, methods and tools. Aim of the paper is to propose a methodological approach to support the identification of a set of coherent leverages for the engineering contents of a Product-Service System throughout its life-cycle. Starting from the identification of the requirements of a PSS engineering process in a given company and of the best sequences of the engineering phases, the methodological approach proposes a way to select the most suitable models, methodologies, methods and tools to be adopted in the different life-cycle phases of a PSS, encompassing its Beginning-of-Life, Middle-of-Life and the End-of-Life.
182	Critical Factors for Managing the Implementation and Diffusion of Eco-Efficient Product-Service Systems: Insights from Innovation Sciences and Companies' Experiences	Ceschin, Fabrizio	Eco-efficient Product-Service System (PSS) innovations represent a promising approach to sustainability. However the application of this concept is still very limited because its implementation and diffusion is hindered by several barriers (cultural, corporate and regulative ones). The combination of theoretical insights (from innovation sciences), and a case study research (which analyzes the innovation journeys made by 8 companies in introducing their eco-efficient PSS concepts in the market), is used to identify the critical factors to effectively manage the implementation and diffusion of this kind of innovations. Starting from these results the paper outlines the implications on the design level.
142	Goal-Driven Service Process Redesign: Conflict Resolution through TRIZ Principles	Karni, Reuven; Kaner, Maya; Dubin, Matias	We discuss the redesign of services at the process level and present a TRIZ-based approach to creative process improvement. The strength of TRIZ as a method for developing creative redesign solutions lies in the removal of conflicts. We recognize that improvements are made in order to better the goals of the service being provided. However we also recognize that bettering one goal can result in a negative effect on some other goal. Thus suitable inventive principles are suggested to resolve the conflict and to produce a creative solution. An "improvement" is therefore justified and achieved by bettering some service goal without degrading another service goal. We describe a five-step goal-driven redesign procedure, and illustrate it through a telesales process and other process improvement cases reported in the literature.
105	Understanding the Use Value Dimensions of Outsourced Maintenance Services	Toossi, Amir; Lockett, Helen; Raja, Jawwad; Martinez, Veronica	Surviving in long-term outsourced maintenance contracts in current financial situation necessitates better understanding of what customers attribute as value and its dimensions. This paper reports on findings from research undertaken with a supplier of automation products and services and its customers. Structured interviewing technique has been conducted in four customer companies from different industrial sectors at different organizational levels. Value dimensions and their role in different decision making levels are identified.

SS 5.1 Product-Related Service Delivery Networks Design, Management and Optimization

ID	Title	Authors	Abstract
231	Cross Training Policies in a Maintenance Field Service Organization	Colen, Pieter; Lambrecht, Marc	As the trend towards more after sales service progresses through the industrial equipment industry, equipment manufacturers are offering comprehensive service contracts in which they take full responsibility for the functioning of their customers' machines. These contracts increase the importance of capacity decisions in maintenance field operations. We evaluate the possibility to deploy technicians dedicated to preventive maintenance instead of fully cross trained technicians based on a real case in the compressed air industry. Our contribution consists of identifying the factors that influence the optimal cross training policy while taking into account the effect of the capacity decisions on the maintenance demand.
113	Responding to the Eco-Sustainability Logistics Challenge: Using Sensor Information to Increase the Eco-Effectiveness of the Transportation Chain	Skorna, Alexander Christian; Hinz, Andreas	In this research, consideration is given to the exogenous drivers that force firms to engage in ecological sustainability logistics initiatives throughout the transportation chain. We link the sustainability challenge with a solution proposal to make logistics operations more eco-sustainable. Sensors can monitor parameters (e.g. temperature) and enhance logistic decision-making. Low-quality or spoiled products can be identified and eliminated from the supply chain in upstream distribution centers to avoid shipping of spoiled goods further down the chain. A simulation study shows how profits, resource efficiency, and product quality on shelves' in-store can be increased with sensor information which also lifts the food manufacturers' revenue.
257	Sustainable Product-Service Ecosystems Monitoring	Aubry, Régis; Biennier, Frédérique; George, Sébastien; Maranzana, Mathieu	The world-wide production context increases the call for distributed manufacturing organisations, paying a particular attention on economical profitability while sustainable constraints start being taken into account by governments and consumers. This leads to product-service organisations integrating services related to the product life cycle (maintenance, disassembly, recycling). Furthermore, information on the ecological impact (as the CO2 cost) is required to integrate "ecological costs" in the consumer decision criteria as well as in potentially new taxes computation. To fit these requirements, we propose to extend the product-service model to integrate and manage sustainable KPI. Thanks to dedicated annotation and an interoperable information system, sustainable performance level can be estimated and monitored. Then adding a late binding facility allows adapting "on the fly" the product-service chain to the current context by selecting the more accurate service candidate.
252	System Dynamics Modeling for Product-Service Systems A Case Study in the Agri-machine Industry	Legnani, Elena; Cavalieri, Sergio; Crespo Marquez, Adolfo; González Díaz, Vicente	The increasing role of services in the strategic plans and the economics of industrial companies poses new relevant organizational and management challenges. Shifting from a transactional to a lifelong relational approach with the customer requires major consideration of those processes which are carried out through the service network. Empirical decisions for tackling such new market opportunities could turn out to be counterproductive if taken on the fly, affecting negatively the overall performance of a service network. This paper exploits the potential of continuous simulation as a support for handling decision making processes in a Product-Service System context. A System Dynamics model has been developed and, within this paper, has been specifically applied to quantitatively assess how the introduction of preventive maintenance contracts can influence the overall service performance of a manufacturer of farm machinery.

SS 6.1 Risk Management as a Powerful Means for Sustainability

ID	Title	Authors	Abstract
204	Can Supply Chain Risk Management Improve Firm Performance? A Focal Firm Perspective	Cagno, Enrico; Micheli, Guido J.L.; Russo, Antonio	The purpose of this research is to investigate the relationship between supply chain risk management practices and performance from a focal firm perspective. While considering supply chain risk, the study focuses on how the individual firm can benefit from supply chain risk management (SCRM), in order to improve performance and sustainability. On the basis of a survey on a sample of 100 companies operating in the Italian industry, the analysis reveals a positive relationship between the level of implementation of SCRM practices and the firm's performance. Finally, our findings highlight the relevance of strategic alignment with supply chain objectives for the achievement of higher SCRM levels, thus enhancing a firm's performance.
212	Do Risk Management Practices Impact on Sustainability Reporting?	Arena, Marika; Arnaboldi, Michela; Azzone, Giovanni; Zanichelli, Sara	The possibility of exploiting sustainability reporting as a leverage for sustainable proactive strategies can create a tension between the need to disclose information to induce socially aware customers to choose specific products and the higher expectations to which "more open" companies are subjected. These higher society expectations and exposures increase reputational risk, and suggest a potential positive link between sustainability reporting and risk management processes. Based on these considerations the paper explored the following research questions: Is the adoption / use of ERM-like systems positively associated with the publication of sustainability reporting? Is the adoption / use of ERM-like systems associated with different features of sustainability reporting?
230	Sustainable Supply Chain Management from the Perspectives of Risk Management	Sekhari, Aicha; Hossain, Syed Akhter; Bouras, Abdelaziz; Santiteerakul, S.	The topics of sustainable Supply Chain Management (sSCM) has received growing attention and become an increasingly popular research area. Several approaches were proposed for the implementation of sSCM initiatives as well as defining the role of organizational factors in the adoption of environmental innovations based on factors identified through survey. Despite different research approaches and studies with sSCM, the critical factors affecting the implementation and adoption of sSCM is still at embryonic stage. On the other hand, supply chain risk management in the successful implementation and adoption of sSCM initiatives entirely determine the sustainability of such initiatives for efficiency and long term commitments. This study examines risk management issues from the perspectives of the sSCM by factor analysis to determine core risk management factors for sSCM. The findings of these critical factors implicates that for the adoption with performance of sSCM operations, risk management plays a significant role.
264	Rightsizing Production: The Calculus of "Ecological Allowance" and the Need for Industrial Degrowth	Reichel, André; Seeberg, Barbara	Pressures arising from sustainability demands from resource markets, customers, political regulation and societal stakeholders demand a new strategic approach of the firm. This is especially the case with the manufacturing enterprise, as its economic activities create the most severe ecological damage. The aim of this contribution is to develop a strategy framework for rightsizing production beyond the dominant growth paradigm as well as to supply an outline of an ecological measure to determine whether or not a firm's operations are within the limits of a finite Planet. Traditional measures, like lifecycle assessment methods or carbon footprint, only compare the sustainability of products and processes on a relative scale. What is needed, however, to give management a robust basis for decision making, is a measure of absolute scale: the calculus of "Ecological Allowance", an answer to the question "what size of production is just right".

SS 8.1 New Product Introduction and Innovation in the 21st Century - I

ID	Title	Authors	Abstract
211	Composite Eco-design	Perry, Nicolas; Mantoux, Olivier; Kromm, François- Xavier; Pilato, Aurélie	The concept of design for recycling (DFR) is becoming an integral part of the designer's brief. DFR can be applied to all manufactured products. However, it is of most complexes to composites products. One of the main elements of DFR is the concept of design for disassembly which deals with reducing the time spent disassembling the product, thereby reducing costs. In addition, the recycling process needs specific requirements to be efficient, and it gives recycled fibers with new properties and future applications. This paper highlights the product design requirements, starting from the different possibilities and phases of recycling process.
331	Indices to Support the Design for Disassembly product Evaluation During the Design Process	Germani, Michele; Favi, Claudio; Mandolini, Marco	Design for Disassembly (DFD) is a well-known technique for improving product disassembly when it occurs. Disassembly can be defined as a systematic method for separating a product into its constituent parts, components and sub-assemblies. The interest for this technique derives essentially from two product life cycle phases: the product maintenance and the product End-of-Life (EOL) treatment. The critical point of both strategies is the cost of disassembly operations and the cost of treatment for parts and materials. The proposed method allows numerically quantifying the effort for part disassembly by using appropriate indices based on cost. A specific CAD-based tool (LeanDFD) calculates these indexes to improve the designer decisional process related to product maintenance and to determine EOL strategies. The examined case study shows the results of a product redesign according to the method and the improvements achieved.
145	Product Portfolio Environmental Performance Analysis – Applied to Room Air-conditioner Market in Japan	Dusek, Jan; Fukuda, Yoshiro	In the framework of environmental assessment, we propose an innovative approach that shifts attention from individual products and services to the environmental performance of product portfolios. The purpose of this work is to identify key factors influencing the evolution of portfolio environmental performance. Research is motivated by the need to comprehend marketing strategies and consumer perception of individual product portfolios in relation to adoption of environmentally friendly technologies. As an example, we apply the proposed method to the Japanese room air-conditioner market.
118	Automotive Part Eco-design using End-Of-Life Treatment Cost Assessment and Value Conservation	Chemineau, Léonard; Froelich, Daniel; Abraham, Fabrice	Car design is increasingly constrained by environmental issues and regulation. For manufacturers, the 2005/64/CE European directive on type-approval imposes vehicle recoverability rates and proof that recovery is performed with reliable technologies. Moreover, motor vehicles are effectively treated 22 to 25 years after a potential eco-design decision. Existing and prospective path knowledge is then obviously very important to make the right design choices. This paper proposes a new modelling method based on treatment cost and final products value conservation assessment, capable of providing designers with integrated recoverability assessment, without recovery expert knowledge. The basic modelling object is the flow, assessed according to technical and economic parameters. The proposed method enables flow linking through paths and trees, and makes it possible to produce eco-design specifications. The proposed method could also be applied outside of the automotive world.

SS 8.2 New Product Introduction and Innovation in the 21st Century - II

ID	Title	Authors	Abstract
350	PLM Perspectives in Mechatronic Systems Design	Bricogne, Matthieu; Troussier, Nadège; Rivest, Louis; Eynard, Benoît	In this paper, the importance of mechatronic systems integration is underlined. To make this integration possible in a collaborative environment, new tools have to be developed. After presenting the Product Lifecycle Management (PLM) advantages, two different approaches are described: hardware/software integration thanks to Product Data Management (PDM) / Software Configuration Management (SCM) combination and system engineering integration. Both approaches are compared to finally propose a new approach based on Core Product Model (CPM) and Adele configuration manager.
117	Business Process Intelligence: An Application to the Product Development Process	Luti, Luigi	Understanding the product development process is the basic requirement for renewing or improving it. All organizations spend time, energy and resources attempting to understand and describe their own way of working. But at last, there is often a gap between what is perceived or supposed to happen, and what actually does. Business Process Intelligence (BPI) is a discipline that allows to extract, from data recorded by information systems during their day by day usage, deep and sound knowledge about a process. This paper, using a real case, introduces the application of the BPI to the product development process and demonstrates how the analysis of event-based information allows to propose concrete improvement actions.
151	A Novel Tool to Support Manufacturing Sustainability in UK Electronics Manufacturing from a Quality Perspective	Huertas Quintero, Lina A.M.; Rosamond, Emma L.; Conway, Paul P.; West, Andrew A.	Sustainability has become as important as time, cost and quality for companies to remain competitive in the manufacturing domain. Since the application of this paper is on high value added electronics manufacturing where quality is the main concern, it addresses sustainability from this perspective. An integrated modelling and simulation tool was proposed to assess the impact on sustainability of additional production processes due to poor quality production. The support provided by the tool to identify and investigate effects on production sustainability is illustrated through a case study of a real industrial context. The capability of the tool was assessed by evaluating potential causes of unnecessary resources utilisation, which were detrimental to the sustainability of the production system, and that could have wider reaching impacts at a lifecycle level. Future work includes the development of further models that enable estimation of explicit environmental metrics.
355	A DSM based Product Development Model for Assessing the Innovation Strategy Effect to the Product Development Cycle	Maravelakis, Emmanuel; Bilalis, Nikolaos; Dermitzakis, Eleytherios; Karapidakis, Emmanuel	This paper presents a new Product Development Model, based on the Design Structure Matrix (DSM) methodology, which focuses on providing a crisp value of the effect of innovation improvement to the product development cycle. The innovative performance of the company is assessed by 30 Innovation Attributes, equally distributed to three axes of innovation: a. Product axis, b. Process Axis and c. Management axis. The model consists of a database with more than 600 companies which provided their data. The proposed innovation improvement strategy indicates the innovation attributes with the highest innovation improvement impact values. This way the company's resources can be guided to the product development activities that are strongly related to the indicated innovative attributes. The effect of innovation improvement is finally assessed with the produced estimated cost and duration of the product cycle.

SS 8.3 New Product Introduction and Innovation in the 21st Century - III

ID	Title	Authors	Abstract
414	Applying Lean Thinking Concepts to New Product Development	Sopelana, Amaia; Sorli, Mikel; Taisch, Marco; Al-Shaab, Ahmed; Keast, John; Flores, Myrna; Skotic, Dragan; Martinez, Leire	Lean Thinking can be introduced in the enterprise to ensure an optimal transformation to a lean environment. There is a need in European manufacturing companies of a new model that implies a further stage of lean manufacturing. This paper outlines the first results of a current European project (LeanPPD-Lean Product and Process Development) which aims to develop a new paradigm with its associate methodology and tools based on applying lean thinking concepts in Product Design and Development field. To tackle this objective, a new model will be developed which consider entire product life cycle, providing knowledge based user-centric design and development environment to support value creation to the customers in terms of innovation and customisation, quality as well as sustainable and affordable products. Several of the scientific and technical objectives settled have already met. This paper constitutes a whole explanation of the LeanPPD model proposed by the project consortium and outlines its four main building blocks providing better understanding on how the project addresses these objectives.
407	The Industrial Requirements of KBE for the LeanPPD Model	Al-Ashaab, Ahmed; Flores, Myrna; Khan, Muhammad; Maksimovic, Maksim; Alam, Raham; Shehab, Essam; Doultsinou, Athanasia; Sopelana, Amaia	This paper presents the industrial requirements of the Lean Product and Process Development (LeanPPD) model. LeanPPD is a project funded by the EU-PF7. The project addresses the needs of European manufacturing companies for a new model that goes beyond lean manufacturing, to ensure the transformation of the enterprise into lean environment. The LeanPPD project faces the challenge to deliver new product and process development tools, which will enable the European companies to implement lean thinking in the product design development process. In order to develop and deliver such tools, the identification of the requirements is one of the key initial steps. This paper describes the process that has been developed within the project to capture the industrial requirements, and then presents in some detail the captured functional and non-functional requirements for the Knowledge-based engineering tool.
338	A Knowledge Engineering Methodology for Long Term Knowledge Retention (LTKR) in Product Lifecycle Management (PLM) Scope	Teng, Fei; Moalla, Néjib; Bouras, Abdelaziz	In spite of the application of traditional document engineering methods, the long term knowledge preservation issues have been mostly neglected in traditional standard information lifecycle implementations. Industry extremely high requirements exist to the processes for administration, archiving as well as reuse of product defining data. That's why nowadays the Long Term Knowledge Retention (LTKR) becomes crucial in terms of traceability, reusability as well as the security of the digital information in Product Lifecycle Management (PLM) of enterprises and industries. In this paper, a knowledge engineering methodology is developed, for long term knowledge retention and in product lifecycle management scope. The knowledge engineering methodology is based on the CommonKADS methodology with software engineering concept. The duties and objectives of the knowledge engineering methodology are: acquiring knowledge from enterprise, particularly for long term scope; manipulating and formalizing knowledge; directing Information Package design and Information Package transferring rules in digital preservation platform.
288	Early Evaluation of Manufacturing Costs within an Integrative Design of Product and Production System	Nordsiek, Daniel; Gausemeier, Juergen; Lanza, Gisela; Peters, Steven	The prevailing market and competitive situation requires companies to develop and produce their products fast and cost-effective. To accelerate the development of a new product and its production system a holistic design methodology is developed. Moreover the methodology contains methods which enable decision makers to calculate manufacturing costs per unit and to estimate uncertainties in early planning stages. The developed methods will be implemented in software tools and combined in one common IT infrastructure to guarantee an easy access and a broad acceptance in industrial companies. The methodology and the appendent software tools are developed within the collaborative research project VireS - Virtual synchronization of product development and production system development. First results have been tested at industry partners and are described in this paper.

SS 8.4 New Product Introduction and Innovation in the 21st Century - IV

ID	Title	Authors	Abstract
307	The Development of a Tool and Methodology for Identifying and Classifying Waste within New Product Development	Martin, Celine Elizabeth; Keast, John; James-Moore, Mike	This paper discusses the use of the lean principles within the Product Development process and, in particular, the effect of identifying and cataloguing waste at the process level. The research is part of the Lean Product and Process Development project (LeanPPD) aimed at increasing and sustaining value at this crucial stage of a product's lifecycle. The paper presents the initial development of an Ontology of Waste, developed with industrial support, as an everyday tool for Project Team members to identify the types of waste within a process. A statistic often quoted is that over 80% of time involved in the design process is waste. This research is aimed at providing a tool for capturing and classifying these wastes so that they can be understood and quantified in order to help companies to mitigate against them.
155	Lean Innovation – Introducing Takt Time to Product Development Processes	Schuh, Gunther; Lenders, Michael; Rauhut, Marcus	Lean Innovation represents the systematic interpretation of Lean Thinking principles regarding to product or process innovation and development. Part of the Lean Innovation System is the introduction of takt time to product development processes, which allows the application of the pull principle to the execution of tasks, the visualization of the continuous value creation and provides teams and developers with a common orientation for their work progress. Therefore three complementary systems are presented. The first system defines the actual process for planning and controlling the execution of development tasks in takt time, the second system defines the regulatory system to synchronize work processing. For the support of the iterative standard procedures for planning and controlling, tools for visual management are presented. The third system represents a model of different role types defining the duties, authorities and responsibilities of project members and the relationships between them.
356	The Wheel of Change Framework towards Lean in Product Development	Flores, Myrna; Díaz, Dayra; Tucci, Christopher; Al-Ashaab, Ahmed; Sorli, Mikel; Sopelana, Amaia; Paris, Alexander	Implementing lean principles in the Product Development process can be a major challenge for most organizations. Companies require guidelines to enable them to measure their readiness to change towards this new way of producing products, where the reduction of waste and the increase of value are the two major drivers. Consequently, this paper presents a novel framework called the Wheel of Change and its customization to enable the implementation of lean principles in the product development process. The framework has been validated with the help of five experts, who considered the proposed four framework elements useful and complete. In the end, the Lean Wheel of Change provides a guideline for those firms who wish to change their current practices and implement lean principles in the product development process. The efforts carried out in this research are part of the LeanPPD FP7 research project funded by the European Commission.

SS 9.1 Intelligent Non-Hierarchical Manufacturing Networks - I

ID	Title	Authors	Abstract
247	Collaborative Configuration of Virtual Organizations for Mass Customization	Fornasiero, Rosanna; Zangiacomi, Andrea; Chiodi, Andrea	This work deals with Virtual Organizations management for mass customization applied to the footwear sector, where collaboration among partners influences the VO configuration which is not the result of a top-down hierarchical approach, but of a partnership where companies have similar contractual power. The mass customization paradigm requires that companies are ready to produce small batches to satisfy customer needs and this work analyses how to deal with the creation of very flexible networks where preliminary partnerships among companies create trust and where answers to market requests have to be very quick and based on customized products. First ideas for VO configuration and for partner selection methodology to be implemented in SMEs of the footwear sector are then proposed.
256	Incentive Approaches for Delivery Reliability Improvement in Non-Hierarchical Networks of the Machinery and Equipment Industry	Stich, Volker; Kleinert, Alexander; Cuber, Stefan	In an increasingly uncertain business environment more flexibility in companies is necessary to stay competitive. While companies in hierarchical networks mainly focus on series production and secure their flexibility through safety stocks, an alternative approach has to be developed for companies in non-hierarchical make-to-order networks to facilitate operational flexibility. In this paper, a methodology to incentivise suppliers to increase delivery reliability will be discussed. Both monetary and non-monetary incentives will be considered and validated in three pilot cases in three European companies.
342	Web-based Benchmarking Platform for Delivery Reliability in Non-hierarchical Production Networks	Schuh, Günther; Kampker, Achim; Jasinski, Thomas; Bachmann, Fabian	Today's European machinery and equipment industry is characterized by multiple and dynamic customer-supplier-relationships. These non-hierarchical production networks lead to problems with delivery reliability and wasteful turbulences throughout the entire network. This paper describes an operational model based on a theoretical framework in order to improve the delivery reliability of each individual customer-supplier-relationship within non-hierarchical production networks. By developing a non-centralized coordination mechanism adapted from a web-based benchmarking platform aggregated key-performance indicators for the delivery reliability of suppliers and certain customer-supplier-relationships can be commonly shared. As a result the manual and non-transparent process of determining the delivery reliability of individual customer-supplier-relationships is automated into a comparable and transparent market mechanism of delivery reliability.
185	Engineer to Order Mass and Extended Production Systems Improvement in the Construction Industry based on GRAI Methodology: An Empirical Study	Errasti, Ander; Santos, Javier Poler, Raul	The aim of the following research is to investigate the adoption of some good practices in the Construction Sector, based on developed practices in other sectors, that could be helpful to gain competitive advantage. These practices (GRAI Methodology to improve the operational performance of the supply chain) are already known and have been studied by researchers; however the development of these techniques in the field of Construction has not been so deep. The proposed research method is based on Action Research, in which the researchers are involved in the changing process of top firms related to Construction sector. This method has been chosen because it is a theory extension or refinement. The conclusion is that the benefits of integrating and improving the planning and control system of the extended enterprise aided by GRAI methodology, as well as Action Research utility for this type of Research are completely demonstrated.

SS 9.2 Intelligent Non-Hierarchical Manufacturing Networks - II

ID	Title	Authors	Abstract
234	Delivery Reliability in Non-hierarchical Networks: Evidence from the Machinery Sector	Pinto, Roberto; Ricondo, Itziar; Uriarte, Arkaitz; Taisch, Marco	This paper presents the results of a survey conducted in three European countries focused on the analysis of delivery reliability problems, related causes and solution approaches in non-hierarchical manufacturing networks. In particular, the machinery and equipment industry is addressed. Generally, the complexity of a NHPN results in highly volatile, instable and non-transparent market conditions leading to high turbulences within the network, causing missed delivery reliability of their suppliers. The results indicate that there are areas for improvement for SMEs, usually lagging behind in the use of electronic data transfer for procurement and the measures and actions to avoid delivery problems.
277	Evaluation of ISO 9001:2008 Standard Applicability within Non-hierarchical Manufacturing Networks	Sitek, Patrick; Seifert, Marcus; Thoben, Klaus-Dieter	Today Manufacturing Networks become temporarily arrangements and show the retention of each network partner's autonomy. The abandonment of formal hierarchical and order structures as well as the temporary existence results in higher complexity and dynamics. This dynamic and complexity implicate specific requirements for collaborative business in Manufacturing Networks and therefore it introduces new challenges to manage quality within them. This paper is going to evaluate the worldwide most adapted ISO 9001 Quality Management standard applicability within such dynamic Manufacturing Networks.
194	Production Error Analysis for a Line of Manufacturing Machines, Variable Structure Control Approach.	Starkov, Konstantin K.; Pogromsky, Alexander Y.; Rooda, Jacobus E.	Nowadays, development of wide variety of different types of products requires more and more complex configurations of production networks out of modern manufacturing industries. Thus, efficient methods for control of complex manufacturing networks are required. In this paper we introduce such a control method for a line of manufacturing machines. The main objective of our method is to guaranty that the number of produced products follows the current production demand. First a general idea of the variable structure control method is given thought the simple case of one manufacturing machine. Then, a flow model of a line of machines with variable structure control is presented. Consequently, the obtained results on the uniform ultimate boundedness of the production errors of each machine in the line are discussed. Performance and robustness issues of the closed-loop flow line model are illustrated in numerical simulations.
103	Understanding Manufacturing Networks as Service Systems: An Ontological Approach	Mettler, Tobias	Continuously increasing market dynamics force manufacturing networks, more than ever, to innovate by not only focusing on the development of new goods but also on the design of additional value-creating services. In order to be able to properly analyze interdependencies and identify opportunities, it is therefore our proposition to understand manufacturing networks as service systems. For this purpose, based on experiences from a major European research project, this contribution discusses the fundamental elements of service systems as well as presents a formal ontology containing the most relevant concepts for analyzing manufacturing service systems.

SS 10.1 Supply Risk Management - I

ID	Title	Authors	Abstract
290	An Investigation of the Relationships Between Supply Risk Awareness, Assessment, Management, and Supply Disruption Occurrence	Pirola, Fabiana; Zsidisin, George; Wagner, Stephan	The today supply chain trends along with the current financial crisis have increased the awareness among professionals that risk assessment and mitigation play a crucial role in successfully managing supply chains. This increasing emphasis on risk management and the even more predominant trend to focus on core activities that creates greater dependencies on upstream supply, emphasizes the importance of the supply risk management. This study focuses on the supply side of the risk, looking at the relationships between top management awareness, supply risk assessment, supply risk management, and disruption occurrence. In particular, through a structural equation model, this research will demonstrate that increasing the top management awareness of supply risk raises the employment of risk assessment tools. Risk assessment allows a company to better understand risk sources increasing the implementation of risk management techniques in order to improve enterprise resiliency and decrease disruption occurrence.
179	Risk Management in Supply Chains: A Solution or Part of the Problem?	Peck, Helen	This paper looks at why disruptive events such as extreme weather, outbreaks of diseases, infrastructure or supplier failures continue to disrupt supply chains, despite more effort than ever before being devoted to business continuity and enterprise risk management. The paper considers this against the findings of research into the UK food supply chains, the advice of a leading management consultancy, and lessons learned following the financial crisis of 2008. The paper re-examines the tensions between operational risk and strategic enterprise risk management in supply chains and considers how best practice in supply chain management, business strategy, business continuity and risk management may all be contributing to the problem of systemic supply chain disruptions.
207	Assessing Supply Chain Risk Adopting Reliability Tools	Musa, S. Nurmaya; Cocca, Paola; Tang, Ou	Cases of disrupted supply chain networks have alerted many practitioners and researchers for studying risk events and analyzing its consequences. However, due to the complexity of supply chain network, it should be complemented with user friendly as well as familiar existing tools in the industries. Therefore, we look at the possibility of adopting reliability tools in the context of assessing supply chain risk. Our findings indicate the feasibility of FMEA or a combination of FTA and AHP application in assessing risk in the supply chain context. The introduction of detection in risk dimension and the framework are noteworthy implication of this research.
160	Supply Chain Risk Management: A Practical Tool-kit	Bernardel, Flora; Martinazzo, Davide; Panizzolo, Roberto	Today the Supply Chains are exposed to new risks they've never experienced before, because of the progressive emergence of exogenous trends, such as the globalization of supply networks, the rapid dynamics of real and financial markets, the excessive interdependence of unreliable partners. This extended operating environment in which companies are operating, requires the adoption of Supply Chain Risk Management tools, which in turn should be derived and integrated with the system of performance measurement. This paper introduces a practical tool for SCRM and a methodology, which may support organizations, in identifying and assessing the risks of business interruption from Supply Chains.

SS 10.2 Supply Risk Management - II

ID	Title	Authors	Abstract
292	A Dynamic Systems Approach to Production Management in the Automotive Industry	Teles, Vasco Figueiredo; Restivo, Francisco	Based on network theories, dynamic systems were previously thought to act randomly. However, it is now understood that they present particular signals pointing to characteristics of order and auto-organization (Barabási 2007). Discovering those signals of interaction within complex networks is then a challenge to these studies. In this work, while doing an analogy to the automotive industry, we explore the possibility to apply phase space tools to recognize patterns in a plot of data in dynamic systems, where deterministic chaos behaviour may occur. This behaviour is mainly related to decision-making within complex networks, where a tipping point situation can lead to dramatic changes in the otherwise stable system.
344	A Survey on the Supply Chain Risk Exposure and Treatment Strategies in SMEs	Aiello, Giuseppe; La Scalia, Giada; D'Aguanno, Antonino; Enea, Mario	As a consequence of economic globalization, the risk exposure of companies towards new uncertainties and risks is dramatically incremented. In such context SMEs frequently lack capacity to respond to crisis effectively, there is therefore urgency to help them to overcome such challenges through structured approaches to risk management. For such purpose government agencies have had insufficient information to define effective actions. This study aims at investigating SMEs resilience towards the effects of external events and indirect economic effects of globalized economy. The investigation has been carried out by means of a survey in order to evaluate companies' assessment of supply chain risks and the relevance of supply chain risk management practices. The survey is referred to a sample of approx. 100 enterprises in the Sicilian province of Trapani and the results obtained are discussed considering the specificity of the geographical context considered.
332	Development and Implications of Power Relationships between Chinese and Western Companies	Schneider, Oliver; Alard, Robert; Oehmen, Josef	The Chinese procurement market remains a very important one for European companies. However, over time they often lose bargaining power in favor of their Chinese suppliers. This paper describes a qualitative case study analyzing reasons for changed power relationships. One reason are different growth rates of buyer and supplier; this aspect is not considered in available concepts and models dealing with the analysis and management of buyer-supplier relationships. Concrete measures for maintaining the bargaining power are derived. An outlook for further research activities is provided.
333	Redesigning Food Supply Chains to Improve Performance Robustness using Vulnerability Profiling	Vlajic, Jelena V.; van Lokven, Sander W.M.; Haijema, Rene; van der Vorst, Jack G.A.J.	Efficient supply chains are vulnerable to unexpected changes in realization of logistic and production processes. This vulnerability is manifested as sudden hiccups or surges in chain's performance values. Objective of the companies is to have robust performances. In this paper we show that it is possible to achieve supply chain robustness, or at least to decrease its vulnerability, by a proper chain mapping, characterization of disturbances in logistic processes; by the performance vulnerability profiling, and by choosing adequate responses and strategies for defined vulnerability profiles.

SS 11.1 Managing Operations Globally - I

ID	Title	Authors	Abstract
217	Framework for Assessing the Current Strategic Plant Role and Deploying a Roadmap for its Upgrading: An Empirical Study within a Global Operations Network	Mediavilla, Miguel; Errasti, Ander	A globalised economy needs an efficient respond to global markets by globally sourcing, manufacturing and supplying. All size companies face difficulties when managing complex global operations networks, but meanwhile the related literature contains few models to design/restructure those. Based on the model of Ferdows for factory role analysis within global operations network, the aim of this paper is twofold: 1) to provide empirical testing of Ferdows' model and 2) to present a framework for a focused and systematic upgrade of a given factory role within its operations network.
152	The Sustainable Utilization of Human Resources in Global Product Development	Hansen, Zaza Nadja Lee; Rasmussen, Lauge Baungaard; Hansen, Mette Sanne; Jacobsen, Peter; Ahmed-Kristensen, Saeema	This empirical paper investigates the challenges global product development faces in regard to a sustainable utilization of resources through case studies and interviews in six Danish multinational corporations. Findings revealed 3 key challenges, which relates to increased rework in product development and production, overlapping work and a lack of utilization of knowledge and information at the supplier or subsidiary. The authors suggest the use of strategic simulation in order to gain greater transparency in the global network and thus utilize resources better. Strategic simulation is the combination of numerical and narrative simulation and can be used as a tool to support strategic decisions regarding different scenarios. The use of this method promotes an ongoing iterative process to constantly clarify points of uncertainty and enhance adaptability in order to promote a sustainable process.
305	ICTs Contribution to Global Logistics Sustainability	Carrasco-Gallego, Ruth; Moreno-Romero, Ana	This paper addresses the economic and environmental sustainability of global supply chains. A main challenge posed by global supply networks is a substantially increased demand for long-distance freight transport services, which results in externalities such as emissions of greenhouse gas and other atmospheric pollutants. The contribution of ICT to mitigate the environmental impacts of global supply chains is explored, focusing the discussion on containers intermodality and on the use of smart tagging for closing material loops through product reuse and materials recycling.
205	Model/Framework for Continuous Improvement Programme Development to Gain Sustainable Performance Improvement in Manufacturing Facilities: An Empirical Study	Eguren, Jose Alberto; Goti, Aitor; Pozueta, Lourdes; Jaca, Carmen	Current organizations must work in continuously varying environments, being one of the major challenges to improve competitiveness through the Continuous Improvement (CI) of product quality and productive efficiency. In this area the different models for the implementation of CI have become powerful tool for competitive advantage. CI programs have been traditionally used by most mature industries, such as auxiliary enterprises in the automotive and domestic appliances sectors. However it was found that there is still room for improvement to increase productive efficiency, so that it is needed to develop CI models that are implemented efficiently. This article presents a model aimed at implementing CI projects. The model has been developed in a research project based on the "case study research", for which have been implemented eight CI projects, in six automotive auxiliary sector companies.

SS 11.2 Managing Operations Globally - II

ID	Title	Authors	Abstract
283	How to Adapt the Management Control System to the Internationalization Process	Agostino, Deborah; Arnaboldi, Michela; Corti, Donatella	In recent years, more and more companies are increasing their global presence. To be sustainable in the long run the right control system for this process should be put in place. The literature about the management of international production network is quite wide, but only a few works deal with the role and use of performance measurement system in managing global organizations. Considering that the empirical analysis of the evolution of management control systems (MCS) within international networks remain largely unexplored, this paper aims at investigating how MCSs evolve along with the internationalization process of multinational companies. An empirical investigation has been carried out to identify which features of MCSs should change and how, depending on the type of internationalization. An interpretative model has been then developed.
293	The Reconfigurability of Dynamically Integrated Manufacturing System - An Experimental Study	He, Naihui; Zhang, David Z	Reconfigurability has been regarded as a promising issue for manufacturing systems to meet the unpredictable market changes, which includes four key attributes, namely responsiveness, scalability, rapid adjustment and cost efficiency. This paper uses an experimental study to demonstrate the reconfigurability, in particular the cost efficiency and scalability, of an innovative integrated model—Dynamically Integrated Manufacturing System (DIMS). Experiment results reveal that the distributed control of decision making by DIMS is able to achieve the minimal cost as centralized control methods. Furthermore, the scalability of a cellular manufacturing system is improved under the control of DIMS.
280	Integrative Production Technology - 9 Success Factors to Keep Production in High Wage Countries	Brosze, Tobias; Kompa, Stefan; Stich, Volker; Burggräf, Peter	The paper shows the results of a meta-study performed in one of the biggest production research projects worldwide. With an interdisciplinary approach 9 success factors to keep production in high wage countries have been developed on a basis of more than 50 actual studies. The paper provides a focused insight in each of the nine success factors such as hybrid competition, emotionality of product and service offers or wide use of the qualification profile of employees.
285	Supply Chain Planning in Open Business Environment based on Business Patterns	Jeong, Hani; Seo, Jinwu; Lee, Dongmyung; Park, Jinwoo	This research is concerned with supply chain planning in open business environment. First it presents possible business patterns based on manufacturer's relationship with suppliers and/or customers, which determines types of RFQ they use in business. For each pattern, then, we formulated mathematical integrated supply chain planning problem, and presented the experimental result with analysis.

SS 12.1 Fostering Energy Efficiency in Manufacturing - I

ID	Title	Authors	Abstract
360	Toward an Integrated Eco-design Method of Products and Processes - Utilization of TPI as a Glue to Combine Multiple Tools	Kondoh, Shinsuke; Mishima, Nozomu	The objective of this study is to propose an integrated eco-design framework of products and processes aiming to support decision making and communication among multiple divisions in manufacturing firms to improve sustainability of their products. Especially, this paper focuses on the integration of three different methods calculating environmental load, cost, and customer utility value, so that manufacturing firms can simultaneously improve environmental and economic performance of their final products and services. To do so, Total Performance Indicator (TPI), which has been developed by the authors' group, is introduced and utilized as a glue for connecting these methods by interrelating their inputs and outputs. A simplified example of a digital camera is presented to illustrate our method. Future challenges and expansion of our framework are also discussed.
364	A Holistic Approach to Computer-aided Scenario Design Targeting Sustainable Manufacturing	Kishita, Yusuke; Mizuno, Yuji; Hirotsaki, Maki; Wada, Haruna; Fukushige, Shinichi; Umeda, Yasushi	Numerous scenarios have been developed in order to create visions of a sustainable society, such as the IPCC's Scenarios. However, sufficient computational assistance has not been provided for designing scenarios. One critical problem is that it is difficult to understand scenarios rationally since scenarios are written in a text form and their logical structure is unclear. For supporting computer-aided scenario design, this paper presents the concept of Sustainable Society Scenario (3S) Simulator. The key approach is to structure scenarios for computerizing them by representing a scenario structure as a directed graph. Based on this approach, this paper proposes a method for dynamically connecting scenarios with associated simulators for their reuse. A case study illustrates that our method clarifies the logical structure of a scenario, e.g., clarifying rationales for deriving conclusions. Also, the method succeeds in exploring alternative futures by changing assumptions in the scenario.
226	Energy Efficiency Enhancement in Discrete Manufacturing Process with Energy Use Parameters	Heilala, Juhani; Klobut, Krzysztof; Salonen, Tapio; Järvinen, Paula; Siltanen, Pekka; Shemeikka, Jari	The European research project AmI-MoSES is focused on developing energy enhancement service solutions for SME manufacturing companies. The planned service concept is based on Energy Key Performance Indicators in the form of Energy Use Parameters (EUP). EUP indicators are based on monitored energy consumption data (ECD), other measured data and related energy use context showing in a detailed way how energy was used. Case study illustrates how to define EUPs for natural gas fired furnace for steel bar preheating process. The results are visualised with an advisory system to assist users in decision making with regard to energy efficiency improvements and optimisation.
357	Improve Energy Efficiency in Manufacturing Plants through Consumption Forecasting and Real Time Control: Case Study from Pharmaceutical Sector	Introna, Vito; Deli Orazi, Simone; Cesarotti, Vittorio	This paper explains how to introduce an energy consumption control system and how this system can improve the energy efficiency of a manufacturing plant by allowing the organization to identify – often inexpensive - actions for improvement. The paper presents a methodology based on the deduction of system behavior by analyzing historical data on energy consumption and related factors through regression analysis. The proposed methodology is shown by means of a case study in a pharmaceutical plant, but it is applicable in many industrial sectors.

SS 12.2 Fostering Energy Efficiency in Manufacturing - II

ID	Title	Authors	Abstract
109	Energy Efficiency in Manufacturing: Using the Energy Value Stream Method for Building an Energy-Efficient Factory	Erlach, Klaus	In many companies, no information is available on the different types and amounts of energy they use in manufacturing. To obtain precise information on internal energy consumption and systematically develop improvement measures, the value stream method, which has been successfully used to optimize industrial production over many years, has been enhanced with the perspective of energy consumption. Firstly, the energy value stream analysis captures the production processes and records the energy consumed by each process step. This makes energy consumption transparent and attributable and provides product- and process-related performance indicators. Secondly, energy value stream design applies eight design guidelines to derive measures for increasing energy efficiency. These guidelines build on each other in a systematic way and are used to principally challenge the existing production flow. The design section concludes by defining the improvement measures. Finally, the measures are put into practice and the procedure for a continuous enhancement of energy efficiency is integrated into the business strategy.
341	Energy Efficiency Optimization through Production Management Decisions in Manufacturing Environment: A Proposal	Cannata, Alessandro; Taisch, Marco; Vallo, Emanuele	Nowadays, energy efficiency in manufacturing is becoming more and more relevant due to raising of energy prices and to the environmental impact of energy consumption. Among several ways to tackle energy efficiency, improved management and coordination of resources is a possible approach. This paper presents an investigation of production management decisions to improve performances of manufacturing plants considering explicitly their energy consumption. The concept and modeling approach is presented through a case study. The results of the analysis show the trade-off between energy consumption and inventory level.
349	Enhanced Production Management Approaches – Integrating Energy Efficiency Performance into Companies Decision Making Processes	Bunse, Katharina; Vodicka, Matthias; Schneider, Christian Oliver	Climate change and unsecured energy supply are topics that become increasingly important in today’s society. As the manufacturing industry is one of the main consumers of energy, solutions have to be found how to increase the energy efficiency in production processes. This paper proposes the integration of energy efficiency performance in current production management concepts as one important lever to reduce energy consumption. On the basis of an extensive literature review on current concepts and their impact on energy efficiency the paper provides the basis for enhancing production management approaches. The paper identifies the interdependencies of current production management concepts and energy efficiency in the context of lean manufacturing. As a result, the paper proposes a framework for enhancing existing approaches for measuring, controlling and improving the energy efficiency in manufacturing processes.
354	Improving Energy Efficiency by Demand Side Management	Ameling, Michael; Wuensch, Daniela; Nietzold, Frank	Energy management has to consider a lot of data, parameters, and conditions. In particular in production environments a holistic view is needed to evaluate where the energy consumption is really too high. Therefore, energy management is not a standalone task but has to be embedded in an overall production control system. Such a system is presented in this paper. Furthermore, the concept of demand-side energy management will be explained and how this paradigm can be used to optimize the energy consumption in a production environment. The concept is finally validated by a prototype.



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