engineering proceedings

MDPI

Proceeding Paper

Towards an Industry 5.0 Enhanced by AI: A Theoretical Framework †

Ayoub Belkadi * and Mustapha Bachiri

CIRPEC Laboratory, University Mohamed V, Rabat 10090, Morocco; m.bachiri@um5r.ac.ma

* Correspondence: ayoub_belkadi2@um5.ac.ma

† Presented at the 7th edition of the International Conference on Advanced Technologies for Humanity (ICATH 2025), Kenitra, Morocco, 9–11 July 2025.

Abstract

The advent of artificial intelligence marks a decisive turning point in the evolution of Industry 5.0, redefining the paradigms of industrial performance. This holistic transformation affects not only technological aspects but also the entire industrial ecosystem. Industrial performance is amplified by AI through two major axes: operational excellence and strategic differentiation of solutions. These drivers of performance are structured around concrete strategic advantages, particularly in terms of technological leadership and operational resilience. However, this transformation raises significant challenges on both the human, technical, and financial levels. The managerial implications require a structured approach to the adoption of AI, supported by appropriate organizational development. Future prospects suggest an ever-deeper integration of AI within the industrial ecosystem, paving the way for new models of performance and innovation. In this paper, we strive to make a scientific contribution aimed at shedding light on the impact of artificial intelligence on Industry 5.0, highlighting its implications for the pillars of industrial transformation: operational efficiency and optimization of industrial processes, technological innovation, and competitiveness. We have opted for a theoretical analysis of research related to the integration of AI into industrial systems, in order to provide a synthetic and critical review of this phenomenon.

Keywords: artificial intelligence; industrial performance; technological innovation; Industry 5.0

check for updates

Academic Editors: Brahim El Bhiri and Ayman S. Mosallam

Published: 14 October 2025

Citation: Belkadi, A.; Bachiri, M. Towards an Industry 5.0 Enhanced by AI: A Theoretical Framework. *Eng. Proc.* **2025**, *112*, 2. https://doi.org/10.3390/engproc2025112002

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

The industrial evolution, from the first steam engines to the digital technologies of Industry 5.0, has profoundly transformed production methods. However, the advent of Industry 5.0 marks a decisive turning point in this trajectory. By envisioning a society where the interaction between humans and robots is symbiotic [1], Industry 5.0 positions artificial intelligence (AI) as the linchpin of a radical transformation.

Since the 1980s, artificial intelligence has gradually been integrated into industrial processes, particularly through automation. Yet, it is with the emergence of Industry 5.0 that AI assumes a central role, becoming a key driver of industrial transformation. Expert systems, a specific form of AI, began to be incorporated into the industrial world as early as the 1960s and 1970s, with applications such as DENDRAL for analyzing chemical structures or XCON for configuring computer hardware [2]. With Industry 5.0, AI plays an even more critical role. Concrete examples include the use of computer vision systems for product

quality control at Siemens [3] or the integration of cobots (collaborative robots) at ABB, which work in harmony with humans to enhance precision and safety [4]. Industry 5.0 does not merely optimize existing processes; it aims to redefine how companies create value by leveraging AI, including expert systems to tackle complex problems on an unprecedented scale. This paradigm positions AI as a vital engine of innovation and performance, delivering intelligent solutions to anticipate challenges and maximize productivity [5].

The interest in studying this interaction in the current context is multifaceted. First, the digital acceleration triggered by recent global events, such as the pandemic, has underscored the urgent need to adapt industries to new economic and social realities [6]. AI boosts business competitiveness and resilience by reducing costs, enhancing productivity, and improving decision-making, while supporting sustainability through better waste management and green innovation. Yet, technological convergence raises concerns about human roles, highlighting the need for customized education and management strategies to integrate AI while strengthening human capital [7,8].

However, this transformation brings significant challenges. Issues related to skills, work organization, and the management of technological risks are critical [5]. In this context, a central question emerges: How does artificial intelligence redefine Industry 5.0, and what are the challenges and opportunities for companies in transitioning toward augmented industrial performance?

Our article presents a structured exploration across five key sections. We begin with an introduction establishing our research scope. The second section contextualizes AI within Industry 5.0, examining industrial evolution and the current technological landscape. Our third section details our methodology and research approach. The fourth section presents the results and discussion, analyzing how AI enhances performance and operational efficiency through concrete applications while addressing implementation challenges and strategic solutions, with insights synthesized into an original conceptual model. Finally, the fifth section concludes by summarizing our findings and proposing future research directions in this rapidly evolving field.

2. Contextualization of AI in Industry 5.0

In this section, we will explore the historical and conceptual context that led to the emergence of artificial intelligence as an essential component of Industry 5.0, examining the evolution of industrial paradigms, the revolution brought about by AI, and the technological convergence that characterizes this new industrial era.

2.1. Historical and Conceptual Evolution from Traditional Industry to Industry 5.0

Over the centuries, industry has evolved through several transformative stages, each driven by technological advancements that reshaped production methods and lifestyles [9]. The First Industrial Revolution (Industry 1.0) introduced mechanization and steam power in the late 18th century, shifting economies from agriculture to manufacturing. The Second (Industry 2.0), in the late 19th century, brought electricity, steel, and mass production, revolutionizing transportation and industry. The Third (Industry 3.0) in the late 20th century ushered in the digital era with computing, automation, and the internet, enhancing productivity and globalization. Today, Industry 4.0 integrates cyber-physical systems, AI, IoT, and big data, creating smart factories and efficient, personalized production. Emerging as Industry 5.0, the next phase emphasizes human–machine collaboration, sustainability, and the fusion of human creativity with advanced technology for responsible progress. These revolutions collectively trace humanity's journey from mechanization to intelligent, interconnected systems [10].

2.2. The Industrial Revolution Driven by AI

AI integration across industries has transformed operations by enabling automation, resource optimization, and personalized services, enhanced by cloud computing and advanced networks for real-time data analysis and proactive decision-making [11]. This evolution cuts costs, boosts efficiency, and drives innovation in areas like customized healthcare, supply chains, and marketing, though it also poses challenges in data security and infrastructure, prompting research for stronger solutions [12]. This dynamic interaction between AI and industry illustrates an era of profound changes, where competitiveness and innovation rely on the intelligent exploitation of data [5].

2.3. AI and Technological Convergence in Industry 5.0

AI integration in Industry 5.0 relies on technological convergence, creating an intelligent, interconnected ecosystem where data is analyzed and transformed into actions. This convergence overcomes conventional system limitations, enabling a new era of industrial automation, optimization, and innovation [10].

3. Methodology

The literature review maps existing knowledge, synthesizes prior work, identifies research gaps, and guides methodological choices while enhancing scientific validity [13]. In management, systematic reviews enhance rigor and reduce bias through a transparent, reproducible process, building a reliable knowledge base from multiple studies. This helps identify research gaps, fosters new contextual studies, and aids practitioners by translating theory into practical applications, supporting evidence-based and pragmatic management science [14].

In the framework of this article, a rigorous documentary research methodology has been adopted, relying on an in-depth analysis and critical synthesis of existing literature. The corpus includes scientific articles, specialized books, industry reports, and other relevant sources. This article forms part of a qualitative study that will be conducted on this topic, aiming to develop a complete and nuanced state of the art on the impact of artificial intelligence in the context of industrial transformation. This literature review aims to develop a comprehensive state of the art on artificial intelligence's impact in industrial transformation, exploring organizational performance dimensions to contextualize issues, identify trends, and provide a solid analytical foundation.

This article's documentary research involved an in-depth exploration of academic and professional databases like IEEE, Springer, Scopus, MDPI, and ResearchGate, gathering diverse, relevant sources such as articles, journals, reports, and books for a comprehensive, reliable analysis. Advanced search techniques, including Boolean operators (e.g., "machine learning" AND "industry 5.0") and keywords like Digital Transformation and Artificial Intelligence, were used alongside filters for language, date, and article type. The initial search yielded 87 articles related to the subject. Inclusion criteria prioritized articles that directly addressed AI's impact on industrial transformation or organizational performance, provided empirical findings or robust theoretical frameworks, were published in peer-reviewed journals or by recognized organizations, and fell within the publication date range of 2018–2025. Exclusion criteria eliminated studies with methodological deficiencies, such as unverifiable data sources, ambiguous methodologies, or lack of validation, published before 2018 (except seminal works with ongoing relevance), or lacking direct relevance to the research focus. After this process, 44 articles were retained for analysis, ensuring a focused and high-quality literature base. Tools like ResearchGate alerts and Zotero (version 6.0.36) facilitated real-time updates and reference management, while article relevance and recency ensured up-to-date, consistent documentation.

4. Results and Discussion

Our literature review reveals that AI integration into business processes greatly enhances company performance and competitiveness by optimizing processes, fostering innovation, and increasing flexibility. These strategic benefits help companies differentiate and lead in their markets, with further details on these factors and their impact on performance explored in the following sections.

4.1. AI for Performance Success

4.1.1. Process Optimization

AI enhances industrial processes through real-time data analysis, predictive maintenance using sensors data to prevent failures, and human–machine collaboration for agile decision-making [15]. This synergy minimizes unplanned downtime, optimizes resource allocation, and extends equipment lifespan through precise failure prevention and efficient system monitoring [16].

Companies like Tesla also illustrate this benefit by employing AI to automate repetitive tasks, such as assembly of parts, using optimized robotic systems, while integrating collaborative robots (cobots) that work in harmony with human operators to improve precision and safety [17]. This human–machine collaboration, at the heart of Industry 5.0, translates into increased responsiveness to production problems, reduced costs associated with human errors, and optimized overall productivity, while supporting sustainable and personalized production [18]. Thus, AI positions itself as a strategic lever for operational excellence, industrial competitiveness, and sustainable transformation of processes [5].

4.1.2. Product and Service Innovation

AI revolutionizes product innovation by accelerating development cycles through machine learning analysis of customer feedback, market trends, and performance data. BMW uses AI in vehicle design to optimize aerodynamics and reduce energy consumption [19], while Tesla leverages data from its fleet to continuously improve its autonomous driving features [17]. Siemens uses AI-powered digital twins to simulate and virtually test new equipment [3].

In the services sector, AI enriches the offering with predictive features: Schneider Electric offers a smart maintenance platform called EcoStruxure that anticipates potential equipment failures and optimizes maintenance interventions [20], while ABB uses its RobotStudio solution to optimize the usage parameters of its industrial robots in real-time, significantly improving their performance and lifespan [4]. This data-driven approach to innovation is not limited to incremental improvements of existing products, but also opens the way to breakthrough innovations, such as at Rolls-Royce, which leverages AI through its IntelligentEngine program to design the next generation of more environmentally friendly aircraft engines, which represents a major advance in terms of energy efficiency and emissions reduction [21].

4.1.3. Flexibility and Adaptation to Markets

AI enables swift market adaptation through comprehensive real-time data analysis of buying habits and trends. Zara strategically uses AI to predict trends, optimize inventory and supply chains, and personalize customer experiences, reducing operational costs while reinforcing its fast fashion leadership and supporting continuous innovation [22].

Similarly, Toyota is leveraging artificial intelligence as a strategic lever to enhance its flexibility and optimize its adaptation to global markets [23]. AI helps the manufacturer analyze real-time vehicle and market data to meet changing consumer demands, optimize the supply chain, and personalize products for regional markets. It also supports continuous

innovation (Kaizen) through advanced tech development, exemplified by a $50 million research initiative with Stanford and MIT to create tomorrow's smart cars [23].

AI transforms inventory and supply chain management, as seen in Amazon's smart warehouses [24] which predict orders and trends while automating logistics with precision. This reduces errors, speeds up sorting and packaging, and optimizes resources, cutting adaptation costs and boosting industries' ability to capitalize on new market opportunities [25].

4.2. Strategic Advantage

4.2.1. Technological Leadership and Project Management

Technological leadership in the AI era shines through the transformation of project management, with AI serving as a key driver for achieving operational excellence [5]. Companies like Siemens use machine learning to enhance planning and risk forecasting in construction projects, while Deloitte employs AI for better resource allocation and cost control, showcasing a new approach to project management [3,26].

In the energy sector, TotalEnergies testifies to the effectiveness of AI in managing complex projects, particularly for drilling operations, where predictive algorithms assist critical decisions made by engineers [27].

These industry examples clearly demonstrate how AI integration in project management has become a critical strategic advantage, transforming operational approaches and driving competitive differentiation through enhanced decision capabilities.

4.2.2. Improvement of Decision-Making Processes

Artificial intelligence is revolutionizing decision-making processes in business by offering advanced capabilities in analysis, prediction, and automation [28]. AI uses predictive analytics to optimize operations, reduce costs, and automate routine decisions, enabling real-time data analysis that reveals trends and personalizes services while freeing decision-makers for strategic tasks [5].

In Logistics X.0, AI optimizes decision-making by dynamically managing delivery routes, analyzing real-time data like traffic, weather, urgent requests, and vehicle maintenance to adjust routes proactively. This reduces delays, cuts costs, improves customer satisfaction with accurate delivery estimates and tracking transparency, and enhances supply chain efficiency by redirecting vehicles and updating customers during disruptions like traffic jams [29].

4.2.3. Competitive Differentiation

Artificial intelligence has become a powerful lever for competitive differentiation, enabling companies to stand out in their markets through unique innovations and advanced personalization [30,31].

Netflix leverages AI for competitive differentiation by personalizing recommendations, optimizing resources, and adapting to local cultures, creating a unique user experience. Its algorithms analyze viewer preferences to dynamically adjust the content catalog [32].

In the industrial sector, FANUC distinguishes itself with its robots equipped with reinforcement learning that continuously self-improve, offering its customers a unique advantage in terms of productive efficiency [33].

The pharmaceutical company Moderna leverages AI to significantly accelerate the development of new medicines, particularly in the design of messenger RNA, giving it a distinctive advantage in the market [34].

John Deere uses AI for autonomous machines, crop classification, and data analysis in precision agriculture, creating competitive advantages that strengthen its market leadership and raise barriers for competitors [35].

4.3. Challenges and Strategies for AI Implementation

The integration of artificial intelligence into organizations offers considerable opportunities, but it is also accompanied by complex challenges and risks that require special attention [5]. This section will analyze AI implementation challenges (technical, human, financial) then suggest actionable solutions and best practices, encouraging collaboration to effectively integrate AI into industrial and managerial systems, enabling organizations to enhance AI benefits and reduce risks.

4.3.1. Implementation Challenges

The adoption of artificial intelligence in businesses raises several challenges that influence its integration and effectiveness. These challenges manifest at different levels, whether they are human, technical, or financial [5].

Table 1 illustrates the primary barriers, shedding light on the critical challenges organizations must navigate to effectively integrate AI into their operations, ensuring a thoughtful and impactful adoption process [36].

Table 1. Limitations and Challenges of AI Integration [36,37].

Category	Aspects	Description
Human Aspects	Resistance to Change	Employees may hesitate to embrace AI, driven by concerns over job security or heightened workloads during the transition phase.
	Over-specialization of Skills	AI can push professionals to focus on very specific skills, which might make it harder for them to adapt if their career path changes.
	Role Transformation	Certain professions, such as social workers, may see their roles shift toward data analysis or other AI-influenced functions.
Technical Aspects	Transparency	AI can sometimes act like a “mystery box,” making it hard to see how it makes decisions, which can be tricky to understand or trust.
	Algorithmic Bias	AI might accidentally copy unfair patterns from its training data, leading to decisions that are not fair for everyone.
	Data Security	Since AI often uses private information, we need strong safety rules to protect that data and keep it confidential.
Financial Aspects	High Development Costs	Developing advanced AI systems requires significant investment in computing infrastructure, software, and specialized expertise.
	Limited Accessibility	Smaller companies, like local businesses, might find AI too expensive to use because of the big costs involved.
	Dependency on External Vendors	Companies might need to work with outside experts for AI, which can make them less independent in their technology choices.
	Uncertain Return on Investment	Uncertain Return on Investment and unclear profitability metrics make executives hesitant about AI capital allocation and investment decisions.

4.3.2. Strategies for Successful AI Integration

To address the challenges related to the implementation of AI, it is essential to adopt a comprehensive and strategic approach, integrating both technological, human, and organizational dimensions [37]. This requires a balanced vision between the interests of shareholders and those of employees, as well as ethical governance that promotes algorithm transparency [5,38]. To overcome technical challenges, collaboration with AI-specialized startups and universities can facilitate access to innovative and adapted solutions [5]. The creation of an internal "AI Center of Excellence" can foster knowledge sharing and offer personalized support to teams [39]. To optimize the financial aspect, innovative financing models such as public–private partnerships, incubation programs, or participation in industrial consortia can be implemented [40–42]. The establishment of an internal "AI Academy", co-financed by several sector actors, can enable the formation of a multidisciplinary team with skills in mathematics, data engineering, and communication. This approach offers the advantage of pooling resources while developing local and sustainable expertise, by exploring strategies such as internal training, graduate recruitment, or company acquisition [43].

Finally, to promote employee acceptance of AI, it is essential to implement training programs to support employees in adopting new technologies, as well as to involve employees and stakeholders in the implementation of AI to reduce resistance to change [5,36,43].

4.3.3. Developing a Human-Centric Conceptual Model for AI-Driven Innovation and Process Optimization in Industry 5.0

The conceptual model (Figure 1) outlines the bidirectional interaction between Artificial Intelligence (AI) and Industry 5.0, where their connection is significantly mediated through a core human-centric lens (H3), linking key technologies like IoT, Big Data, Machine Learning, and Deep Learning (H1a) to Industry 5.0's human–machine collaboration (H1a–H3). Through technological convergence (H1b) and strategic implementation (H1c), AI addresses challenges such as organizational resistance and skill gaps (H3a) while unlocking opportunities (H3b) like process optimization, innovation, and competitiveness (H2a–H2c). This evolution toward Industry 5.0 focuses on innovation, customized production, surpassing the efficiency-centric model of conventional industry, with AI enabling automation (e.g., predictive maintenance, supply chain optimization) and fostering human–machine synergy, as seen in Tesla's use of cobots for precision and safety (H2b). As illustrated in Table 2, strategic frameworks, including AI governance, proactive data management, and employee training (H1c), help overcome barriers, ensuring AI's role as an indispensable tool for resilient, human-centered industrial transformation.

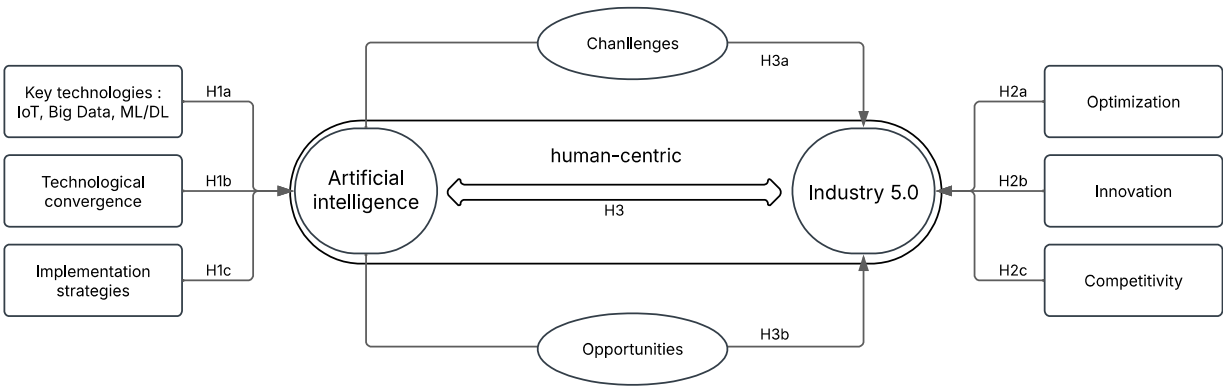


Figure 1. Proposed Research Conceptual Model.

Table 2. Table of Research Hypotheses.

Hypothesis	Description
H1a	The adoption of key AI technologies significantly improves process optimization in Industry 5.0.
H1b	Technological convergence strengthens the innovation capacity of industrial enterprises.
H1c	AI implementation strategies influence the competitiveness of enterprises.
H3	Driven by a human-centric approach, artificial intelligence is radically transforming Industry 5.0.
H3a	Technical, human and financial challenges limit the adoption of AI.
H3b	Opportunities lead to value and wealth creation.
H2a	Optimization is represented by efficiency, cost reduction, and quality improvement.
H2b	Innovation relies on the creation of new products or services, personalization, and customer experience.
H2c	Competitiveness is reflected in market positioning, differentiation, and market share.

5. Conclusions

This literature review has shed light on the transformative impact of Artificial Intelligence (AI) on Industry 5.0, exploring its role in redefining industrial paradigms through a historical and conceptual contextualization, a rigorous methodology, and an analysis of performance, challenges, and opportunities. The evolution of industry, from the first mechanical revolutions to Industry 5.0, has made AI indispensable for optimizing processes, stimulating product and service innovation, and strengthening competitiveness, as demonstrated by cases such as the use of cobots at Tesla for sustainable and precise production [15,18]. The integration of AI, supported by convergent technologies such as IoT, Big Data, and Machine Learning, fosters a symbiotic human–machine collaboration at the heart of Industry 5.0, redefining the relationships between technology and human work for resilient and personalized production, as discussed in the section "Flexibility and adaptation to markets". However, the identified challenges, such as resistance to change, skill gaps, and training needs, require structured implementation strategies, including robust governance and training initiatives [38,43].

Future studies should investigate frameworks for ethical AI governance in industrial settings, ensuring that technologies align with human values and societal needs. Additionally, research could explore the long-term impacts of AI on workforce dynamics, such as evolving skill requirements and the potential for job displacement versus job creation, to better prepare organizations for a human-centric industrial future [5,37,38].

In conclusion, the relationship between AI and Industry 5.0 is bidirectional and synergistic. AI drives Industry 5.0 with advanced automation, predictive analytics, and resource management via IoT and Big Data, boosting efficiency and resilience. Conversely, Industry 5.0 enhances AI by fostering human collaboration focused on creativity, emotional intelligence, and ethics, creating an agile, human-centric industrial ecosystem [44]. AI stands as a key pillar for a human industry, offering innovation and competitiveness while requiring a responsible approach to maximize benefits in a global industrial transformation.

Author Contributions: Conceptualization, A.B. and M.B.; Formal analysis, A.B.; Funding acquisition, this research received no external funding; Investigation, A.B.; Methodology, A.B. and M.B.; Project administration, A.B. and M.B.; Resources, A.B.; Supervision, M.B.; Validation, A.B. and M.B.; Writing—original draft, A.B.; Writing—review and editing, A.B. and M.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data sharing is not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Wang, S.; Lim, W.M.; Cheah, J.-H.; Lim, X.-J. Working with Robots: Trends and Future Directions. *Technol. Forecast. Soc. Change* **2025**, *212*, 123648. [CrossRef]
2. Smith, C.; McGuire, B.; Huang, T.; Yang, G. *The History of Artificial Intelligence*; University of Washington: Seattle, WA, USA, 2006; Volume 27, pp. 22–24.
3. Kishorre Annanth, V.; Abinash, M.; Rao, L.B. Intelligent Manufacturing in the Context of Industry 4.0: A Case Study of Siemens Industry. *J. Phys. Conf. Ser.* **2021**, *1969*, 012019. [CrossRef]
4. Bronnikov, A.; Bendeberia, M. Development of a Manipulator Kinematic Model Using Abb Robot Studio. *Innov. Technol. Sci. Solut. Ind.* **2024**, *4*, 5–18. [CrossRef]
5. Boushaba, I.; Chakor, A. L'impact de l'intelligence Artificielle Sur Le Management de Projet: Opportunités et Défis. *Int. J. Econ. Manag. Res.* **2023**, *4*, 87–109.
6. Guennoun, M.; Bennouna, F. Utilisation de l'industrie 4.0 par les entreprises industrielles marocaines comme moyen de résilience face à la crise du Covid-19. In *Colloque sur les Objets et Systèmes Connectés 2023*; HAL (Archive Ouverte): Lyon, France, 2023.
7. Mariani, M.M.; Machado, I.; Magrelli, V.; Dwivedi, Y.K. Artificial Intelligence in Innovation Research: A Systematic Review, Conceptual Framework, and Future Research Directions. *Technovation* **2023**, *122*, 102623. [CrossRef]
8. Banitaan, S.; Al-refai, G.; Almatarneh, S.; Alquran, H. A Review on Artificial Intelligence in the Context of Industry 4.0. *Int. J. Adv. Comput. Sci. Appl.* **2023**, *14*. [CrossRef]
9. Samatas, G.G.; Moumgiakmas, S.S.; Papakostas, G.A. Predictive Maintenance—Bridging Artificial Intelligence and IoT. In Proceedings of the 2021 IEEE World AI IoT Congress (AIIoT), Seattle, WA, USA, 10 May 2021; pp. 0413–0419.
10. Rajkumar, N.; Nachiappan, B.; Mathews, A.; Radha, V.; Viji, C.; Kovilpillai, J.A. Industry 5.0: The Human-Centric Future of Manufacturing. In *Challenges in Information, Communication and Computing Technology*; CRC Press: London, UK, 2024; pp. 562–567. ISBN 978-1-00-355908-5.
11. Rim, L.; Abdelmalek, B. L'impact de l'intelligence artificielle sur la prise de décision The Impact of Artificial Intelligence in Decision Making. *Rev. Internatioale Des Sci. De Gest.* **2024**, *7*, 660–678.
12. Windmann, A.; Wittenberg, P.; Schieseck, M.; Niggemann, O. Artificial Intelligence in Industry 4.0: A Review of Integration Challenges for Industrial Systems. In Proceedings of the 2024 IEEE 22nd International Conference on Industrial Informatics (INDIN), Beijing, China, 18 August 2024; pp. 1–8.
13. Gavard-Perret, M.-L.; Gotteland, D.; Haon, C.; Alain, J. *Méthodologie de la Recherche: Réussir son Mémoire ou sa Thèse en Sciences de Gestion*; Pearson éducation: Paris, France, 2008. ISBN 978-2-7440-7241-3.
14. Tranfield, D.; Denyer, D.; Smart, P. Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. *Br. J. Manag.* **2003**, *14*, 207–222. [CrossRef]
15. Ritala, P.; Aaltonen, P.; Ruokonen, M.; Nemeh, A. Developing Industrial AI Capabilities: An Organisational Learning Perspective. *Technovation* **2024**, *138*, 103120. [CrossRef]
16. Lee, W.J.; Wu, H.; Yun, H.; Kim, H.; Jun, M.B.G.; Sutherland, J.W. Predictive Maintenance of Machine Tool Systems Using Artificial Intelligence Techniques Applied to Machine Condition Data. *Procedia CIRP* **2019**, *80*, 506–511. [CrossRef]
17. Soori, M.; Arezoo, B.; Dastres, R. Artificial Intelligence, Machine Learning and Deep Learning in Advanced Robotics, a Review. *Cogn. Robot.* **2023**, *3*, 54–70. [CrossRef]
18. Goralski, M.A.; Tan, T.K. Artificial Intelligence and Sustainable Development. *Int. J. Manag. Educ.* **2020**, *18*, 100330. [CrossRef]
19. Despot, K.; Srebrenkoska, S.; Sandeva, V. The role of artificial intelligence in automotive design. *Knowl. Int. J.* **2023**, *61*, 423–429.
20. Madanaguli, A.; Sjödin, D.; Parida, V.; Mikalef, P. Artificial Intelligence Capabilities for Circular Business Models: Research Synthesis and Future Agenda. *Technol. Forecast. Soc. Change* **2024**, *200*, 123189. [CrossRef]
21. Kemp, S.; Shafik, M.; Liyanage, K. Optimization of Rolls-Royce Gas Turbine Components Machining Using Artificial Intelligence. *MATEC Web Conf.* **2024**, *401*, 06004. [CrossRef]
22. Cao, J. Enabling ZARAs Operational Innovation and Value Creation with Artificial Intelligence. *Adv. Econ. Manag. Polit. Sci.* **2024**, *86*, 81–87. [CrossRef]
23. Dalla, B.; Milod, T. Case Study Analysis of Toyota Company and Make Time to Market. *ResearchGate* **2024**. [CrossRef]
24. Li, Z. Review of Application of AI in Amazon Warehouse Management. *Adv. Econ. Manag. Polit. Sci.* **2024**, *144*, 1–8. [CrossRef]
25. Bateh, D.D. Machine Impact in Supply Chain Management. *Int. J. Bus. Manag. Technol.* **2019**, *3*, 13–18.
26. Bai, G. Research on the Application and Influence of Auditing Artificial Intelligence. *DEStech Trans. Soc. Sci. Educ. Hum. Sci.* **2017**. [CrossRef]

27. Masson, F.; Watremez, X.; Levent, S.; Preuilh, J.; Urfels, L. How Artificial Intelligence Applied to Sound Recognition Can Help Gas Leak Detection in Acoustically Complex Environments? *INTER-NOISE NOISE-CON Congr. Conf. Proc.* **2024**, *270*, 8515–8526. [CrossRef]
28. Boudoumi, M. L'impact de l'intelligence artificielle sur les processus décisionnels en entreprise. Master's Thesis, Université de Montréal, École des Relations Industrielles, Faculté des Arts et des Sciences, Montréal, QC, Canada, 2024.
29. Glistau, E.; Coello Machado, N.I.; Trojahn, S. Logistics 4.0: Goals, Trends and Solutions. *Adv. Logist. Syst. Theory Pract.* **2022**, *16*, 5–18. [CrossRef]
30. Ali Mohamad, T.; Bastone, A.; Bernhard, F.; Schiavone, F. How Artificial Intelligence Impacts the Competitive Position of Healthcare Organizations. *J. Organ. Change Manag.* **2023**, *36*, 49–70. [CrossRef]
31. Hossain, M.A.; Agnihotri, R.; Rushan, M.R.I.; Rahman, M.S.; Sumi, S.F. Marketing Analytics Capability, Artificial Intelligence Adoption, and Firms' Competitive Advantage: Evidence from the Manufacturing Industry. *Ind. Mark. Manag.* **2022**, *106*, 240–255. [CrossRef]
32. Khandelwal, K. A Study to Know—Use of AI For Personalized Recommendation, Streaming Optimization, and Original Content Production at Netflix. *Int. J. Sci. Res. Eng. Trends* **2023**, *9*, 1738–1743. [CrossRef]
33. Brunello, A.; Fabris, G.; Gasparetto, A.; Montanari, A.; Saccomanno, N.; Scalera, L. A Survey on Recent Trends in Robotics and Artificial Intelligence in the Furniture Industry. *Robot. Comput.-Integr. Manuf.* **2025**, *93*, 102920. [CrossRef]
34. Moderna, Inc. *How Building a Digital Biotech Is Mission-Critical to Moderna*; Moderna, Inc.: Cambridge, MA, USA, 2020.
35. Perry, T.S. John Deere's Quest to Solve Agricultures Deep-Learning Problems. *IEEE Spectr.* **2020**, *57*, 4. [CrossRef]
36. Trottier, M.; Oiry, E.; Martin, D.; Gambs, S.; Thibault-Bellerose, A. Étendue et enjeux de l'intelligence artificielle dans les emplois professionnels: Une perspective pluridisciplinaire. *Ad Mach.* **2024**, 177–199. [CrossRef]
37. Giblas, D.; Godon, A.-S.; Fargeas, M.; Duranton, S.; Gard, J.-C.; Audier, A.; Caye, J.-M.; Buffard, P.-E. *Intelligence Artificielle et Capital Humain: Quels Défis Pour les Entreprises ?* The Boston Consulting Group, Malakoff Médéric: Boston, MA, USA, 2018.
38. Papagiannidis, E.; Enholm, I.M.; Dremel, C.; Mikalef, P.; Krogstie, J. Toward AI Governance: Identifying Best Practices and Potential Barriers and Outcomes. *Inf. Syst. Front.* **2023**, *25*, 123–141. [CrossRef]
39. Tadwalkar, S.V. Create Centre of Excellence (CoE) for Better Business. *Ubiquity* **2008**, *2008*, 1–9. [CrossRef]
40. Colombo, M.G.; Delmastro, M. How Effective Are Technology Incubators? Evidence from Italy. *Res. Policy* **2002**, *31*, 1103–1122. [CrossRef]
41. Ratinho, T.; Henriques, E. The Role of Science Parks and Business Incubators in Converging Countries: Evidence from Portugal. *Technovation* **2010**, *30*, 278–290. [CrossRef]
42. Mendes, C.; Lee, S. Role of Public-Private Partnerships in Accelerating Digital Transformation: A Qualitative Study. *Digit. Transform. Adm. Innov.* **2024**, *2*, 7–12.
43. Herremans, D. aiSTROM—A Roadmap for Developing a Successful AI Strategy. *IEEE Access* **2021**, *9*, 155826–155838. [CrossRef]
44. Islam, M.T.; Sepanloo, K.; Woo, S.; Woo, S.H.; Son, Y.-J. A Review of the Industry 4.0 to 5.0 Transition: Exploring the Intersection, Challenges, and Opportunities of Technology and Human–Machine Collaboration. *Machines* **2025**, *13*, 267. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.