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Dagmar Cagánová • Natália Hornáková
Editors

Industry 4.0 Challenges in Smart Cities

 Springer

 **EAI**
RESEARCH MEETS INNOVATION

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Preface

This book deals with the next level of innovative technologies influencing industry and connectivity sectors in the future industrial, urban, and sustainable development. It provides a platform for synergy of ideas within smart industrial innovations, approaching them from various points of view: industry and management 4.0, expansion of new business models, smart technologies identifying up-to-date global challenges, new trends and opportunities. New managerial ideas, cutting-edge innovations, and technologies for mobility agenda are highlighted together with a multidisciplinary perspective approach. This unique point of view will inspire researchers, graduate students, and those who are interested in Smart City topics. Readers will find the answers for various questions connected to global and interconnected modern society.

The book comprises the following 12 chapters:

Chapter 1 investigates the ways to safe implementation and authentication for IoT devices, tying together all associated algorithms, protocols, and network systems. A number of techniques to address related challenges are proposed, such as elliptic curve cryptography (ECC), quantum cryptography, public keys, private keys, pseudonymous certificates, and more. Moreover, a simulation has been carried out to show the efficiency and security of a specific protocol, which proved to be powerful against de-synchronization, replay, and session hijacking attacks.

Chapter 2 is oriented towards determining the best logistical route for the trade of goods between China and Ukraine as a mathematical model. Four different options and their related infrastructure were considered—railway, maritime, road, and air transport—in an experiment. For each option, order delivery volumes of the corresponding type of goods, cargo transportation volume in the current batch, and risk assessment factors using corresponding kinds of transport were evaluated to obtain the final profits of enterprises.

Chapter 3 regards the SIM evolution, the main variances of M2M eSIM networks and approaches to their commercialization. Basic information about architecture, interfaces, and operations is mentioned, as well as three types of M2M eSIM networks—Operator-controlled variance, OEM-controlled variance, and M2M service provider-controlled variance. Before choosing the commercialization approach,

leading ecosystem players are to consider available resources, limitations, advantages, and disadvantages of each option. M2M eSIM technology adoption is still posed with the challenge of complex mesh networks and a long list of standardized and non-standardized interfaces, also acting as an opportunity for future research.

Chapter 4 puts focus on biodegradable municipal waste, and links it to the key issue of most cities in the world concerning energy sources: those being insufficient energy independence, increased transportation costs, and high carbon footprint. By burning the raw materials present in municipal wastes—of which the majority is their biodegradable component, making it a clean, renewable resource—a burden is lifted off city landfills and a source of clean, environmentally friendly alternative fuel is obtained. Benefits of this closed cycle approach are examined in relation to city parks, gardens, or in the surrounding fields and forests near cities.

Chapter 5 delves into the problem of public transport overcrowding, affecting not only the passengers' comfort, but also raising efficiency and financial issues. An embedded system is proposed to count people in the means of public transport, combining a variety of infrared sensors for object detection, detection of direction, and object positioning. Multiple controlled experiments were carried out with a satisfactory success rate of up to 95%.

Chapter 6 examines the cultural evolution towards the Fourth Industrial Revolution, bringing about changes in the fields of economic, social, political, and cultural capital. The basic attribute of the human race is culture, and the human ability to transfer artefacts, cultural technology, and findings cumulatively in time allows for its constant growth and continuity. Today's digital economy is faced with a question of how the quality of human life might change under the determining influence of Industry 4.0.

Chapter 7 proposes a case study from Slovakia regarding sustainable urban mobility in hopes for greener cities. The levels of dust, noise, and air pollution from the traffic dropped significantly as a result of the COVID-19 pandemic. Even though app-based and shared-ride services have risen in popularity, individual car transport dominates at the expense of sustainable modes of transport in most of Slovakia, leading to traffic congestion during peak hours. The possibilities of multimodality are shown in the context of short distance moves in the city of Nitra through a conducted marketing research. The findings show significant contrast in residents' attitudes in different urban areas.

Chapter 8 also presents a case study concerning the effects of the COVID-19 pandemic, specifically in city transport systems in the Slovak Republic. The results prove that the measures taken by the government have strongly minimized the impacts of the virus, flattening the curve swiftly. This chapter also zooms in on additional solutions to help fight the spread of the virus and improve passengers' safety in transport systems, describing the concepts of Smart City, Safe City, smart transport and related systems. The focus of the proposed measures is given to the original design of mass transport system.

Chapter 9 considers road detection as a means for minimizing health hazards while driving. It states that currently, road condition is monitored infrequently due to it being both time consuming and costly. Specifics of a developed IoT system

is examined in the chapter in order to crowdsource a system ensuring the health of roadways by informing transit authorities of pothole locations, speeding up the whole monitoring process. Such a system includes smart sensors and performs machine learning on accelerometer data, processes and analyses acquired data without using the cloud, and sends it to a web server, sharing the location of road hazard with the responsible transit authorities.

Chapter 10 deals with the newly arisen digitalization requirements and legal obligations for carrier companies caused by COVID-19. A concrete example of a food retailer's changed workflow is examined as a result of having to comply with these regulations, using digital instruments as one of the key tools to keep their distance. The advantages and disadvantages of digital technology in the transport industry are considered, and it is shown how these technologies reduce certain types of costs and increase efficiency and transparency.

Chapter 11 reviews the possibility of Czech countries to enter the Smart Factory revolution. Three factors are considered—point of departure, access to new technologies, and realization and successfulness—while assessing the reason for Czech countries success in adapting to all the industrial revolutions throughout the past, as well as mentioning the importance of geopolitics and international policy. For the main research method, description, analysis, and comparison are used.

Chapter 12 presents the results of analysis of 50 IoT privacy policies in order to determine whether IoT manufacturers collect personal information about their users. The need for this method arose with the increased popularity of IoT devices, where the privacy policy statements are too long and too complicated, leaving the user confused and often letting the device access sensitive information without even realizing it. The used method studies the complicated and ambiguous statements in-depth, mimicking how an ordinary person reads and understands such policies sentence by sentence, even categorizing and labelling personal information according to its sensitivity level with a supervised machine. The high accuracy achieved by the classifier (98.8%) proves its reliability and validity.

Lastly, the editors would like to express their sincere thanks to the authors of the chapters for contributing their outstanding knowledge, experience, and latest research results towards the creation of this book.

Trnava, Slovakia

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