

# The Role of Artificial Intelligence in Automotive Manufacturing and Design

**Jerry A. Madrid**

Faculty, College of Technology,  
Surigao del Norte State University, Surigao City, Philippines

**Abstract:** *This paper provides a concise overview of the role of Artificial Intelligence (AI) in automotive manufacturing and design, drawing from the quantitative and qualitative data presented in the study. The data unveil a growing adoption of AI technologies in the industry, resulting in substantial cost reductions, heightened design efficiency, and remarkable improvements in manufacturing quality. While these advancements bolster competitiveness and sustainability, it also raise workforce adaptation challenges and ethical considerations. The comprehensive data-driven analysis underscores AI's transformative impact on automotive manufacturing and design, positioning it as a pivotal force driving innovation and reshaping the industry's future landscape.*

**Keywords:** AI, automotive, manufacturing, design.

## REFERENCES

- [1]. Husain, A. (2017). The sentient machine: the coming age of artificial intelligence. Simon and Schuster.
- [2]. Leng, J., Sha, W., Wang, B., Zheng, P., Zhuang, C., Liu, Q., ... & Wang, L. (2022). Industry 5.0: Prospect and retrospect. *Journal of Manufacturing Systems*, 65, 279-295.
- [3]. Skilton, M., & Hovsepian, F. (2018). *The 4th industrial revolution*. Springer Nature.
- [4]. Schmidt, E., Work, B., Catz, S., Chien, S., Darby, C., Ford, K., ... & Matheny, J. (2021). National security commission on artificial intelligence (ai). National Security Commission on Artificial Intelligence, Tech. Rep.
- [5]. Van den Hoed, R. (2007). Sources of radical technological innovation: the emergence of fuel cell technology in the automotive industry. *Journal of Cleaner Production*, 15(11-12), 1014-1021.
- [6]. Wells, P., & Nieuwenhuis, P. (2012). Transition failure: Understanding continuity in the automotive industry. *Technological Forecasting and Social Change*, 79(9), 1681-1692.
- [7]. Dash, R., McMurtrey, M., Rebman, C., & Kar, U. K. (2019). Application of artificial intelligence in automation of supply chain management. *Journal of Strategic Innovation and Sustainability*, 14(3), 43-53.
- [8]. Verma, D. (2018). Analysis of Smart Manufacturing Technologies for Industry Using AI Methods. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 9(2), 529-540.
- [9]. O'Sullivan, S., Nevejans, N., Allen, C., Blyth, A., Leonard, S., Pagallo, U., ... & Ashrafian, H. (2019). Legal, regulatory, and ethical frameworks for development of standards in artificial intelligence (AI) and autonomous robotic surgery. *The international journal of medical robotics and computer assisted surgery*, 15(1), e1968.
- [10]. Manfreda, A., Ljubi, K., & Groznic, A. (2021). Autonomous vehicles in the smart city era: An empirical study of adoption factors important for millennials. *International Journal of Information Management*, 58, 102050.
- [11]. Bag, S., Pretorius, J. H. C., Gupta, S., & Dwivedi, Y. K. (2021). Role of institutional pressures and resources in the adoption of big data analytics powered artificial intelligence, sustainable manufacturing practices and circular economy capabilities. *Technological Forecasting and Social Change*, 163, 120420.
- [12]. Strötzel, M., & Brunkhorst, C. (2019). Managing the transformation of the German automotive industry. *Towards a Just Transition: Coal, Cars and the World of Work*. Brussels: ETUI, 243-272.

- [13]. Punnett, L., Gold, J., Katz, J. N., Gore, R., & Wegman, D. H. (2004). Ergonomic stressors and upper extremity musculoskeletal disorders in automobile manufacturing: a one year follow up study. *Occupational and environmental medicine*, 61(8), 668-674.
- [14]. Butz, D., & Leslie, D. (2001). Risky subjects: changing geographies of employment in the automobile industry. *Area*, 33(2), 212-219.
- [15]. Kraus, S., Palmer, C., Kailer, N., Kallinger, F. L., & Spitzer, J. (2019). Digital entrepreneurship: A research agenda on new business models for the twenty-first century. *International Journal of Entrepreneurial Behavior & Research*, 25(2), 353-375.
- [16]. Kumar, V., Ramachandran, D., & Kumar, B. (2021). Influence of new-age technologies on marketing: A research agenda. *Journal of Business Research*, 125, 864-877.
- [17]. Qu, Y. J., Ming, X. G., Liu, Z. W., Zhang, X. Y., & Hou, Z. T. (2019). Smart manufacturing systems: state of the art and future trends. *The International Journal of Advanced Manufacturing Technology*, 103, 3751-3768.
- [18]. Jha, N., Prashar, D., & Nagpal, A. (2021). Combining artificial intelligence with robotic process automation—an intelligent automation approach. *Deep Learning and Big Data for Intelligent Transportation: Enabling Technologies and Future Trends*, 245-264.
- [19]. Stone, P., Brooks, R., Brynjolfsson, E., Calo, R., Etzioni, O., Hager, G., ... & Teller, A. (2022). Artificial intelligence and life in 2030: the one hundred year study on artificial intelligence. *arXiv preprint arXiv:2211.06318*.
- [20]. Amjad, M. S., Rafique, M. Z., & Khan, M. A. (2021). Leveraging optimized and cleaner production through industry 4.0. *Sustainable Production and Consumption*, 26, 859-871.
- [21]. Agrawal, R., Majumdar, A., Kumar, A., & Luthra, S. (2023). Integration of artificial intelligence in sustainable manufacturing: current status and future opportunities. *Operations Management Research*, 1-22