Book Review

Your Life Is Manufactured: How We Make Things, Why It Matters and How We Can Do It Better Authored by Tim Mishall

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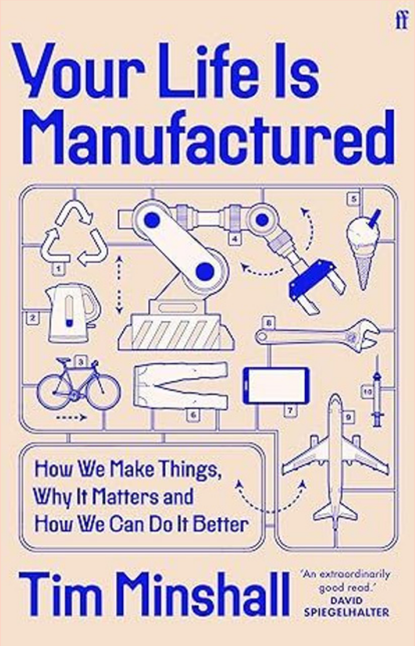
Abstract

This book review highlights the pivotal role of manufacturing in modern society and the increasingly varied industrial landscapes shaped by digital transformation. This underscores the importance of adopting a human-centered approach to achieve sustainable manufacturing. From a sociomaterialist perspective, Cambridge University Professor Tim Minshall discusses the critical role of manufacturing within complex artificial systems that emerge from digital innovation, advocating sustainable practices rooted in human-centered values. By utilizing a sociotechnical systems innovation framework, this book offers valuable insights for those interested in exploring complex systems and technological trends, supported by the epistemic foundation of sociomaterialism that underpins Minshall's arguments. This review explores the vital contributions of manufacturing, considering



its epistemological basis and addressing the often-overlooked practical agenda for latecomer manufacturers in the Global South, such as Thailand, to promote sustainable manufacturing-led innovation amid ongoing digital transformation.

Keywords: Manufacturing, Technology Management, Design Management, Sociomaterialism, Human-centred manufacturing

1. Overview

Professor Tim Minshall, Head of the Institute for Manufacturing (IfM) at the University of Cambridge, UK, and an internationally recognized expert, released his most recent book, *Your Life is Manufactured* (2025). This publication delivers a nuanced analysis of the intricate interplay between engineered goods and human experience, highlighting how manufacturing fundamentally shapes contemporary life. Adopting a human-centered perspective, Minshall explored the social and technological dimensions of manufacturing, emphasizing its critical role within increasingly complex artificial systems. The book is organized into two principal sections. The first examines how manufacturing operates in the world, spanning chapters one to four, and investigates the pervasive influence of manufacturing on everyday life. This section draws on diverse case studies, including a local food factory in the UK and manufacturers embedded within global supply chains, to illustrate the integration of manufacturing into daily life. The second part addresses transformative trends in the sector, such as digitalization and sustainable manufacturing practices, all considered through a human-centered perspective.

Throughout the text, Minshall contends that the significance of manufacturing has been overlooked amid the rapid advancements characterizing the Fourth Industrial Revolution, particularly with the ascendance of the knowledge economy (KE) and growing digital innovation. Referencing economist Ha-Joon Chang's critique of the overemphasis on KE and the accelerated process of deindustrialization in the Global North (Chang, 2014, pp. 256–262), Minshall articulates concerns about prevailing narratives that portray manufacturing as environmentally harmful or outdated within national innovation strategies.

By employing a socio-technical system innovation approach, Minshall offers valuable insights to a broad audience, including university students, designers, engineers, and early career professionals, who seek a comprehensive understanding of complex systems and current technological trends such as AI-driven digital developments (Yoo et al., 2024). In addition, the discourse engages with the epistemic foundations of sociomaterialism, which underpins Minshall's argument regarding the pivotal importance of manufacturing in complex, artificial environments.

This paper introduces the concept of sociomaterialism as articulated by Minshall, discusses the central contributions of the book within this theoretical framework, and identifies areas that warrant further investigation. In particular, the practical implications for latecomer manufacturers in the Global South, such as those in Thailand, are examined, especially in the context of fostering sustainable manufacturing-led innovation during the ongoing digital transformation.

2. How Might Things be Manufactured and Shape Our Lives?

2.1 Underlying Epistemic Assumption: Sociomaterialism

Minshell's epistemic foundation aligns closely with the sociomaterialist epistemological framework, which contributes to theoretical advancements across fields, such as design, information systems, organizational science, sociology, engineering, and technology management. As Minshall emphasizes in the book, this epistemological perspective helps clarify how material practices, including design and manufacturing, emerge from the interplay between human social actions and non-human actors.

The discussion begins with complexity theory, as proposed by the renowned economist Herbert Simon (1996), focusing on complex systems and the principle of 'nearly decomposability.' This concept describes a method for partitioning systems that enables a series of interactions among components, subsystems, and internal structures, typically organized hierarchically to achieve the functioning of artifacts, including products, services, organizations, or systems. For example, Minshall addressed the impact of the level of complexity in a product system to be manufactured on a global supply chain; more complex products require more complex logistics to be considered in the manufacturing process, such as the iPhone. Until the final product arrives in the consumer's hands, the product, including components supplied globally, travels at least 250,000 km, which diverse stakeholders might engage in the supply chain (Minshall, 2025, pp 74-75). Hence, researchers in technology innovation management, such as Minshall's discussions in the book, broadly draw on the theoretical foundation.

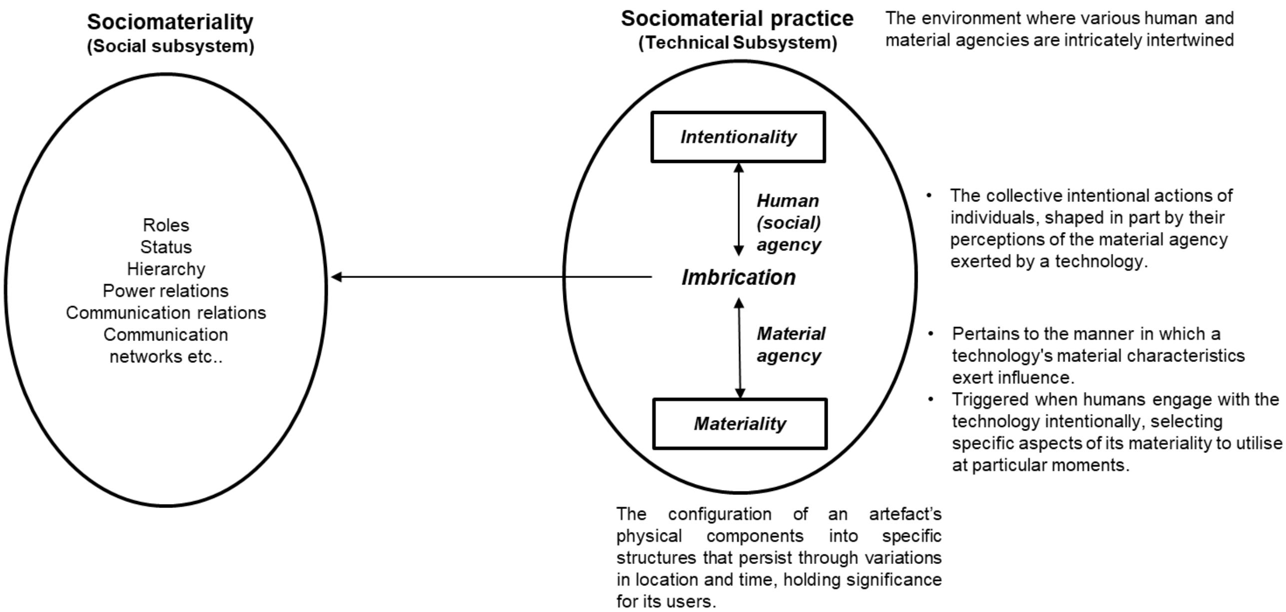


Figure 1. A socio-technical system is conceptualized as an abstract infrastructure bridging social constructs, including human and societal elements, and technical components, such as technological products, services, and systems. This system evolves recursively through various sociomaterial practices including design and manufacturing. Within these practices, individuals' intentionality develops in response to both social and material actions facilitated by the technical system (adapted from Leonardi 2012).

Simon's complex system theory serves as a foundation for sociomaterialist theory, which suggests that human social actions within material practices are intrinsically linked with non-human entities like norms, institutions, and technology. These elements are crucial when analyzing how humans construct and evolve artificial environments comprising various subsystems (Leonardi, 2012; Suchman et al., 2002) (see Figure 1). For example, design is a form of sociomaterial practice, particularly in the context of prototyping. Effective design results, such as prototypes, arise from the interaction between human user preferences and essential non-human factors, such as the technologies used in the design process, ultimately leading to user-friendly solutions (Suchman et al., 2002). Researchers in digital innovation management have also explored these concepts from a sociomaterialist viewpoint, examining how digital materiality differs from physical goods. Digital artifacts are fluid and generative, created through a continuous combination of software and hardware within a widely distributed innovation network involving numerous social agents (i.e., humans), which may influence increasingly digitalized social and technical systems (Leonardi, 2012; Yoo et al., 2012) (Figure 2).

From a sociomaterialist viewpoint, design researchers contend that design practices should emphasize human-centered problem-solving, aiming for innovation within both social and technical systems through integrated sociomaterial approaches. Successful design necessitates addressing both social and technical aspects simultaneously rather than solely concentrating on technical solutions (Bannon & Ehn, 2013). The current trend in design studies towards sustainable innovation, including Design for Sustainability (DfS), embodies this perspective by promoting systems innovation that encompasses individual products, services, and socio-technical frameworks such as policy design and institutional reform (Ceschin & Gaziulusoy, 2016).

According to sociomaterialist scholars, human agency is fundamentally involved in sociomaterial practices, such as design and manufacturing. Within this framework, various materials act as agents or conduits, transmitting actions that originate from human intentions toward technical systems (Figure 1). These social actions are intricately connected to nonhuman entities, such as norms, institutions, and technology, and they participate in material practices that meet the needs of social actors. Consequently, the material practices executed by human agencies mirror the expectations of social actors, thereby forming sociomaterial practices (Leonardi, 2012; Suchman et al., 2002). These practices are essential for shaping and organizing everyday activities, including work practices (Leonardi, 2012; Orlikowski & Scott, 2014; Suchman et al., 2002).

Minshall's epistemic assumption emphasizes the complex nature of manufacturing environments, illustrating the reciprocal relationship between manufacturing intricacies and social dynamics from a sociomaterialist perspective, as demonstrated in his series of research papers on technology innovation management. For instance, Mortara and Minshall (2014) proposed that social dynamics, including human participation, play a vital role in a company's open innovation process to achieve innovative outcomes. This encompasses activities such as talent acquisition and stakeholder communication. This viewpoint offers valuable insights for policymakers and can influence changes in public attitudes and decision-making processes, perceiving open innovation as a recursive interaction and evolutionary process between the actions of social and material agencies.

2.2 Towards Social-Technical Innovation by Manufacturing

2.2.1 The Value of Manufacturing

In the initial section of his book, Minshall examined various sociomaterial practices associated with manufacturing in the context of daily life and the broader industrial ecosystem. He analyses how our lives are interconnected with manufacturing environments, drawing on a range of case studies from local food factories in the UK to the intricate semiconductor chip industry embedded in global supply chains. Minshall contends that the process of creative destruction, which drives paradigm shifts in technological innovation (Kuhn, 1997), has frequently been propelled by advancements in manufacturing, as exemplified by companies like Tesla. The emergence of electric vehicles (EVs) has significantly disrupted the gasoline-powered automotive industry.

Minshall explored issues related to dominant logic in the technological innovation process, noting the influence of social and technological inertia within the industry. Dominant logic serves as an information filter during the creation and processing of organizational knowledge. While it assists firms in prioritizing pertinent information, an overreliance on established logic can introduce bias, impeding the integration of new designs, business ideas, and technologies (Bettis & Prahalad, 1995; Chesbrough, 2010).

Despite significant breakthroughs, EV adoption remained limited until Elon Musk introduced mass-market EVs in 2008, largely because of the prevailing dominant logic and complexity inertia within the industry. These entrenched conventions, supported by highly skilled professionals trained in internal combustion engine (ICE) manufacturing, pose substantial challenges to the adoption of novel technological paradigms in the automotive industry. The economic reliance on existing manufacturing processes further complicates this transition.

Minshall underscores the evolving significance of manufacturing in the digital era, which is characterized by artificial intelligence (AI)-driven digital ecosystems (Yoo et al.,2024). He asserts that despite the growing interest in the knowledge economy and data-driven models, manufacturing retains its critical relevance, as demonstrated by semiconductor industry cases. For instance, ARM, a UK-based fabless semiconductor designer, embodies successful knowledge-economy innovation by providing chip-design services to manufacturers such as Samsung. However, Minshall (Chang, 2014) argues that these high-end knowledge-oriented service models are intrinsically dependent on the physical manufacturing infrastructure of global supply chains. Without manufacturers of smart devices or AI-enabled data centres, such services would be untenable.

2.2.2 The Increasing Value of Manufacturing in Digitalization

Another section of the book addresses the necessary transformation of manufacturing and advocates a shift in the conventional mindset toward a human-centered approach.

To initiate this discussion, Minshall's epistemological assumptions were rooted in the concept of digital materiality. Adopting a sociomaterialist perspective, he noted that the characteristics of digital artifacts (products or services) differ fundamentally from those of traditional materials, whether physical or immaterial, as functional artifacts. Unlike traditional products or services, functional digital artifacts consist of heterogeneous components, including software elements (such as content and services) and hardware components (networks and devices). These diverse materials collectively constitute functional digital products or services (Hendler 2019; Yoo et al. 2010).

This theoretical framework underpins Minshall's argument regarding the growing significance of interdependencies between heterogeneous digital materials, illustrated through examples such as Excel spreadsheets and pizza delivery applications. Despite an increasingly interconnected physical world enabled by IT systems such as the Internet of Things (IoT), data-driven innovations powered by global Internet infrastructure still require substantial physical resources, including cables, data centers, and additional devices, to provide users with access to the information they seek (Minshall, 2025, pp. 184-186). For instance, Digital Twins in industry, comprising hardware systems integrated with IoT technology, enables stakeholder groups to monitor operations in real time and address unexpected issues remotely, as exemplified by Rolls-Royce's jet engine management services for business users, such as airline companies and aircraft manufacturers (Minshall, 2025, p. 190). This demonstrates that widely distributed networks facilitating digital innovation continue to rely on dedicated hardware systems, highlighting the reciprocal interdependency between heterogeneous materials in the digital ecosystem (Hendler, 2019; Yoo et al., 2010) (Figure 2).

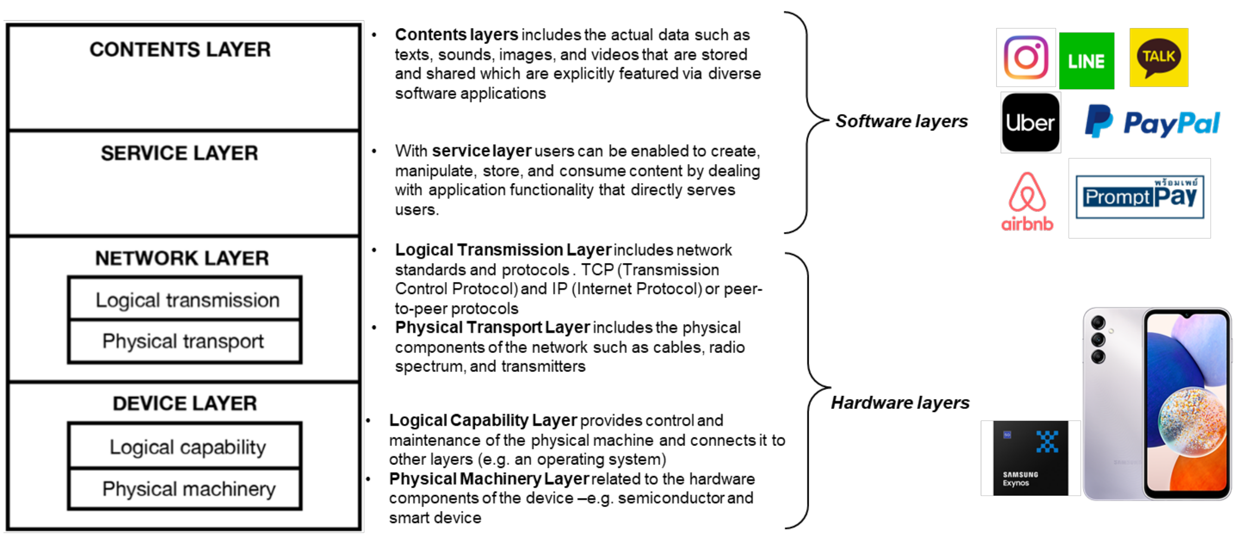


Figure 2. Digital materiality: A functional digital artifact is composed of various materials, each forming its own layer, including software (content and services) and hardware elements (networks and devices). Each layer contains its own sub-hierarchical structure, which can be complex, and together, these layers create a layered modular architecture where heterogeneous components function in an interdependent manner. This suggests that the realities of digitalization increa singly require collaborative, interdisciplinary, and cross-functional approaches as Minshall remarks in the book (adapted from Hendler, 2019; Kallinikos et al., 2013; Yoo et al., 2010).

Furthermore, Minshall voiced his concerns about the current digital landscape, which is predominantly dominated by large incumbents leading incremental innovation in an exploitative manner. He exemplifies this with the semiconductor chip industry—a primary driver of AI-powered digital innovation (Minshall, 2025, p. 167) —which he describes as "Huge, Complex, Bonker." The industry is propelled by economies of scale—"Huge" —where only major corporations, such as Intel and Samsung, possess the resources to invest; building a semiconductor factory can cost around $12 billion, with projected industry investments reaching $3 trillion over the next decade due to ongoing digitalization. Additionally, the manufacturing ecosystem grows increasingly "complex": although the process of making semiconductor chips appears straightforward (printing electric circuits onto wafers, assembly, packaging, testing, and shipping), it demands advanced support across the entire ecosystem. For instance, specialized equipment for manufacturing and production, such as electronic design automation (EDA) tools and photolithography machines, are supplied by only a few firms, including ASML. Moreover, the industry is led by a small group of dominant players —"Bonker"— that historically received limited attention prior to the rise of AI. Companies such as NVIDIA, which is now one of the largest GPU suppliers, have become pivotal in driving the market and ecosystem for AI-enabled hardware devices (Minshall, 2025, pp. 187-190).

2.2.3 Human-centred Manufacturing

Minshall's analysis is notable for its scope, extending beyond the technical dimensions of production to examine the broader impact of sustainable manufacturing frameworks across social, economic, and technological spheres. This book raises essential questions regarding how community-oriented manufacturing and system innovations contribute to the advancement of a circular economy (CE), aligning with the prevailing scholarly consensus in innovation, design, and engineering fields on the significance of adopting a human-centered approach to manufacturing—specifically, sustainable manufacturing (e.g., Baines & Lightfoot, 2013; Bocken et al., 2016; Ceschin & Gaziulusoy, 2016).

In particular, Chapters 7 and 8 highlight innovation at the production-consumption system level, encompassing both social and technical systems, rather than focusing solely on production-side advancements within a linear framework. It addresses the roles of communities, consumers, policy, and behavior in systemic changes (Bocken et al., 2016; Ceschin & Gaziulusoy, 2016). In Chapter 7, "Merge," Minshall presents examples from medicine manufacturing during the COVID-19 pandemic, including vaccines and personal protective equipment (PPE). The industry's operations are governed by stringent institutional frameworks such as Good Manufacturing Practice (GMP)—regulations that pharmaceutical companies must adhere to—and Good Distribution Practice (GDP), which pertains to logistics (Minshall, 2025, pp. 197–198). Notably, the expedited approval and global distribution of the Oxford-AstraZeneca vaccine during the pandemic underscores the importance of accessible, community-focused manufacturing infrastructure for fostering a sustainable future.

Furthermore, Chapter 8, "Survive," challenges conventional assumptions by suggesting that manufacturing can serve as an innovative and sustainable pathway supporting planetary health, rather than solely acting as a major source of greenhouse gas emissions (Ibid, p. 225). The chapter advocates transforming traditional production-consumption systems, currently shaped by a linear economic model, into circular economic models. Minshall proposed an expanded CE framework labelled ***renovate, repair, and rethink***, moving beyond the established principles of ***reduce, reuse, and recycle***. This extended model necessitates a comprehensive and systematic approach to CE from a manufacturing perspective, emphasizing the development of ethical consumers and producers supported by sustainable socio-technical systems such as laws, culture, and regulations that define existing institutional structures. Illustrative cases include retrofitting buildings rather than demolition (renovation), the emergence of start-ups providing repair services for smartphones (repair), and car-sharing clubs such as Zipcar (rethink). These arguments are corroborated by current research on sustainable innovation across the engineering, design, and innovation management disciplines (Bocken et al., 2016; Ceschin & Gaziulusoy, 2016).

3. Reflection & Conclusion

3.1 Missing Agenda: Potentials of Human- Centred Manufacturing for the Global South

This review highlights that although the book offers thorough insights into the evolving social and technical systems exemplified by manufacturing, it pays less attention to the difficulties faced by manufacturers in the Global South (Amann & Cantwell, 2012) and their potential for innovation, such as reverse innovation (Govindarajan et al., 2012; Von et al., 2014). Furthermore, it inadequately covers recent trends in business model innovation within manufacturing, particularly through new value propositions such as dematerialization via the adoption of product-service system (PSS) models focused on environmental sustainability (Baines & Lightfoot, 2013; Ceschin & Gaziulusoy, 2016), which presents an innovation opportunity for firms in the Global South.

Initially, the book's focus on the significance of manufacturing only partially examines the potential of firms in the Global North. In contrast, manufacturers in developing nations and emerging markets, collectively referred to as the Global South, face various complex challenges. In these areas, latecomer firms (LCFs) often have limited capabilities in product-focused innovation and advanced technological progress, hindering their ability to gain a competitive edge. These limitations stem from mismatched social and technical systems, underdeveloped institutional structures, inadequate infrastructure, and a lack of human resources for knowledge-based manufacturing activities such as R&D, product design, and patenting (Amann & Cantwell, 2012; Hobday, 1995; Mathews, 2002). These elements create substantial obstacles to achieving the international standards for sustainable manufacturing.

Thailand is an example of this scenario. Its economy is heavily reliant on manufacturing, which contributed 25% of its GDP in 2022. However, its institutional framework, limited awareness of sustainable or green manufacturing, and insufficient capacity for knowledge exchange may hinder the promotion of sustainable product innovation (Intarakumnerd, 2017; Lee et al., 2020).

Second, the book is unlikely to offer fresh perspectives on emerging opportunities for manufacturers in the Global South, particularly in terms of new manufacturing models or business model innovations linked to human-centred manufacturing in the digital age (particularly, in relation to the Chapter 8 in the book). Despite some technological innovation constraints, an increasing number of manufacturers in the Global South are engaging in value-driven manufacturing networks with novel value propositions, exemplified by the Chinese electric-car manufacturer BYD (Govindarajan et al., 2012; The Economist, 2023c).

In addition, the adoption of Product-Service System (PSS) models, such as servitization facilitated by Digital Twin technology, where manufacturers provide services related to product maintenance or extend product lifespans instead of merely selling products, can help these firms in the Global South identify innovation opportunities. By leveraging digital innovation networks, reducing material consumption in production-consumption systems can aid dematerialization in these regions without heavily relying on advanced technology for product-level innovation (Baines & Lightfoot, 2013; Bocken et al., 2016; Ceschin & Gaziulusoy, 2016). In fact, a growing number of Southeast Asian manufacturers and startups are spearheading PSS-oriented innovation, such as Gojek, a ride-hailing bike service in Indonesia, and Arun Plus of PTT in Thailand, in collaboration with the global supply chain (The Economist, 2023b, 2025). Notably, Siam Cement Group (SCG), Thailand's leading industrial conglomerate, challenges the conventional view of cement companies as carbon dioxide polluters (The Economist, 2023a). SCG has adopted a PSS-oriented strategy, showcasing the potential for human-centred manufacturing innovations in the Global South. Instead of selling construction materials that would eventually be discarded and harm the natural ecosystem, the company provides integrated PSS solutions within a construction materials supply chain, such as energy-efficient building systems, water management services, and smart infrastructure consulting, by combining product delivery with long-term service engagement (SCG Sustainability, n.d.; SCG Green Innovation, n.d.), thereby contributing to a circular economy in the construction materials system.

3.2 Concluding Remark

In conclusion, this book offers a comprehensive examination of manufacturing by presenting a timely and thought-provoking perspective on its sociotechnical evolution through the sociomaterialist lens. For academic audiences, including students, instructors, and researchers in fields such as design, engineering, or business, the book provides a chance to delve into a variety of emerging research topics that are pertinent to the evolution of artificial worlds from both social and technical angles. For industry professionals, the book analyses the intricate industrial landscape, where the lines between industries are becoming increasingly blurred and influenced by the interplay of social and technical elements within the realm of AI-driven digital innovation. This approach expands the understanding of competitive landscapes in the fields of design, business, and technology management.

References

Amann, E., & Cantwell, J. (2012). *Innovative firms in emerging market countries.* Oxford University Press.

Baines, T., & Lightfoot, H. (2013). *Made to serve." What it takes for a Manufacturer to Compete*. John Wiley & Sons.

Bannon, L. J., & Ehn, P. (2013). Design matters in participatory design. In J. Simonsen & T. Robertson (Eds.), *Routledge international handbook of participatory design* (pp. 37-63). Routledge.

Bettis, R. A., & Prahalad, C. K. (1995). The dominant logic: Retrospective and extension. *Strategic Management Journal, 16*(1), 5-14.
Bocken, N. M., Pauw, I. D., Bakker, C., & Grinten, B. (2016). Product design and business model strategies for a circular economy. *Journal of Industrial and Production Engineering, 33*(5), 308-320.
Ceschin, F., & Gaziulusoy, I. (2016). Evolution of design for sustainability: From product design to design for system innovations and transitions. *Design studies, 47*, 118-163.
Chang, H.-J. (2014). *Economics: The user's guide*. Bloomsbury Publishing.
Chesbrough, H. (2010). Business model innovation: Opportunities and barriers. *Long Range Planning, 43*, 354-363.
Govindarajan, V., Trimble, C., & Nooyi, I. K. (2012). *Reverse innovation: Create far from home, win everywhere*. Harvard Business Review Press.
Hendler, S. (2019). Digital-physical product development: A qualitative analysis. *uropean Journal of Innovation Management, 22*(2), 315-334.
Hobday, M. (1995). East Asian latecomer firms: Learning the technology of electronics. *World Development, 23*(7), 1171-1193. https://doi.org/10.1016/0305-750x(95)00035-b
Intarakumnerd, P. (2017). Mismanaging innovation systems: Thailand and the middle-income trap. Routledge.
Kallinikos, J., Aaltonen, A., & Marton, A. (2013). The ambivalent ontology of digital artifacts. MIS quarterly, 357-370.
Kuhn, T. S. (1997). *The structure of scientific revolutions*. University of Chicago press.
Lee, K., Wong, C.-Y., Intarakumnerd, P., & Limapornvanich, C. (2020). Is the Fourth Industrial Revolution a window of opportunity for upgrading or reinforcing the middle-income trap? Asian model of development in Southeast Asia. *Journal of Economic Policy Reform, 23*(4), 408-425.
Leonardi, P. M. (2012). Materiality, sociomateriality, and socio-technical systems: What do these terms mean? How are they different? Do we need them? In P. M. Leonardi, B. A. Nardi, & J. Kallinikos (Eds.), *Materiality and organizing: Social interaction in a technological world* (pp. 25-48). Oxford University Press.
Mathews, J. A. (2002). Competitive advantages of the latecomer firm: A resource-based account of industrial catch-up strategies. *Asia Pacific Journal of Management, 19*, 467-488. https://doi.org/10.1023/a:1020586223665
Minshall, T. (2025). Your life is manufactured: How we make things, why it matters and how we can do it better. Faber & Faber.
Mortara, L., & Minshall, T. (2014). Patterns of implementation of OI in MNCs. In H. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), *New frontiers in open innovation* (pp. 223-241). Oxford University Press.
Orlikowski, W. J., & Scott, S. V. (2014). Exploring material-discursive practices. *Journal of Management Studies, 52*(5), 697-705.
SCG. (n.d.-a). *Green innovation overview*. https://www.scg.com/about-scg/business-purpose/green-innovation
SCG. (n.d.-b). *Product stewardship*. https://www.scg sustainability.com/en/product-stewardship-en/
Simon, H. (1996). The sciences of the artificial. MIT Press.
Suchman, L., Trigg, R., & Blomberg, J. (2002). Working artefacts: Ethnomethods of the prototype. *The British Journal of Sociology, 53*(2), 163-179.
The Economist. (2023a, April 26). *How to make low-carbon concrete from old cement*. https://www.economist.com/science-and-technology/2023/04/26/how-to-make-low-carbon-concrete-from-old-cement
The Economist. (2023b, September 14). *Electric two-wheelers are creating a buzz in Asia*. https://www.economist.com/business/2023/09/14/electric-two-wheelers-are-creating-a-buzz-in-asia
The Economist. (2023c, February 2). *China's BYD is overtaking Tesla as the carmaker extraordinaire* https://www.economist.com/business/2023/02/02/chinas-byd-is-overtaking-tesla-as-the-carmaker-extraordinaire
The Economist. (2025, March 18). *Where will be the next electric-vehicle superpower? Three Asian countries make their pitch*. https://www.economist.com/finance-and-economics/2025/03/18/where-will-be-the-next-electric-vehicle-superpower
The World Bank. (2022). *Research and development expenditure (% of GDP)*. https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=TH-KR
UN Sustainable Development Group. (2022). *UN sustainable development cooperation framework for Thailand 2022 to 2026.* United Nations Thailand.
Von Zedtwitz, M., Corsi, S., Søberg, P. V., & Frega, R. (2014). A typology of reverse innovation. *Journal of Product Innovation Management, 32*(1), 12-28.
Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). Research commentary—The new organizing logic of digital innovation: An agenda for information systems research. *Information Systems Research, 21*(4), 724-735.
Yoo, Y., Henfridsson, O., Kallinikos, J., Gregory, R., Burtch, G., Chatterjee, S., & Sarker, S. (2024). The next frontiers of digital innovation research. *Information Systems Research, 35*(4), 1507-1523. https://doi.org/10.1287/isre.2024.editorial.v35.n4

Yoo, Y., Boland, R. J., Jr., Lyytinen, K., & Majchrzak, A. (2012). Organizing for innovation in the digitized world. *Organization Science, 23*(5), 1398-1408.