Preface

Due to its dynamism and competitiveness, the industrial sector has become a point of reference in the definition of new corporate strategies to dominate the global market. Therefore, improvement and optimization of industrial processes now play important roles. For instance, Toyota with its production system has turned into a benchmark for improving industrial processes. It has impacted on different industrial sectors, such as the automotive, aerospace, and steel industries, but it has also extended to service providers such as tourism and health, among others (Womack et al., 1990; Bicheno, 2000; Holweg, 2007).

However, process improvement, as a corporate strategy, is not only applicable to production processes. It is also useful to the different key areas of business, including procurement, distribution, customer service, transportation, information technology, logistics, and supply chain management. On the one hand, due to its various benefits – especially in terms of time and costs reduction – process improvement both enhances the corporate image toward customers and increases market coverage (Yuce et al., 2014; Pen et al., 2014). On the other hand, it has become important since, amid market globalization, companies have stopped concentrating their operations on one country or region. They now chose to settle in different places and diversify their operations. Consequently, new regions become industrially and commercially specialized and are integrated into international competition (Sturgeon et al., 2009).

Finding ways to enhance different business processes is therefore significant for researchers and consultants to define new approaches or tools for competitive advantage. Examples of these improvement approaches and tools include simulation techniques for inventory management and diverse methods in production processes, such as lean manufacturing, constraints theory, Kanban systems, Just in Time, and the design of sequencing policies. Also, as for distribution processes, researchers have focused on techniques to design distribution routes, the selection of multimodal and intermodal transportation method, and load analysis. Likewise, the study and evaluation of Supply Chains (SC) and flows of materials and information have enabled ameliorations of industrial processes through e-procurement, B2B strategies, software for service integration with other SC processes, strategic outsourcing of technology and processes, and technology-driven innovations in SC, among others.

Since the general aim of all these techniques is to increase the efficiency of industrial processes, their suitable integration offers promising opportunities to refine costumer service and reduce operating costs, set-up times, inventory, and transportation activities. For instance, Lean Manufacturing (LM) allows companies to increase their competitiveness without reducing or compromising their quality standards. Therefore, LM has become one of the most widely accepted practices for industrial processes, especially in the automotive sector, in which it has managed to increase options for car assembling. This is an important competitive advantage for any automotive company, although it can be replicated in or adapted to other sectors, such as electronics, food, steel, and furniture (Holweg, 2007; García et al., 2014).
From the same perspective, it has become evident that, due to their complexity, supply chains must rely on different tools and techniques (simulation, meta-heuristic approaches, structural equation modeling, artificial intelligence, computing systems, innovation systems, etc.) to be evaluated and analyzed. For instance, simulation has gained relevance in comparison with mathematical programming or stochastic models. Among its strengths, it enables users to find, analyze, and learn about the dynamic behaviors of the system studied, and this is helpful in supply chain decision-making (Sánchez et al., 2011; Moncayo, 2014).

Similarly, computing has become crucial for SC integration and to improve industrial processes. Some examples of computer-based systems are e-procurement, B2B, ERP, B2C, and EDI. They are key components in the development of business models and competitive advantage. For example, e-procurement system is an electronic purchasing channel where users find, select, buy, and return goods via the Internet. Moreover, it provides an organized way to keep an open line of communication with potential suppliers during a business process (Alor et al., 2014).

The general aim of this book is therefore to describe the new trends and recent advances in industrial processes improvement that have reached great impact on different fields of emerging markets (automotive, aerospace and agricultural sectors, telecommunications, healthcare, tourism, supply chain, etc.) In addition, the specific objectives of this work can be summarized as follows:

- Create a collection of theoretical, real-world, and original research works in the field of industrial processes that includes: effective service supply chain design, strategic outsourcing of technology and processes, improvement of service supply chain experience through co-creation, use of Information and Communication Technologies (ICTs) to improve and optimize industrial processes, knowledge management in industrial processes, quantitative models for managing multimodal logistics platforms, industrial processes scheduling and planning, mobile applications in industrial engineering, cloud computing in industrial engineering, cross-domain software innovations applied in industrial engineering, B2C and B2B trends in emerging markets, industrial applications in public and not-for-profit sectors, service-event management, uncertainty in industrial practice, logistics simulation, simulation models for manufacturing, simulation-based scheduling, simulation in warehouse operations, modeling of physical systems, industrial processes, and process modeling, among others.
- Go beyond the state-of-the-art in the field of optimization and improvement of industrial processes.
- Use case studies and successful applications of new approaches, methods, and techniques to improve and optimize industrial processes.
- Provide an appropriate dissemination venue from both academic and industrial communities.

This book merely includes regular research papers as contributions, which have been edited according to the norms and guidelines of IGI Global Publishing. Several call for chapters were distributed among the main mailing lists of the field for researchers to submit their works to this issue. As a result, 42 expressions of interest were received from several countries, including Colombia, Slovenia, India, Mexico, Spain, and Thailand, among others. However, due to the large amount of submissions, abstracts were subject to a screening process to ensure their clarity, authenticity, and relevance to this book.

After the screening process, 30 proposals were invited to submit full versions of their research, and two reviewers were assigned to every work to ensure the peer review process. In the end, 27 chapters were accepted for their publication after corrections requested by reviewers and editors were addressed.
Therefore, the content of this book is structured in five sections: (1) Supply Chain and Logistics, (2) Human Factors and Decision Making, (3) Quality Control, (4) Lean Manufacturing, and (5) Optimization.

Section 1 is titled “Supply Chain and Logistics” and comprises five chapters described as follows:

Chapter 1 named A Framework for Improving Logistics Operations in Container Terminals, carried out by Mar-Ortiz et al. from Centro Universitario Tampico-Madero (Mexico) and Universidad de Los Andes (Chile), discusses how to improve logistics operations to increase the throughput and capacity of container terminals by means of lean logistics principles and simulation optimization methods.

Chapter 2: An Algorithm to Supply Chain Configuration Based on Ant System from Moncayo-Martínez at Instituto Tecnológico Autónomo (Mexico) proposes a new approach to configure supply chains (SC) based on Ant Colony Optimization (ACO). The study addresses how to achieve on-time product deliveries at the minimum cost, select the correct supplier to acquire product components, identify the suitable manufacturer, and determine the appropriate transportation to deliver the final product to customers.

Chapter 3 named Improving the Supply Chain (SC) Stream with Green Product Design (GPD) Strategy, carried out by Villanueva et al. from Universidad Autónoma de Ciudad Juárez (Mexico) and Universidad de La Rioja (Spain), addresses the importance of green product development processes in supply chain. This argument is statistically supported with a case study that demonstrates and describes relationships among the variables studied.

Chapter 4 titled Logistics Geostrategy as A Decision Factor to Locate a Multimodal Logistics Platform was proposed by Rodriguez and Martinez from Universidad Antonio Nariño (Colombia) and Universidad Popular Autónoma del Estado de Puebla (Mexico). The research studies geographical aspects that in one way or another influence decisions, such as determining the best location of a Multimodal Logistics Platform (MLP), without neglecting other factors (economic, political, and environmental) which also affect decision-making processes.

Chapter 5 named Logistics Practices in Small and Medium Enterprises (SME): Risk Context Survey for Hurricanes is a research carried out by researchers Escalante et al. at Universidad Politécnica de Cataluña (Spain) and Universidad Autónoma de Yucatán (Mexico). The chapter explores logistics practices from managers of small and medium-sized companies that face risks associated with hydro-meteorological phenomena. The research aims to study the similarities and relationships between different groups of variables using the ERRS-2014 survey to gather information.

Section 2 of this book is titled “Human Factors and Decision Making.” This section is six chapters long and described as follows:

Chapter 6 named Ergonomic Assessment of Material Handling in CV Joint Assembly is proposed by authors Hernandez-Arellano et al. from Universidad Autónoma de Ciudad Juárez (Mexico) and Universidad de Guanajuato (Mexico). This chapter addresses the ergonomic evaluation of the main tasks in a Constant Velocity (CV) joint assembly process. Tasks selected and evaluated using ergonomic methods were the transport of manufacturing parts on carts, parts supply at the workstation, materials handling within the workstation, and loading the finished product on pallets.

Chapter 7 titled Macroergonomic Work Systems’ Design Factors and Elements: A Literature Review, by Realyvásquez et al. from Universidad Autónoma de Ciudad Juárez (Mexico), offers a literature review to eventually identify the most frequent design factors and elements for macroergonomic work systems. The study also proposes a classification of these factors and elements identified.

Chapter 8 named An Ergonomic Compatibility Perspective on the Selection of Advanced Manufacturing Technology: A Case Study for CNC Vertical Machining Centers is proposed by authors Maldonado-Macías et al. from Universidad Autónoma de Ciudad Juárez (Mexico) and Instituto Tecnológico de Orizaba
This chapter introduces a literature review on the different applications of the Axiomatic Design Theory in the selection of two vertical CNC machining centers.

Chapter 9: Uncertainty in Industrial and Technological Diversification Processes: Stability of AHP-Absolute Measurements Results, by Muerza et al. from Universidad de Zaragoza (Spain), analyzes the suitability of diversification processes by studying the stability of results obtained using the multicriteria technique known as Analytic Hierarchy Process (AHP). The general goal of this chapter is to increase knowledge of uncertainty in the two types of diversification processes.

Chapter 10 named Influence of ICT in the Industrial Sector of MSMEs, carried out by Machorro-Cano from Universidad del Papaloapan (Mexico), reports the influence of information and communication technologies (ICT) on micro, small, and medium-sized companies in the industrial, commercial, and service sectors. Companies are classified based on their type, considering their management, financial, and marketing activities.

Chapter 11 named Operational Risk Management in Third Party Logistics (3PL) was carried out by Manotas-Duque from Universidad del Valle (Colombia). This work analyzes the Third Party Logistics (3PL) provider phenomenon of outsourcing as a growing trend in industries. Benefits of 3PL are addressed in terms of cost reduction and improved performance that allow companies to focus on their core businesses and build virtual enterprises through strategic alliances. Finally, authors develop a model to identify the operational risk factors of a 3PL provider.

The third section of this book, “Quality Control,” comprises five more chapters.

Chapter 12 is named Automatic Defect Detection and Classification of Terminals in A Bussed Electrical Center Using Computer Vision. The research is proposed by Vergara-Villegas et al. from Universidad Autónoma de Ciudad Juárez (Mexico), and it reports an intelligent computer vision (CV) system for the automatic defect detection and classification of terminals in a bussed electrical center (BEC). The system detects and classifies three types of defects: a) twisted, b) damaged, and c) missed terminals in one set of the seven lower pairs.

Chapter 13: Factorial Design for Reduction of Variation in Plastic Parts Weight: Plastic Parts Weight and Injection Molding is a research carried out by Becerra et al. from Instituto Tecnológico de San Juan del Río (Mexico), Universidad Politécnica de Querétaro (Mexico), and Centro de Innovación Aplicada en Tecnologías Competitivas (Mexico). The chapter reports the causes of weight variation of plastic products that lead to high costs and rework. The analysis uses statistical control and describes the type of machinery used for manufacturing. Similarly, it considers the properties and use of materials such as acetal and the conditions for injection molding operation, where a factorial experimental design was used.

Chapter 14 titled CAD Applied to the Design and Cost Reduction in The Use of Molds for Die Casting Process, by Aguilar-Duque et al. from Universidad Autónoma de Baja California (Mexico), reports a case study to improve the productivity of a die casting process. The methodology used involves the integration of a design technique with the DMAIC methodology, using tools such as CAD design.

Chapter 15 named Cloud Computing: A Wave in Service Supply Chain is proposed by authors Banerjee and Raina from Kalyani Government Engineering College (India) and Kalyani University (India). This chapter analyzes the growth and integration of IT industry in business, especially in supply chain members. The study addresses cloud computing as a solution to provide a flexible, on-demand, and dynamically scalable computing infrastructure for many applications.

Chapter 16 titled The Role of Strategic Outsourcing in Global Business, by Kijpokin Kasemsap from Suan Sunandha Rajabhat University (Thailand), reveals the role of strategic outsourcing in global business. Similarly, it describes the theoretical and practical concepts of strategic outsourcing, the management
theories for strategic outsourcing, the applications of Business Process Outsourcing (BPO), Information Technology Outsourcing (ITO), and the significance of strategic outsourcing in global business.

Section 4 of this book is titled “Lean Manufacturing” and introduces five chapters related to this approach.

Chapter 17: Improved Laser Cutting Process in Textile-Automotive Industry is proposed by authors Ruiz y Ruiz et al. from Universidad Autónoma de Baja California (Mexico). This research exposes the problem that one automotive organization faced with a CNC laser cutting machine used in the production process of airbags. The cutting process was identified as the bottleneck that slowed down the rest of the production process and caused problems.

Chapter 18 titled SMED: A Literature Review from 1985 to 2015, by Díaz-Reza et al. from Universidad Autónoma de Ciudad Juárez (Mexico) and Universidad de La Rioja (Spain), reports a literature review of the Single-Minute Exchange of Dies (SMED) technique. This work highlights the main journals and authors that have focused on SMED, as well as new related trends and research.

Chapter 19 named Using Lean Sigma for the Integration of Two Products during a Ramp-Up Event is a research carried out by Alba-Baena et al. from Universidad Autónoma de Ciudad Juárez (Mexico). The chapter describes a combination of lean manufacturing speed with the power of Six Sigma analysis to maintain the quality and productivity of a production process during product design.

Chapter 20 is titled Management Commitment and Its Impact on Economic and Competitive Benefits Gained by The Implementation of Kaizen in The Industry: Management Commitment and Its Relation with Economic and Competitive Benefits of Kaizen. This study was carried out by researchers Oropeza-Vento et al. from Universidad Autónoma Indigenista de México (Mexico), Universidad de Camagüey (Cuba), and Universidad de Holguín (Cuba). It addresses management commitment as a critical success factor for Kaizen and analyses its effect on the economic and competitive benefits obtained from Kaizen implementation in industrial companies.

Chapter 21, The Six Sigma Strategy: Tools and Techniques, was carried out by Limon-Romero et al. from Universidad Autónoma de Baja California (Mexico), Universidad de Zaragoza (Spain), and Universidad Autónoma de Ciudad Juárez (Mexico). This research studies the critical success tools and techniques (T&Ts) of Six Sigma (SS) strategy reported by researchers and practitioners. The main objectives of this work are to describe the current situation of SS and collaborate in the understanding of its successful implementation.

Finally, the fifth section titled “Optimization” and introduces the last five chapters of this book.

Chapter 22 named Managing Emergency Units by Applying Queueing Theory is proposed by Hernandez et al. from Instituto Tecnológico de Celaya (Mexico). The research demonstrates how the queueing theory can be applied to analyze the performance of an emergency unit under different capacity scenarios. The analysis shows that increasing the number of servers required to maintain constant congestion (emphasis on efficiency) is more expensive than adding servers to maintain constant the probability that a patient has to wait (emphasis on quality and efficiency).

Chapter 23 titled Optimizing the Reconfiguration of A Desktop Machining Micro-Factory Based on Scheduling Simulation, by Perez et al. from Universidad de Holguín (Cuba), Universidad de Gramma (Cuba), Instituto Tecnológico de Monterrey (Mexico), Universidad de Camagüey (Cuba), and Universidad Autónoma de Ciudad Juárez (Mexico) discusses a framework to optimize the development of micro-factories in the context of micro-reconfigurable manufacturing systems based on micro-reconfigurable machine tools.
Chapter 24: Sustainable Operation Planning and Optimization in Manufacturing: A Case with Electro Discharge Machining is proposed by authors Vikas et al. from Birla Institute of Technology (India). This study develops a model for the planning production in a sustainable environment. The model forces operations and businesses to remain strongly focused on those factors that have a clear and direct effect on their economic performance, such as materials costs and profits.

Chapter 25, Management Practices for Processes Optimization: Case of Slovenia, by Zlatko-Nedelko and Vojko-Potocan from University of Maribor (Slovenia), examines the use of management practices in Slovenian industrial organizations. More specifically, the research assesses the level of utilization of management practices in industrial organizations in comparison with service companies.

Chapter 26 is titled The Knowledge Transfer Process in the Development of Dynamic Capabilities through Industrial Networks. It is proposed by researchers Gil and Mataveli from Universidad de la Rioja (Spain). The chapter analyzes the processes of knowledge transfer generated in industrial networks to produce dynamic capabilities, specifically innovation development. Researchers also analyze the relationships among network, innovation, learning, and knowledge.

Following this brief summary of chapters, editors of this book would like to express their gratitude to the reviewers who kindly contributed to the evaluation of the research papers at all stages of the editing process.

TARGET AUDIENCE

This book is aimed at professionals and students wishing to expand their knowledge of the optimization of industrial processes performance. Certain concepts addressed in this work assume prior knowledge and understanding from readers. However, every chapter includes a list of related resources that the audience may consult for further reading at any moment.

As for the subject area, this publication combines topics of simulation, operations research, production models, logistics models, lean manufacturing, ICT in industrial processes, and supply chain models. Therefore, the target audience may also include readers interested in or having the following occupations: stakeholder, analyst, consultant, customer service manager, inventory control manager, logistics engineer, logistics manager, logistics software manager, materials manager, production manager, purchasing manager, transportation manager, vendor managed inventory coordinator, warehouse operations manager, professors in academia, government officers, students, corporate leader, senior general manager, managing director, board director, academics and researchers from both universities and business schools, information technology directors and managers, and quality managers and directors. Similarly, libraries and information centers may count on this work as an additional resource on the aforementioned topics.

CREDITS

Although certain topics addressed in the chapters depended on the personal experience of researchers, some others have also been studied and addressed by more authors in different parts of the world. Therefore, this book is an effort to combine the experience from different and various researchers.
REFERENCES


