



Genoveva Vargas-Solar
EDITOR

CRITICAL FACTORS IN INDUSTRY 4.0

A Multidisciplinary Perspective



El Colegio de
Chihuahua
Institución Pública de Investigación y Posgrado

D.R. © El Colegio de Chihuahua
Calle Partido Díaz 4723
Colonia Progresista, C.P.32310,
Ciudad Juárez, Chihuahua, México
Tel. 52 6566390397



Texto sometido a doble proceso ciego por académicos externos a esta institución.

Primera edición publicación electrónica 2021
ISBN: 978-607-8214-64-8

Coordinación editorial: E. Liliana Chaparro Vielma
Corrección: Carolina Caballero Covarrubias
Cubierta y diagramación: Karla María Rascón González

Editado en México/Edited in Mexico

Contents

Prologue

CHAPTER 1

Smart Industry: The 4.0 Data Centric Revolution

Genoveva Vargas-Solar, José Luis Zechinelli-Martini,
Javier A. Espinosa-Oviedo..... 11

CHAPTER 2

Facial Recognition & Fingerprint Based Authentication System for Industry 4.0 Cybersecurity

Francisco Enríquez, Jesus Silva, Salvador Noriega, Gabriel Bravo, Erwin
Martínez39

CHAPTER 3

Critical Psychosocial Factors in Workplace Design

Gabriela Jacobo Galicia, Aurora Irma Máynez Guaderrama, Vianey Torres
Argüelles57

CHAPTER 4

Reliability Engineering in Industry 4.0

Manuel Baro-Tijerina, Manuel R. Piña-Monarrez,
Rey David Molina Arredondo.....73

CHAPTER 5

Weibull Reliability Methodology for Ball Bearing Design Based on Hertz Stress With Focus on Industry 4.0

Baldomero Villa-Covarrubias, Manuel R. Piña-Monarez, Lázaro Rico-Pérez 95

CHAPTER 6

Critical Factors on Sustainable Management in Smart Manufacturing Plants of Ciudad Juárez

Cristina Zapien-Guerrero, Vianey Torres-Argüelles, Salvador Noriega, Andrés Hernández-Gómez, Roberto Romero..... 131

CHAPTER 7

Model of Logistics Factors and their Impact on the Competitiveness of Small and Medium Enterprises within the Industry 4.0 Paradigm

Idalí Bailón, Roberto Romero, Favela Marie 147

CHAPTER 8

Design Simulation of a Rotating Prototype for Arm Enhancement on an Exoskeleton

Sofia Maturino, Natalia E. Noriega, Alberto Ochoa-Zezzatti 169

CHAPTER 9

Intelligent Humidifier for Humidity Control in a Smart City Using IoT and Type-2 Fuzzy Logic

Rafael Perez-Tejada, Natalia E. Noriega, Alberto Ochoa-Zezzatti 181

CHAPTER 10

Essential Factor in the Survival of High-Tech SMEs: Relational Capital in the Machining Industry of the Juarez, Chihuahua

Blanca Marquez Miramontes..... 195

CHAPTER 11

Future Determination of Programmed Obsolescence and Future Paradigm Shifts in Technology Consumption of Generation Z Using an Innovative Metaheuristics

Alberto Ochoa-Zezzatti, Liliana Gamez207

CHAPTER 12

Side Effects of the 4.0 Industry on Generation Y: A Review of Technological Changes from an Automotive Labor Perspective at Continental in Ciudad Juárez

Víctor Cabral, Sarahi Sánchez, Alberto Ochoa-Zezzatti 221

CHAPTER 13

Automatic Recognition for Models of Detection of Arachnid Bites in Images Through the use of Deep Learning, a Solution Based on Aml

Ivette Mendoza, Eddy Sánchez-De la Cruz, Alberto Ochoa-Zezzatti.....235

CHAPTER 14

Implementation of a Convolutional Neural Network for the Detection of Avian Pests in Citrus Using Smart Drone

Antonio Romero, Eddy Sánchez-De la Cruz, Alberto Ochoa.....253

CHAPTER 15

Study to Determine the Relationship Between Clinical Variables Associated with Infection and Death from Rickettsiosis in Mexicali, Baja California, Mexico

Ana Dolores Martínez Molina, Rafael Villa Angulo, Javier Molina Salazar, Teresa Franco Esquivel263

CHAPTER 16

Visiting an Urban Park in a Smart City: An Intelligent Systemic Approach Considering Visitors' Desires and Expectations

Diego Adiel Sandoval, Aida-Yarira Reyes, Alberto Ochoa-Zezzatti 281

CHAPTER 17

Case-Based Reasoning to Improve a Serious Game Associated with Borderline Syndrome

Ismael Rodriguez, Alberto Ochoa-Zzzatti293

CHAPTER 18

Ambient Intelligence in the Timely Detection of Color Vision Bedeficiency by Nursing

María Concepción de Luna-López, Rosalba Robles-Ortega, Luis Ernesto Cervera-Gómez, Alberto Ochoa-Zezzatti, Juana Trejo-Franco, Luis Flores-Padilla, Michel Amador-Ruiz, Carlos Gerardo Urenda-Campos, Francisco Javier Luevano-de la Rosa309

CHAPTER 19

Industry 4.0 Sustainability in Manufacturing Enterprise and Impact on Poverty Mitigation in Ciudad Juarez

Carlos Gerardo Urenda Campos, Cely Celene Ronquillo Chávez, Michel Amador Ruiz, María Concepción de Luna López, Armando Esquinca Moreno, José Luis Ihave Gonzalez 321

CHAPTER 20

Elements of the Tap and Sociodemographic Variables that Influence the Entrepreneurial Intention of University Students: A Statistical Analysis

Michel Amador Ruiz, Karla Erika Donjuan Callejo, Sarahí Sánchez León, Carlos Gerardo Urenda Campos, María Concepción de Luna López, Alberto Ochoa Ortiz Zezzatti y Gisela Medrano Hermosillo 335

CHAPTER 21

Blurred Image: Traveling Photographers. The Story of a Profession that Passed Away

Francisco Javier Luévano-de la Rosa, María Concepción de Luna-López, Carlos Alberto Ochoa-Ortiz353

CHAPTER 4

Reliability Engineering in Industry 4.0

Manuel Baro-Tijerina^{*1}, Manuel R. Piña-Monarez¹,
Rey David Molina Arredondo¹

¹ Universidad Autónoma de Ciudad Juárez

^{*} Corresponding Author: al164467@alumnos.uacj.mx

Abstract. In the digitalization era, organizations are investing in tools that allow their processes, human resources, machines, supply chains, and products, to be integrated into a global network. This helps the company's improvement and development to increase in a more efficient way. The industry 4.0 (also known as "the fourth industrial revolution") considers the Internet of Things (IT) and how the improvement in technology allows devices or products interconnect to obtain data, analyze and intercommunicate the data to other devices in real-time.

Industry 4.0 is based on mechanization, electricity and the internet. Therefore, the fourth industrial revolution, via the IT becoming integrated with the manufacturing environment. Because Industry 4.0 considers the connection of the physical world and virtual world by an internet protocol, the physical-virtual systems will take shape of smart facilities, smart storage, smart factories, and smart supply chains. This lets us bring improvements in manufacturing through the whole value chain. The source for improvement comes from the process, engineering, material usage, product management and product reliability. Thus, the object of this research is to present a practical reliability methodology that can be integrated into the implementation of the industry 4.0 paradigm.

Keywords: Future Development for the Internet of Things, Industry 4.0, Factors Affecting Industry 4.0.