

Preface

Currently, there is a lack of interoperability, optimization, and integration among tools that is preventing a proper knowledge reuse in the life cycle of critical systems in industry. This situation implies that factories are facing major challenges that go beyond the own complexity of these systems. Although interoperability, optimization, and integration issues have been widely studied, the truth is that no solution has been fully and successfully applied to this critical sector in which safety is a common and likely the most relevant factor. Furthermore, other key points also include (1) keep backward compatibility with existing sound systems in industry, (2) improve current practices to cover the whole life cycle of the engineering of complex systems for industry, (3) tackle the bricks that existing tools and techniques contain in order to prepare a new suite of smart and advances practices that can be adequately applied to these complex systems, and (4) address the challenge of evolving systems that require the cooperation of large sets of stakeholders.

The goal of this book will disseminate current trends among innovative and high-quality research regarding the implementation of conceptual frameworks, strategies, techniques, methodologies, informatics platforms, and models for developing advanced industrial tools and techniques and their application in industry. The specific objectives can be summarized as follows:

- Create a collection of theoretical, real-world, and original research works in the field of applied industrial tools and techniques
- Go beyond the state of the art in the field of industrial and software engineering.
- Publish successful applications and use cases of studies of new approaches, applications, methods, techniques for developing advanced industrial tools, methodologies and techniques and their application in different fields
- Provide an appropriate dissemination venue from both academia and industrial communities. The proposed book aims then at helping in communicating and disseminating relevant recent research on industrial and software engineering.

Moreover, the topics in this book are the interest to academics, researchers, students, stakeholders, and consultants.

This book contains one kind of contribution: regular research papers. These works have been edited according to the norms and guidelines of Springer Verlag Editorial. Several calls for chapters were distributed among the main mailing lists of the field for researchers to submit their works to this issue. In the first deadline, we received a total of 40 expressions of interest in the form of abstracts. Due to the large amount of submissions, abstracts were subject to a screening process to ensure their clarity, authenticity, and relevancy to this book. After the screening process, 30 proposals were invited to submit full versions. At least two reviewers were assigned to every work to proceed with the peer-reviewed process. Twenty-four chapters were finally accepted for their publication after corrections requested by reviewers and editors were addressed.

This book content is structured in four parts: (1) Lean Manufacturing Tools and Techniques Applied to Industry, (2) Applications of Artificial Intelligence Techniques for Industry, (3) Ergonomics Tools and Applications in Industrial Processes, and (4) Application of Logistics Tools to Improve Industrial Processes.

Part I Lean Manufacturing Tools and Techniques Applied to Industry: This part contains ten chapters.

Chapter 1, named SEM: *A Global Technique—Case Applied to TPM*, carried out by Martínez-Loya et al, from Universidad Autónoma de Ciudad Juárez (México), proposes a Structural Equation Modeling (SEM) applied the TPM technique to improve the productivity in maquiladora industry of Ciudad Juárez.

Chapter 2, entitled *Green Production Attributes and its Impact in Company's Sustainability*, by Mendoza-Fong et al. from Universidad Autónoma de Ciudad Juárez (México) and Instituto Tecnológico de Orizaba (México) designed a Structural Equation Modeling with four latent variables: green policy attributes, green attributes preproduction, green attributes in production processes and green attributes in postproduction process to select a supplier. The proposed model was validated in maquiladora industry of Ciudad Juárez, México.

Chapter 3, entitled *Collaborative Multiobjective Model for Urban Goods Distribution Optimization*, by Arango-Serna et al. from Universidad Nacional de Colombia (Facultad de Minas-Sede Medellín, Colombia) and Universidad de San Buenaventura (Colombia) is presenting a genetic multiobjective model for the goods distribution optimization through collaborative inventory between m suppliers and n customers. The model is based on vendor-managed inventory (VMI) strategy and was developed to improve a food distribution process in Medellín downtown (Colombia).

Chapter 4, entitled *Multiagent System Modeling for the Coordination of Processes of Distribution of Goods Using a Memetical Algorithm*, proposed by Arango-Serna et al from Universidad Nacional de Colombia, Facultad de Minas-Sede Medellín (Colombia), and Universidad de San Buenaventura (Colombia), presented a multiagent model for the collection and delivery of goods in a four-level distribution network integrated with a memetic algorithm that facilitates the resource assignment in the several levels and improving the distribution process.

Chapter 5, named *Operational Risk Prioritization in Supply Chain with 3PL Using Fuzzy QFD*, carried out by Osorio-Gómez et al. from Universidad del Valle (Colombia) and Universidad Autónoma de Ciudad Juárez (México), proposed the integration of QFD—Fuzzy Logic for the prioritization of operational risks identified on a supply chain, according to their impact on the most important performance indicators. This proposal was applied to two case studies for Colombian companies.

Chapter 6, entitled *An Alternative to Multi-response Optimization Using a Bayesian Approach*, presented by Limón-Romero et al. from Universidad Autónoma de Baja California (México), Universidade Federal de Santa Catarina (Brazil), Universidad Autónoma de San Luis Potosí (México) and Universidad Estatal de Sonora (México), proposed the modification of a technique of simultaneous optimization of multiple response variables that works using a Bayesian predictive distribution to incorporate different weights to the response variables according to their importance in the cost or functionality of products.

Chapter 7, entitled *A Methodology for Optimizing the Parameters in a Process of Machining a Workpiece Using Multi-objective Particle Swarm Optimization*, proposed by Vergara-Villegas et al. from Universidad Autónoma de Ciudad Juárez (México), used a methodology based on multiobjective particle swarm optimization algorithm in order to identify the optimal parameters for machining a workpiece with a milling.

Chapter 8, named *Lean Manufacturing: A Strategy for Waste Reduction*, proposed by Báez-López et al. from Universidad Autónoma de Baja California (México), Universidad Autónoma de Ciudad Juárez (México), and Universidad de Zaragoza (Spain), discussed the current state of lean manufacturing methodology and described the leading tools that have contributed to waste reduction and increased productivity in the industrial sector.

Chapter 9, named *Collaborative New Product Development and the Supplier/Client Relationship: Cases from the Furniture Industry*, presented by Reis-Silva and Carrizo-Moreira from University of Aveiro (Portugal), identified the procedures and management methods used by firms of the furniture industry on collaborative new product development (CNPd) involving supplier–customer relationships.

Chapter 10, entitled *Realization and Demand for Training in the Planning Processes of Change: Empirical Evidences in the Wine Industry in Rioja Spain*, proposed by Gil and Mataveli from University of La Rioja and National Distance Education University (Spain), analyzed the strategic planning and the implementation of and requirements for continuous training in the Rioja wine sector in Spain and contributes to the field of study of administration of companies by investigating key industrial knowledge in the Spanish economy.

Part II Applications of Artificial Intelligence Techniques for Industry: This part contains five chapters.

Chapter 11, named *Generation of User Interfaces for Mobile Applications Using Neuronal Networks*, presented by Sánchez-Morales et al. from Instituto Tecnológico de Orizaba (México) and Universidad Tecnológica de la Mixteca

(México), presented a software component for generating user interfaces for mobile applications by using pattern recognition, image processing, and neural networks techniques.

Chapter 12, entitled *Association Analysis of Medical Opinions about the Non-realization of Autopsies in a Mexican Hospital*, proposed by Rubio-Delgado et al, from Instituto Tecnológico de Orizaba (México), Hospital Regional de Río Blanco (México), and Universidad Autónoma del Estado de México (México), applied different techniques such as data mining that allowed the construction of a model, which is represented by a set of rules. The rules suggest that in opinion from doctors, some factors are related to decrease autopsies realization in the hospital.

Chapter 13, entitled *Interdependent Projects Selection with Preference Incorporation*, presented by Gomez et al, from Instituto Tecnológico de Madero (México), Universidad Autónoma de Ciudad Juárez (México), and Instituto Tecnológico de Tijuana (México), developed a strategy, based on ant colony optimization that incorporates the decision-maker's preferences into the solution of a case of project portfolio problem under conditions of synergy, cannibalization, redundancy, and with interactions between projects. The algorithm was experimentally tested, and the results show a good performance of it over a random set of instances.

Chapter 14, named *MED-IS-IN, an Intelligent Web App for Recognizing Non-prescription Drugs*, presented by Ceh-Varela et al, from Universidad Tecnológica Metropolitana (México), Instituto Tecnológico de Mérida (México), and Instituto Tecnológico de Orizaba, explained that self-medication and self-prescription are common practices that can be observed in many countries around the world. The consequences of self-medication can range from a mild allergic reaction to death and for this reason, authors develop a Web App, which uses a classifier model for counter medication based on computer vision and machine learning techniques, such as Bag-of-visual-words, K-Means and Support Vector Machines.

Chapter 15, entitled *A Brief Review of IoT Platforms and Applications in Industry*, by Machorro-Cano et al, from Instituto Tecnológico de Orizaba (México) and Universidad del Papaloapan (México), presented the application of Internet of Things (IoT) in the industry, describing its application domains, platforms, and various study cases. In addition, it presents a comparative analysis of the study cases, as well as the trends and challenges of the IoT according to each domain of application.

Part III Ergonomics Tools and Applications in Industrial Processes: This part contains six chapters.

Chapter 16, entitled *A Theoretical Framework About the Impact of Human Factors on Manufacturing Process Performance*, by Arredondo-Soto et al., from Universidad Autónoma de Baja California (México) and Instituto Tecnológico de Tijuana (México), proposed a theoretical framework of how the human factor, since the social, economic, and environmental dimension, affects the productivity. The authors analyzed and contrast the Toyota Production System (TPS), the Ford Production System (FPS), and the Caterpillar Production System (CPS).

Chapter 17, named *Effects of Organizational Culture and Teamwork on Manufacturing Systems' Performance*, by Realyvásquez et al, from Instituto Tecnológico de Tijuana (México) and Universidad Autónoma de Ciudad Juárez (México), determined the relationships between two macroergonomic elements, organizational culture and teamwork, and manufacturing systems' performance (manufacturing processes, customers, and organizational performance).

Chapter 18, entitled *Methodology to Determine Product Dimensions Based on User Anthropometric Data*, by Hernández-Arellano et al, from Universidad Autónoma de Ciudad Juárez (México) and Universidad Autónoma de Baja California (México), proposed a method for dimensioning products based on user-product interactions and the user's anthropometric dimensions.

Chapter 19, *Manual Lifting Standards: Ergonomic Assessment and Proposals for Redesign for Industrial Applications*, by Prado-León Herrera-Lugo from Universidad de Guadalajara (México), presented fundamental guidelines in the field of ergonomics and, in particular, one of the most relevant tools for evaluating the risk implied in lifting heavy loads: The National Institute of Occupational Safety and Health Lifting Equation, along with strategies to prevent or reduce this risk through three case studies related to industrial jobs within the context of México.

Chapter 20, named *Relationship Between Social Support and Burnout Dimensions in Middle and Senior Managers of the Manufacturing Industry in Ciudad Juárez*, presented by Valadez-Torres et al, from Universidad Autónoma de Ciudad Juárez (México), analyzed the relationships between social support and the three dimensions of burnout syndrome (BS) (emotional exhaustion, cynicism, and professional efficacy). The research was carried out in six manufacturing companies from Ciudad Juárez, México, and the sample included 361 middle and senior managers from different departments.

Chapter 21, named *Stressing the Stress or the Complexity of the Human Factor: Psychobiological Consequences of Distress*, by Serrano and Costa from Universidad de Valencia (Spain), addressed the topic of stress in industry, in order to point out several aspects that can contribute to a better understanding of the effects of stress on human factors and to show how stress is associated with diseases in order to emphasize the need to tackle job stress prevention.

Part IV Application of Logistics Tools to Improve Industrial Processes: This part contains three chapters.

Chapter 22, named *A Systemic Conceptual Model to Assess the Sustainability of Industrial Ecosystems*, by Mota-López et al, from Instituto Tecnológico de Orizaba (México) and Universidad Veracruzana (México), proposed a conceptual model to analyze four environmental impact factors: water consumption, energy consumption, emission of water pollutants, and emission of air pollutants, and evaluate the damage they cause to ecosystems. This model is supported by systems dynamics since it is a tool that successfully integrates all involved elements to effectively assess sustainability.

Chapter 23, entitled *An Evolutive Tabu-Search Metaheuristic Approach for the Capacitated Vehicle Routing Problem*, by Caballero-Morales et al, from Universidad Popular Autónoma del Estado de Puebla A.C. (México), presented the

design of a metaheuristic in order to provide near-optimal solutions for large CVRP instances. The proposed metaheuristic integrates a two-stage solution process: First, a set of feasible CVRP routes are obtained by means of a tabu search (TS) algorithm, and second, a Genetic Algorithm (GA) is integrated to improve the feasibility of each CVRP route.

Chapter 24, *Production Planning for a Company in the Industry of Compact Discs Mass Replications*, by Moreno et al, from Universidad Panamericana Campus Guadalajara (México), analyzed a production planning problem for a company that mass-replicates compact discs. The combination of attributes of the orders and the available machines for the processes generate a high complexity to determine the appropriate production routes and sequencing. To optimize the utilization of the production capacities, two approaches were proposed: a simulation model and a linear programming model.

Once a brief summary of chapters has been provided, we would also like to express our gratitude to the reviewers who kindly accepted to contribute in the evaluation of chapters at all stages of the editing process.

Ciudad Juárez, Mexico
Orizaba, Mexico
Ciudad Juárez, Mexico
Orizaba, Mexico

Jorge Luis García-Alcaraz
Giner Alor-Hernández
Aidé Aracely Maldonado-Macías
Cuauhtémoc Sánchez-Ramírez

New Perspectives on Applied Industrial Tools and
Techniques

García-Alcaraz, J.L.; Alor-Hernández, G.;

Maldonado-Macías, A.A.; Sánchez-Ramírez, C. (Eds.)

2018, XXXII, 516 p. 124 illus., 73 illus. in color.,

Hardcover

ISBN: 978-3-319-56870-6