

Consolidating a research community on production research and logistics in Latin America

Building a research community in Latin America is a challenge nowadays. Despite worldwide globalization and collaboration, wide access to academic papers and exchange programs, research is still in early stages in our continent. It is difficult to point fingers at a single cause, but we can say that this is due to several factors that include geographical barriers, lack of integration between academic units, shortage of funding and government politics. The International Foundation of Production Research and its Americas chapter plays a leading role in bringing researchers around the topic of “production” in the wide sense. Since its early days in 2002, when the chapter was born, the International Conference on Production Research-Americas Region (ICPR-AR) has been held uninterruptedly every two years. The conference has built its own character and differentiates from other conferences in the region. For the local organizers, besides ensuring the quality of the papers and presentations, it is a primary goal to bring hospitality to their guests. Having this in mind, the ICPR-AR has consolidated itself and created a research community. There is still a lot to be done, but the AR is taking steps forward in this direction.

A little bit of “History”

In the early 1960s, Professor Norman Dudley, former Head of the Production Engineering Department at The University of Birmingham in England, founded the *International Journal for Production Research (IJPR)* that started formally in November 1961. Taylor and Francis, the renowned academic publisher edited and produced (and still does it today) the first paper issues of the journal.

In the first editorial, *IJPR*'s founding Editor-in-Chief Norman Dudley wrote; “Production is a meeting place of many disciplines, for the planning, organizing and control of manufacturing industry necessitate an understanding of the nature and interaction of the technical, human and economic forces which are the agents of production. If this understanding can be advanced by bringing together papers which would otherwise have been scattered throughout the literature of the several contributing sciences, the initiative of The Institution of Production Engineers in launching this International Research Journal will have been well justified.”

The journal quickly gained worldwide reputation as one of the top-notch journals in production research. In a bid to attract quality papers, the Editor-in-Chief, Dr Dudley organized the first International Conference on Production Research in Birmingham, UK in 1971. The conference was deemed a success and the organizing committee decided to hold the conference every two years consecutively.

As the conference gained considerable worldwide audience, new regional chapters emerged: the first chapter was Europe-Africa followed by Asia-Pacific and the Americas chapters. The Americas chapter started to organize the International Conference of Production Research (ICPR) – Americas that alternates with the ICPR world event. The Americas Conference also aims to plan and organize the activities of the Americas Region related to the International Foundation of Production Research for the growth of the discipline especially among young researchers. The fundamental role of the regional



American chapter is the establishment of relationships among participants from researcher institutions, academia and industry from the Northern, Central, Southern and the Caribbean regions, as well as the introduction of students in the spread research topics that the ICPR conferences usually offer.

The first ICPR Americas conference, chaired by Professor Cihan Dagli, current board IFPR member, took place in November 2002 in Saint Louis, Missouri, USA under the general theme of “Production Research and Computational Intelligence for Designing and Operating Complex Global Production Systems.” Dr Dagli was also the first president of the Americas chapter. The second version of the ICPR-Americas was held in August 2004 in Santiago, Chile with the conference theme “Information and Communication Technologies for Collaborative Operations Management.” The conferences generated positive responses from the attendees creating an opportunity for the ICPR regional meeting in the Americas alternating with the ICPR world event. The third edition of the ICPR-Americas held in Curitiba, Brazil, had the general theme of “Rethinking Operation Systems: New Roles of Technology, Strategy and Organization in the America’s Integration Era.” The proposed general theme sought to promote a deep discussion about the role of Production Engineering in the America’s integration process. For 2008, the venue of ICPR-Americas took place in Sao Paulo, Brazil at the Universidade de Sao Paulo Campus. The conference had the theme “The Role of Emerging Economies in the Future of Global Production: Creating New Multinationals.” During 2010, Bogota, Colombia hosted the conference with the subject “Technologies in Logistics and Manufacturing for Small and Medium Enterprises.” The sixth edition (2012) was organized around the topic “Production Research in Americas Region: Agenda for the next decade” by the University of Santiago de Chile in Santiago. More recently, in Lima, Peru, the ICPR-Americas addressed the general theme of “Towards sustainable eco-industrialization through applied knowledge.” Currently, the ICPR-Americas has become a regular event that congregates researchers from different regional countries and universities.

The ICPR-Americas 2016 at Valparaiso

The ICPR-Americas aims to exchange experiences and encourages collaborative work among American researchers and practitioners from the continent including the Caribbean region. The conference also aims to plan and organize activities of the Americas Region of the International Foundation on Production Research (IFPR) for the growth of the discipline, especially among young researchers. The 2016 Conference took place at the campus of the Pontifical Catholic University of Valparaíso. The conference theme was “New challenges for engineering in the industry 4.0 era.”

The term Industry 4.0 was first used by the German Government as a strategy “to drive digital manufacturing forward by increasing digitization and the interconnection of products, value chains and business models” (Digital Transformation Monitor, 2017). Industry 4.0 is considered the fourth global industrial revolution, using the three technological innovations: automation, the internet of things and artificial intelligence; stimulating the industrial innovation and creating new economic models (Berger, 2013). In their recent work (Dalenogare, Benitez, Ayala, and Frank, 2018) define the Industry 4.0 as a “new industrial stage in which vertical and horizontal manufacturing processes integration and product connectivity can help companies to achieve higher industrial performance.”

The “Industry 4.0” concept has had a high impact in developing countries. The concept focuses on the manufacturing industry, the optimization of the production process and on the management of supply chain; all concepts relevant for the IFPR.

With this in mind, during the ICPR-Americas 2016, three plenary sessions were organized. The first speech, by Stefan Voss, Professor and Director of the Institute of Information Systems at the University of Hamburg was titled “Future trends in logistics: a biased view.” Prof Voss illustrated the main trends in today’s logistics systems and discussed the possible

directions that logistics as a discipline could take. Professor Voss gave his insights mainly about the role of technology in decision making in the field of logistics.

Edson Pinheiro de Lima, Professor at the Pontifícia Universidade Católica do Paraná in Brazil was the speaker for the second talk: "Industry 4.0 and the challenges for emerging countries." Prof Pinheiro de Lima, shared his thoughts of the future of manufacturing in an internet-linked world and stated that the future of emerging countries in this new era lays on their ability to adapt and react to this changing and turbulent environment.

Finally, Dr Marco Orellana, CIO of Codelco, gave the talk titled "Codelco Digital." Dr Orellana illustrated the changes that have taken place in Codelco, one of the largest mining companies in the world, in order to stay competitive. Dr Orellana focused on the technological changes at all levels, from sensors and other devices, to information systems to manage high level decision making.

The parallel sessions

The ICPR-Americas 2016 assembled more than a hundred researchers that shared their work in 12 different production topics: energy management, green manufacturing, innovation clusters, production and quality management, advanced manufacturing, lean manufacturing, supply chain, human factors, healthcare systems and management, production, multidisciplinary design optimization and other topics in production research. The participants had the opportunity to attend 21 sessions over the course of three days, where 82 researches from different Latin-American countries were shared.

As is stated below, the core of the conference is the production systems and during this edition, the integration of technology and information technology to production, Industry 4.0 was the main topic. In this context, the production session included scheduling planning problems, production planning models, optimization scheduling and planning problems, lot-sizing, etc. All of these topics looked at the integration of production information to the system in order to improve the production systems.

A strongly related topic to production systems is the coordination and management of supply chain. During the ICPR-Americas 2016, the main issues tackled during this session were related with port operation, location problems for agro-food products, planning problems under uncertain conditions, evaluation and comparison of inventory policies, and also there were some exploratory works that looked at identifying opportunities in traditional Latin-America supply chain (forestry industry, hospitality industry and food banks). In this session, there were also optimization models applied to inventory management, distribution in humanitarian situations and mobile markets. It is important to say that this topic was one of the most demanding during the conference, demonstrating the importance that the supply chain management has in scientific contexts.

During the last decade, lean manufacturing has been a trend in production systems. Taking this in to consideration, the lean manufacturing has been an important topic in America where the use of this concept, for example, in a post-graduate school in Brazil managerial problems were identified, the quality system of a slaughterhouse was improved upon and, in a laboratory and a software company the processes were optimized. These cases were included in the conference agenda.

Common and historic topics in production research are always related with human factors and quality. These areas were also included in the conference with talks that involved design thinking, ergonomics, distribution planning, organizational behavior and social analysis (HF), balanced scorecard, quality in service and considerations relating to sustainability and climate change in the quality of production systems (Q).

In this edition, ICPR included new trends in production as energy management, eco-efficiency, SMES and health operations. All of them, subjects relevant in the Latin-America context mainly the topics related with new raw materials, sustainable mobility, social issues in

production and discussions about knowledge management, technology management, industrial clusters and their competitiveness, structural transformation, among others.

Figure 1 shows the distribution of the work presented by session, illustrating the relevance of supply chain, production and lean manufacturing, sessions that had the greatest number of papers.

The *Academia ARLA* Special Section

For this ICPR-Americas edition, two special issues were prepared, one endorsed by the *Engineering Management Journal* and the other by *Academia ARLA*. The scientific ICPR-Americas committee evaluated all research works presented during the conference, from these 37 papers were selected and 27 were invited to submit a complete paper to *Academia ARLA* Special Section. Even though, the special section is dedicated to ICPR-Americas, the call for paper was not exclusive to participants. A total of 11 works accepted the invitation to submit their research for evaluation. Once the peer review processes had been completed, five papers were selected to publish; these reflected the diversity of methodologies, tools and scopes used in Latin America research in production topics.

Related with qualitative methodologies and strategic problems, the paper entitled “Designing a balanced scorecard using a scenario approach” proposed by Miguel Gonzalez, Luis Quesada and Pedro Palominos, presents a method that allows the generation of new strategies that relates to the strategic objectives with the dynamic environments, and therefore integrates them in the company strategy map. The proposal was tested in a training session where the variables that could affect a company’s performance were identified. The method described in this paper could utilize in other companies, generating a better understanding of how the environment affects the company and how it could quickly adapt to external changes.

At operational level, Jairo Rafael Montoya Torres, Elyn Solano Charris and William Guerrero Rueda presented the paper entitled “A decision support system for technician routing with time windows: a case study of a Colombian public utility company.” The Decision Support System is based on the cluster first – route second approach, supported by optimization heuristics. The authors’ proposal was tested on a Colombian public utility

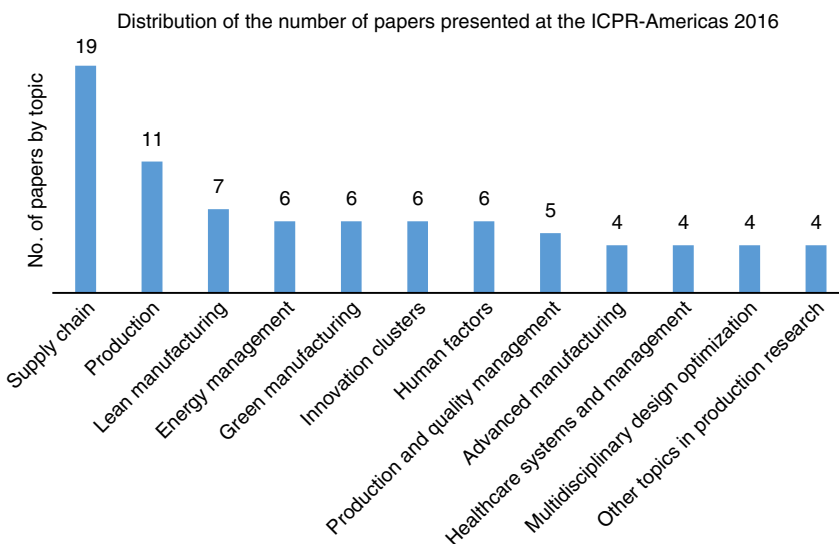


Figure 1.
Works presented
during the ICPR-
Americas 2016
grouped by session

company, allowing an increase of 22 percent in the company's productivity. This paper shows the importance of mathematical modeling to solve real life problems.

The contribution of Juan Villegas and Rodrigo Restrepo's paper is related with the use of Data Envelopment Analysis (DEA) to evaluate and classify suppliers. The authors tested their approach on a motorcycle company. In the first stage, the suppliers were evaluated using an input oriented cross efficiency DEA and then they were classified in categories according to their performance. The methodology presented in the paper "Supplier classification in a Colombian motorcycle company using data envelopment analysis" can be adapted to other similar companies.

Rosa Guadalupe Gonzalez Ramirez, Patricio Vera, Christopher Nikulin and Monica Lopez Campos proposed a methodology to develop prospective studies that were validated on a mining company in Chile. Their approach uses archetypes and system dynamics; mixing qualitative and quantitative analysis. These two methods, integrated with the Vester Matrix, simplify the representation of challenging situations and facilitates analysis. The whole approach was used to study the mining industry in Chile. Four scenarios were studied that integrates the experts' opinions in a more systematic and structured tool. Based on information, critical scenarios and variables were identified. The authors approach is a novelty considering that is the very first time that three well-known tools are integrated in a prospective study.

"Modeling the operation of synchronized supply chains under a collaborative structure" is the title of the paper from Monica Lopez Campos, Salvatore Cannella, Pablo A. Miranda and Raul Stegmaier. Their proposal used the Business Process Modeling (BPM) to identify the information flows among supply chain partners, defining how these chains must share information, and collaborate to reduce collateral damage as, for example, the bullwhip effect. The findings highlight the importance of BPM to easily and to quickly integrate information to the supply network. The authors remark the advantage of this methodology to create flexible structures that can be adaptable to new collaboration practices. The main contribution of this paper is related to the proposal for an algorithm to share information with a collaborative structure integrated in a supply chain.

Final comments

We do hope this Special Section of the 8th ICPR-AR Conference catches the reader's attention and serves your research interests with high quality papers that we have carefully selected and that have gone our rigorous review procedures. We also hope that the researchers that have contributed with this Special Section keep in touch and find the journal as a suitable outlet for their research.

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Appendix. List of title presented during the ICPR-Americas 2016 in their original language

- (1) Análise da produção de etanol, utilizando-se o milho como matéria prima e a energia do bagaço de cana de açúcar.
- (2) Energy efficiency indicators: the evolution of the concepts in the last two decades.
- (3) Energy efficiency framework on machining processes: a proposed model.
- (4) Análisis multi-criterio sobre la valoración de la energía eléctrica de Itaipu en el mercado eléctrico brasileño.

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- (5) A study of the relations among domestic power supply in Brazil, GDP and population growth between 1970 and 2014.
 - (6) Bibliometric analysis of the scientific literature on management of energy efficiency in ports.
 - (7) The evolution of biomimetic applied to sustainable product development.
 - (8) Model for the evaluation of the effectiveness of green practices in supply chains: a study in the electrical and electronics industry in Southern Brazil.
 - (9) Desarrollo de modelos de eco-eficiencia en pequeñas y medianas empresas.
 - (10) Gestión de Operaciones y Logística oportunidades en Movilidad Sostenible: Puntos de intervención en Sistemas Públicos de Bicicletas.
 - (11) Technology development for aquaculture clusters in Brazilian coastal communities.
 - (12) An overview on lean and green product development.
 - (13) Knowledge management in small and medium enterprises implementation analysis: a bibliometric study.
 - (14) Metodología para la medición de la competitividad en clústeres industriales. Un caso de aplicación.
 - (15) An ANP model to identify influence on risk and technology management in context of strategy synergy in a medium – sized Chilean port.
 - (16) Transformación Estructural del Sector Productivo del Paraguay: Un enfoque desde la perspectiva de la Complejidad Económica y del Espacio Producto.
 - (17) Análisis del activo para la innovación en el clúster textil de Paraguay.
 - (18) Innovation in production systems: a systematic review of the last five years.
 - (19) Caracterização de um ambiente empresarial do tipo ETO: um estudo de caso.
 - (20) El Dilema del prisionero y prisionero iterado aplicado a decisiones de mitigación del cambio climático.
 - (21) Diseño de un Cuadro de Mando Integral con un Enfoque de Escenarios.
 - (22) A link between CSR strategy and sustainable operations.
 - (23) A conceptual model proposal for quality management in services.
 - (24) Processes automation and materials feeding in tooling: an international comparison.
 - (25) Una revisión de la manufactura aditiva (AM): tecnología, procesos, postproceso y aplicaciones.
 - (26) Towards an agent-based control of a CyberPhysical Production System using JADE: the CIMUBB case.
 - (27) Bayesian model of microstructure from machining manufacturing process.
 - (28) Determinação dos principais problemas de uma escola de pós-graduação Lato Sensu privada no Brasil: estudo de caso.
 - (29) Lean Six Sigma en las Pymes: Proposición de un indicador de ayuda a la gestión para una implementación exitosa.
 - (30) On the relationship between lean manufacturing implementation, leadership styles orientation and their contextual variables.
 - (31) Herramientas de control de calidad y gestión de procesos aplicadas a planta de beneficio animal.
 - (32) A literature overview about the combination of lean manufacturing tools and simulation.
 - (33) Development of a methodology for the implementation of lean thinking in a reference laboratory.

- (34) Identificação de desperdício a partir da aplicação do mapeamento do fluxo de valor em uma empresa de software de grande porte.
- (35) Modelo de simulación logístico para el transporte de carga terrestre en un corredor vial de la ciudad de Medellín, Colombia, Sud América.
- (36) Empty container's stacking operations: case of an empty container depot in Valparaiso Chile.
- (37) Modelo de planificación jerárquica de producción en cadenas de suministro considerando demanda incierta.
- (38) Estrategias de Localización de Mercados Móviles en Ciudades de Economías Emergentes.
- (39) Propuesta de un sistema de gestión logística en el proceso de exportación de arándanos.
- (40) Challenge in supply chains management in Argentina: the case of forestry-industrial sector.
- (41) Vulnerabilidad del Sistema de Trazabilidad de la Carne bovina de Exportación en la cadena integrada por grandes productores de la cadena productiva, caso comuna de Osorno, Chile.
- (42) Improving the Household waste collection routing in a commune of Santiago de Chile.
- (43) Evaluación de políticas para el control de inventarios de repuestos para equipos biomédicos con demanda intermitente.
- (44) A multivariate-based method to classify products in replenishment categories for VMI applications.
- (45) Multi-criteria assessment of advanced planning system implementation.
- (46) Instrumental, supported in fuzzy methodology for consultants assessment of performance of the implementation of management systems of supply chain in Rio de Janeiro State.
- (47) Power relationships as input for operational decisions.
- (48) Una propuesta de estrategias de mitigación de riesgos en el servicio de transporte para la cadena logística de exportación.
- (49) Theoretical discussion of the dependence of the risks in the supply chain.
- (50) Types of trust: comparative framework.
- (51) Un Modelo de Ruteo con Flota Heterogénea para Distribución de Ayuda Humanitaria en Caso de Desastre Natural.
- (52) Integration of quantitative models and qualitative contextual factors to forecast meat demand in a fast food restaurant.
- (53) The bin packing problem applied to groceries distributed by a food bank.
- (54) Bases biológicas y culturales de la observación en el proceso de Design Thinking.
- (55) Ergonomic analysis of a workstation on a knives sharpening industry: a case study.
- (56) Conversaciones productivas en sistemas de actividad humana de gran complejidad: un enfoque de Gestión Enactiva.
- (57) Una extensión de la metodología Systematic Layout Planning usando QFD: Aplicación al diseño de distribuciones físicas orientada a los servicios.
- (58) Organizational commitment as non-linear behavior.
- (59) Sustainable operations management – a social analysis.
- (60) Desarrollo de una propuesta de mejoramiento continuo para el servicio de urgencias del Hospital Universitario de La Samaritana.
- (61) Desenvolvimento do Sistema de Controle de Vigilância Sanitária (SISVISA) da Subsecretaria de Vigilância, Fiscalização Sanitária e Controle de Zoonoses do Município do Rio de Janeiro (BRASIL).

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- (62) Prothesis design: relevant aspects of user requirements analysis for pre-prosthetic preparation.
 - (63) Asignación de Médicos Internos en el Hospital Universitario San Rafael de Bogotá.
 - (64) Programación de una línea de producción bietápica mixta Open Shop y Flow Shop.
 - (65) Estrategia de resolución para la programación de la producción de una industria de bebidas no alcohólicas basada en un modelo de programación entera mixta.
 - (66) Aplicación de técnicas de sublotteo a un sistema flowshop: consideración de máquinas con tiempos de procesamiento independientes del tamaño del sub lote.
 - (67) A scheduling approach to Production 4.0.
 - (68) Evaluando el proceso de incorporación de un sistema de información ERP en MIPYMES del Sector Cuero, Calzado y Marroquinería en Bucaramanga, Colombia.
 - (69) Presence of strategy production's dimensions in supply chain performance evaluation systems: a bibliometric research.
 - (70) Business Process architecture in the context of enterprise architecture: a survey.
 - (71) Energy-oriented Job Shop Scheduling Problem based on Multi-objective Genetic Algorithm.
 - (72) Caminos críticos en sistemas flowshop.
 - (73) Robust approach to production planning model that combines linear programming with the concept of clearing function.
 - (74) Un sistema de soporte para la planificación de producción en plantas embotelladoras de vino.
 - (75) SVM determination of the best group of chemical variables for predicting abnormal wine fermentations.
 - (76) Metodología en el diseño de pruebas experimentales para instancias en problemas combinatorios.
 - (77) Propuesta de un predictor de venta de acciones a futuro para una Sociedad Deportiva Anónima.
 - (78) Un Modelo Conceptual para la Evaluación de la Disponibilidad Operativa
 - (79) Processo de desenvolvimento de produto orientado a serviços: análise das principais referências.
 - (80) Integrated product development process: a systematic review.
 - (81) Desarrollo e implementación de una metodología para el diseño de celdas de manufactura en pymes.
 - (82) Studying high performance manufacture through the lens of operations strategy.