
Book Review

Reviewed by Leigh Wang

Email: leighwang2024@u.northwestern.edu

Handbook of Research on Artificial Intelligence, Innovation and Entrepreneurship

**by: Elias G. Carayannis and Evangelos Grigoroudis
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The Handbook takes an integrated approach to AI-enabled technology innovation and entrepreneurship, exploring the role of AI in digital transformation and innovation ecosystems. It adopts a Quadruple/Quintuple Innovation Helix approach, including the fourth and fifth helices of media-based and culture-based public, civil society, arts, artistic research, arts-based innovation, and natural environments of society. The 26 chapters across eight parts cover various aspects of AI-driven digital transformation in knowledge economies and societies.

Part I. AI for business

The first part of the Handbook introduces AI for business and its implications. It discusses the nature, dynamics, content, and impact of advanced and emerging AI technologies, methodologies, and tools on the competitive landscape of businesses. It also explores the development of new tools and strategies for business success.

Chapter 1 by Hernández et al. uses bibliometric analysis to examine the intellectual structure and evolution of the AI concept, identifying the most frequently used keywords related to AI. The study maps the AI knowledge base, highlighting emerging specialties such as machine learning, deep learning, robotics, natural language processing, support vector machines, and neural networks. This mapping can provide insights into the development of AI as a field and suggest new research directions.

Harvard explores the concept of AI as a term that inspires innovation and entrepreneurship, rather than being a threat in Chapter 2. The chapter emphasises the potential of AI to create a people-friendly future. Lemonakis and Zopounidis discuss the impact of AI, machine learning, and deep learning on the future of business in Chapter 3. They explore current AI applications and highlight how AI can improve quality of life.

Chapter 4 by Harvard presents a collection of interviews with French entrepreneurs who are implementing AI. The chapter investigates how entrepreneurs interpret

intelligence, innovation, and entrepreneurship in their daily operations. The study reveals that AI, as perceived by entrepreneurs, is linked to novelty, improvement, problem-solving, trust, and risk.

Part II. Digital transformation

The second part of the Handbook examines the impact of expanding networks on the role of information systems (IS) and information technology (IT) in organisations, emphasising their strategic importance beyond back-office process enablers. Theories of technological change are also explored.

Chapter 5, “Digital transformation and digital maturity models: A blueprint strategic decision-making framework” by Mitroulis and Kitsios, discusses the critical factors that organisations need to consider for their digital transformation journey. The authors propose a conceptual framework, along with a case study, based on the existing literature on digital transformation maturity models. The synthesised framework can serve as a blueprint for strategic decision-making in digital transformation.

Piccolo et al. explore the advantages of utilising AI in new product development, with a specific focus on sustainable urban mobility in Chapter 6. Using a case study of electric minibuses in Turin, the authors showcase how design can serve as an engine of innovation, creating innovative product and service offerings from a technological perspective. The chapter highlights the benefits of applying AI to new product development and its potential to drive sustainability in urban mobility.

Chapter 7, written by Michael, examines the four pillars of modern AI systems: data, organisation, automation, and explanations. The chapter emphasises that explainability is essential for certifying AI systems, not only in terms of objective metrics of accuracy but also in terms of their cognitive compatibility with the subjective needs and abilities of the humans for whom the system was designed. The chapter discusses the importance of explainability as a tool in the development and certification of AI systems.

Marinakakis et al. present the AI-4-Energy framework, which supports AI-on-Demand in the energy sector in Chapter 8. The chapter explores next-generation energy management systems (‘Energy Management 4.0’) and discusses how the framework enables cross-sector analytic tools for integrated and intelligent energy management. It emphasises seamless data information and knowledge exchange under respective sovereignty and regulatory principles. Finally, the chapter presents some applications of next-generation energy management.

Part III. Digital entrepreneurship

The third part of the Handbook explores the connection between AI and value creation in digital entrepreneurship, discussing industry-specific trends and opportunities. The focus is on how AI can accelerate or assure value creation and how it can be incorporated into the value creation process.

Chapter 9 by Kitsios and Kamariotou examines the collaborative roles of stakeholders in open data ecosystems. The authors propose a theoretical framework and present a case study in Thessaloniki, Greece, regarding the development of open data-driven projects. These projects increase social networking among public and private sector actors, non-

governmental organisations, citizens, and developers. The chapter analyses their relationships, networking opportunities, and challenges to better understand their collaborative roles in open data ecosystems.

Knox et al. discuss cognitive agility as a critical requirement for successful AI utilisation in entrepreneurial contexts in Chapter 10. The authors emphasise that cognitive expertise development can help mitigate ethical issues, power imbalances, bias, and adversarial factors that pose significant challenges to AI-based solutions. They explore the importance of cognitive flexibility and adaptability in managing these challenges and present a framework for developing cognitive agility in AI-based entrepreneurship.

Chapter 11 by Cherepovitsyna explores AI-driven innovation and entrepreneurship in the energy sector. The author discusses the potential for AI to transform the sector and meet growing demand while also meeting environmental targets. The chapter highlights how AI can create new models and operating principles that are more efficient and environmentally friendly, fostering innovation in the process. AI is seen as a key enabler of decarbonised pathways in the energy sector.

Baldassarri and Formica explore the cultural world of high-tech startups and its role in transformative entrepreneurship in Chapter 12. The authors highlight the importance of the cultural landscape in which businesses are born and developed, emphasising the need for startups to embrace both technology and culture to achieve true innovation and disrupt the current state of the industry.

Part IV. Digital business models and Industry 4.0

The Handbook's fourth section explores digital business models and Industry 4.0, examining the impact of AI-enabled technologies on new business models and the implications of AI in Industry 4.0. The section covers technical issues such as blockchain technology, robotics, and intelligent manufacturing, as well as the socio-economic aspects of Industry 4.0.

Aggarwal and Sindakis' Chapter 13 examines the value creation of artificial intelligence through business models based on the Internet of Things (IoT). The authors explore how these business models influence the value creation of AI and find that AI systems are accepted as a technology that offers an alternative approach to addressing complex issues. Additionally, the concept of business models provides strategists with a new way to consider options in complex, uncertain, and unpredictable environments.

In Chapter 14, Spathoulas and Katsikas explore the implications of blockchain technologies in Industry 4.0. The authors present the current use of blockchain technology in Industry 4.0 and discuss limitations and challenges. They also highlight opportunities to address technological and social challenges or propose new approaches, through the use of blockchain technology.

Chapter 15, "Artificial Intelligence and emerging technologies: Exploring Opportunities through smart specialisation" by Rakhmatullin and Hegyi, explores the connections between AI and Smart Specialisation Strategies (S3). The authors emphasise that new and emerging technologies, including AI, are associated with several S3 priorities in European regions. The chapter also examines how interregional collaborative actions, such as thematic S3 partnerships, can help regions benefit from the opportunities provided by new technological developments.

Part V. Cyber Security

The Handbook's fifth section centers on cybersecurity.

Chapter 16 by Livanis et al. examines the financial dimension of cyber risk and underscores the critical role of Chief Executive Officers and Chief Financial Officers in its management. The authors argue that cyber-security is not solely an information technology concern but rather a cross-functional risk management challenge. As such, businesses should evaluate cyber risks and establish strategic plans for their mitigation. This requires developing a framework that includes financial risk analysis and collaboration across organisational units to manage cyber risks efficiently.

Pandey and Katsikas' Chapter 17 explores the future of cyber risk management and proposes an AI-driven, DLT-based smart contract system for the secure sharing of threat intelligence, risk modelling, and automated risk transfer. The authors evaluate the proposed architecture for the automation of decision-making processes for cyber risk mitigation and residual risk transfer. A SWOT analysis demonstrates that the system's strengths and opportunities outweigh its weaknesses and threats. The chapter emphasises the potential of AI and DLT to enhance cyber risk management through automated modelling, decision-making, and transfer.

Part VI. Smart cities

The Handbook's sixth section focuses on smart cities, exploring the role of AI in their development and how their infrastructure and digital solutions impact knowledge-based innovation ecosystems. It examines how AI can power the growth of smart cities while analysing the effects of smart cities infrastructure and digital solutions on the development of such ecosystems.

Panori et al.'s Chapter 18 explores the intersection of AI, smart cities, and innovation in public services. The authors argue that current smart city services are limited by their monolithic architecture and fragmented solutions across domains, which limits their impact. To address this, the chapter proposes a new framework for smart city services design that incorporates microservices and enhances them with AI and Big-Data Analytics. The authors highlight the importance of combining human intelligence, collective intelligence, and machine intelligence in the development of smart city public services.

Sotirelis et al. investigate various smart city architecture models and present a customised multidimensional smart grid architecture model (SGAM) in Chapter 19. The proposed architecture is built on six pillars, enabling cost-efficient and comprehensive management of smart cities. The chapter emphasises the importance of formalisation and consistency in the reference model to foster common ground for different smart initiatives. The goal is to promote a standardised approach that ensures effective coordination and integration of smart city solutions.

Chapter 20 by Farinha et al. delves into smart city innovations through a case study, analysing six collaborative projects in areas such as road prevention, underground utility management, and user experience analysis for mobile operators. Additionally, the study examines energy consumption prediction in smart buildings and an integrated technology platform for smart cities. The analysis offers insights that may be applied to other

territories, facilitating the replication of successful solutions and enhancing the overall intelligence of smart city innovation ecosystems.

Part VII. Society and the digital transformation

Part 7 of the Handbook explores how AI-driven technology innovation and entrepreneurship affect civil society, labour, and education.

In Chapter 21, Michalitsi-Psarrou et al. examine how simulation of human mobility can aid in the search for missing children. The authors emphasise the importance of citizen engagement in citizen-sensing applications that use mobile technology. The presented approach uses data analytics, algorithmic processes, modelling, and simulation to provide an innovative solution to this social problem. The chapter highlights the potential of technology to address critical societal issues such as missing children.

Krassadaki and Matsatsinis check “Career options and necessary technical skills in AI” and dig up issues related to the labour market in AI technologies in Chapter 22. In addition to the direct impacts of AI on employment, the authors note that a new range of specialties and professions will appear in the future. These specialties, in addition to technical skills, are associated with certain human attitudes, competencies, and values, justifying the importance of informally acquired social-emotional skills.

Chapter 23, titled “The Impact of AI on Expert Labor and Professions,” introduces a “neo-traitist” framework to assess the potential effects of AI on the professional status of project management. The authors argue that AI can both threaten and enhance the status of project management and practitioners. The framework is applicable to various professions in contemporary organisations, enabling the evaluation of AI’s impact on professional roles and responsibilities.

Part VIII. AI and democracy

The Handbook’s final section highlights the importance of democracy for the full realisation of AI and innovation. It underscores that democracy enables the connectedness of knowledge and democracy development, making it essential to AI’s creative innovation in Industry 4.0. The section examines the nonlinear process of AI-based digital transformation and its impact on labour, education, and civil society. The Handbook suggests that a knowledge economy’s evolution will depend on how democracies harness AI’s potential.

In Chapter 24, Campbell and Carayannis’ explore the transition from Industry 4.0 to 5.0, and the role of governance in supporting this shift. They emphasise the importance of higher education institutions in promoting knowledge and innovation through their governance structures. By leveraging good governance tools, democracies can stimulate and support the development of industry, and institutions of higher education are key players in this process.

Clough and Otterbacher’s chapter 25 titled “Democratizing AI: From Theory to Practice” highlights that the current state of AI democracy only addresses one element of democracy, which is providing people with tools and technical infrastructure to participate in AI. However, it fails to address the other two elements of a democracy, which are protecting people’s freedoms and ensuring access to social benefits.

In Chapter 26, Campbell and Carayannis emphasise that governance, policy output, and sustainable development are key determinants of high-quality democracy in their analysis of sustainable development. They argue that sustainable development plays a crucial role in measuring and conceptualising democracy. They also suggest that the success of digital transformation in democracy should be judged by whether it furthers the advancement of sustainable development as a benchmark for assessing its progress.

This dynamic topic continues to be the focus of ongoing research, with recent studies including Gupta et al. (2023), who analysed a dataset of 482 research papers published from 1994 to 2022 in Scopus to explore the role of AI in achieving sustainable development goals. The study found a positive relationship between AI and sustainable entrepreneurship, highlighting the importance of environmental factors and economic models in achieving sustainability objectives. Mariani et al. (2023) conducted a Systematic Quantitative Literature Review to explore AI-related innovation research, identifying key antecedents and consequences of AI in innovation, including technological, social, and economic factors, as well as product, process, business model, and social innovation. Additionally, a comprehensive encyclopaedia has recently been published (Wang, 2023).

The Handbook is an extremely valuable resource for academics, policymakers, practitioners, and researchers interested in Science, Technology, Innovation, Entrepreneurship, Artificial Intelligence, Digital Transformation, and their impact on Industry, Labor, Democracy, and Education. It can also supplement graduate courses in Emerging Technologies, IS/IT Strategies, New Technologies, Innovation, and Entrepreneurship, New Ventures Financing, and Entrepreneurship.

References

- Gupta, B.B., Gaurav, A., Panigrahi, P.K. and Arya, V. (2023) 'Analysis of artificial intelligence-based technologies and approaches on sustainable entrepreneurship', *Technological Forecasting and Social Change*, Vol. 186, p.122152.
- Mariani, M.M., Machado, I. and Nambisan, S. (2023) 'Types of innovation and artificial intelligence: A systematic quantitative literature review and research agenda', *Journal of Business Research*, Vol. 155, p.113364.
- Wang, J. (Ed.) (2023). *Encyclopedia of Data Science and Machine Learning (5 Volumes)*, IGI Global, <https://doi.org/10.4018/978-1-7998-9220-5>