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Automation and Innovation with Computational Techniques for Futuristic Smart, Safe and Sustainable Manufacturing Processes

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Preface

Sustainability is a variable that many companies want to achieve in three dimensions: social, environmental, and economic. It is well known that Ergonomics and Safety can contribute to the sustainability of companies. To achieve this, several computational techniques can be applied to solve mathematical, scientific, engineering, geometrical, geographical, and statistical problems, which in turn facilitate the sustainability of companies.

Currently, the processes of solving problems in computational techniques are mostly stepwise and methodical, and they are used in all fields of engineering. Therefore, soft computing methods are used to resolve all innovative research problems in engineering, manufacturing, and business management.

Many innovative designs and sustainable solutions have been resolved using IoT and A.I. techniques. Any troublesome work without hard labor and with easy approaches can be resolved by the IoT, which is safer and can be learned quickly. This will help research and find a significant replacement with innovative solutions to technical and business-related problems. Safety and sustainability are major problems for most industries and emerging sectors. Sustainability mainly deals with the environmental parameters that impact industries and social life. Without safety practices, the highly productive industrial sectors will fail. Therefore, safety is an essential criterion and is often addressed by framing and following safety policies.

This book is divided into three parts. Part I, called Sustainability in Manufacturing, comprises Chaps. 1–5. Chapter 1 presents a bilbiometric review of sustainable and intelligent manufacturing, innovation, industry, and safety. The authors used 376 documents on these topics that were analyzed using VOSviewer and Bibliometrix software. The authors report the most-cited authors, countries, and documents.

Chapter 2 presents a systematic literature review regarding the main challenges associated with Industry 4.0 technologies implementation in managing the supply chain in the context of sustainability. The review comprised 45 articles showing trends toward challenges related to labor competency, the costs of implementing 4.0 technologies, organizational culture, and computer security.

Chapter 3 reports a structural equation model integrating three latent variables, with poka-yoke as the independent variable, jidoka as the mediator variable, and

social sustainability as the dependent variable. The variables were related using three hypotheses validated using information from 411 responses to a survey. The authors use the partial least squares technique to test the hypotheses, and the findings indicate that poka-yoke has a direct and positive effect on jidoka and social sustainability, since they improve working conditions and safety for employees.

Chapter 4 aims to determine the importance of barriers to intelligent manufacturing systems in plastic sector companies operating in the providence of Samsun (Turkey) and select the best innovation management model. While the Neutrosophic AHP method was used to weigh the criteria as barriers to intelligent manufacturing systems, the Neutrosophic MARCOS method ranked alternatives as an innovation management model.

Finally, Chap. 5 presents the critical success factors (CSF) in Six Sigma (S.S.) deployment and their relationship to long-term sustainable benefits (S.B.). Using structural modeling, three factors were found: senior management commitment, relationships with clients and suppliers, and training and education. The originality of this study is that these factors predicted 56% of the S.B. derived from the application of S.S. projects for environmental improvement.

Chapters 6–11 deal with different cases of Ergonomics and Safety in manufacturing companies. Chapter 6 provides a case study on the impact of noise on human health. The case study is conducted on Bhubaneswar-based manufacturing, textiles, auto shops, and small-scale industries, where people work continuously from 7 to 8 h daily. The study used three questionnaires to examine labor-related health issues at clinical and workplace levels. Then, an assessment was conducted to evaluate the noise, suggesting a few noise-control devices and soundproofing materials.

Chapter 7 comprises a case study that clarifies occupational health safety as an essential concern for workers engaged in loading and unloading jobs. Moreover, in this case study, people worked near high temperatures to melt the metals or pour them into a frame to fabricate utensils. Subsequently, they were exposed to danger. Finally, ergonomic posture was assessed to determine discomfort in the workplace.

In Chap. 8, we discuss the impact of noise pollution on human hearing capability. To do this, they used the Simulation Annealing optimization method, prioritizing the risk associated with noise using the WASPAS multi-criterion decision-making method.

Chapter 9 discusses the inclusion of ergonomics in autonomous vehicles (A.V.s). First, the components of human-driven vehicle ergonomics, such as "vehicle ergonomics", "warehouse ergonomics", "training and education", and "research and profession", are explained. Second, the discussion focuses on the features of A.V.s used in both "on and off-highway" situations, such as agriculture and mining. Considering these two factors will help decide how much ergonomics are still required for A.V.s and whether they are essential.

Chapter 10 describes a study conducted to assess the postural risk of workers who perform the task of installing paneled walls. Based on the results obtained, a mechanical device was designed and simulated. The findings of this study suggest that the proposed design may be able to improve the postural load levels of workers during the installation of paneled walls.

Finally, Chap. 11 analyzes the Kano Model and Factor Analysis to determine and classify the design attributes for an ergonomic factor tester product for office chairs. Consequently, nine ergonomic attributes for the chairs and eight design attributes for the product were obtained, which were classified as attractive attributes for the user. In turn, they were grouped into three and two groups.

Finally, Part III contains Chaps. 12–14. These chapters cover computational techniques applied in manufacturing. For instance, Chap. 12 raised the problem of vegetable waste in India. Therefore, this chapter focuses on discovering the problems and difficulties of the vegetable production network and finding an answer to the problem in a production network. As a solution, the authors developed an intelligent device that tracks food based on its freshness by flashing green, red, or orange light. In this way, food with preserved natural freshness can be sold to customers.

Chapter 13 presents a technology transfer model for the Autonomous University of Ciudad Juarez based on the essential managerial, linkage, technological, and research elements required for university-industry technology transfer. Taking advantage of the accumulated capabilities in the city allows for the improvement of products and processes developed in manufacturing firms, which could lead to the economic and technological development of the region.

Finally, Chap. 14 presents System Dynamics (S.D.) and its applications in various disciplines; simple considerations in drawing causal loop diagrams; stock and flow diagrams; and safety management systems. Thus, this chapter reveals the application of S.D. as a modeling and computational technique useful in manufacturing safety systems for intervention strategy allocations.

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Tijuana, Mexico — Arturo Realyvásquez Vargas
Bhubaneswar, India — Suchismita Satapathy
Ciudad Juárez, Mexico — Jorge Luis García Alcaraz

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December 12th, 2023

Dear Jesús Andrés Hernández Gómez:

Through this letter, we state that your book chapter entitled **"Predictor model for six sigma deployement and its sustainable benefits"** has been accepted to be published in the book ***Automation and Innovation with Computational Techniques for Futuristic Smart, Safe and Sustainable Manufacturing Processes***. Considering this to do Academic Excellence, Springer's commitment to providing the highest quality publications, excellent service, and a positive image coupled with a steadfast pledge to put the research community and underrepresented research concepts before profit make Springer a unique and preferred publisher.

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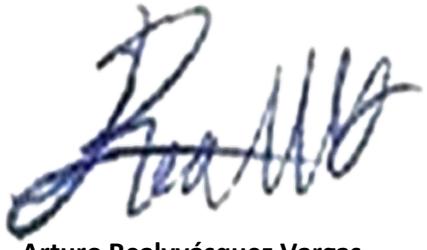
Regards,



Arturo Realyvásquez Vargas

Guest Editor

Forwarded message ---------
De: **suchismita satapaty** <ssatapathyfme@kiit.ac.in>
Date: mié, 19 de abr de 2023, 11:04 p. m.
Subject: your chapter in the final stage of acceptance for the book " Automation and innovation with computational techniques for futuristic smart, safe, and sustainable manufacturing processes".
To: Aida Lopez Guerrero <aida.lopez@uabc.edu.mx>

Dear Prof,
Greetings

I inform you that your chapter is in the final stage of acceptance for the book " Automation and innovation with computational techniques for futuristic smart, safe, and sustainable manufacturing processes".

However, the following is necessary:

1. For all the authors, include full affiliation: department, university, mailing address, city, state, country. Make these changes in the attached document.
2. Be sure all citations are in the SpringerBasic (author-date) style.
3. In another document, Provide an abstract of five rows following the format of the main text of the chapter. Also, for all the authors, provide a short biography in the professional field.

Kindly check and send
Regards
Dr S Satapathy

Reply Forward

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Chapter 5
Predictor Model for Six Sigma Deployment and Its Sustainable Benefits

Aída López-Guerrero, Jesús Andrés Henández-Gómez, Karla Isabel Velázquez-Victorica, Mydory Oyuky Nakasima-López, and Luz del Consuelo Olivares-Fong

Abstract The purpose of this research is to present the critical success factors (CSF) in Six Sigma (SS) deployment and their relationship to long-term sustainable benefits (SB). The method derives from a literature review between the links SS and SB contrasted, conducted in a cross-sectional study in the aerospace industry applying a survey to experts with experience in the subject. Using a structural equation model, three factors are found: senior management commitment, relationship with clients and suppliers, and training and education. The originality of this study shows that these factors predict 56% of the SB derived from the application of SS projects for environmental improvement. These results can guide organizations that are not committed to sustainability to contemplate the sustainable benefits that can be obtained with the implementation of SS, one of the limitations is that the results only apply to the aerospace sector.

Keywords Six sigma · Continuous improvement · Sustainable benefits · Structural model

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