

Balancing Automation and Human-Centered Care: Evaluating the Impacts of Industry 4.0 and 5.0 on the UK Healthcare Sector

In the context of the UK healthcare system, particularly within the NHS, the impact of Industry 4.0 is becoming increasingly evident. The integration of digital systems, artificial intelligence (AI), and the Internet of Things (IoT) has improved healthcare delivery, particularly in healthcare systems engineering (HCSE), and enhanced patient care. However, it has also revealed critical system vulnerabilities and limited resilience (Mohamed & Al-Jarodi, 2019).

A notable example is the 2017 WannaCry ransomware attack, which exposed the dangers of overdependence on digital infrastructure. Ghafur et al. (2019) report that over 600 NHS organisations were affected, including 34 hospital trusts offering acute care and 46 others, resulting in cancelled appointments, reduced emergency and elective admissions (by 6%), and an estimated £5.9 million loss in hospital activity.

These challenges highlight the growing need for a shift toward Industry 5.0, which emphasises a more human-centric model where intelligent systems augment, rather than replace, healthcare professionals. Saxena et al. (2024) propose a collaborative framework where smart technologies and human capabilities co-exist. Similarly, Abdel-Basset, Mohamed, and Chang (2025) stress integrating social justice, sustainability, and technology to promote flexibility and better outcomes.

Industry 5.0 offers significant opportunities, from enhancing disease prediction to improving real-time monitoring while supporting hybrid decision-making models. For systems like the NHS, this shift is essential not only for resilience but also for ensuring sustainable, equitable, and socially responsive care (Abdel-Basset, Mohamed, and Chang, 2025).

References

- Abdel-Basset, M., Mohamed, R. and Chang, V. (2025) 'A Multi-Criteria Decision-Making Framework to Evaluate the Impact of Industry 5.0 Technologies: Case Study, Lessons Learned, Challenges and Future Directions', *Information Systems Frontiers* 27(2), pp.791-821.
- Ghafur, S., Kristensen, S., Honeyford, K., Martin, G., Darzi, A. and Aylin, P. (2019) 'A Retrospective Impact Analysis of the Wannacry Cyberattack on the NHS', *NPJ digital medicine* 2(1), p.98.
- Mohamed, N. and Al-Jaroodi, J. (2019) 'The Impact of Industry 4.0 on Healthcare System Engineering', *International Systems Conference* pp. 1-7. IEEE.
- Saxena, A., Chauhan, S.P.S., Singh, H., Chauhan, U. and Kumari, P. (2024) 'Impact of Industry 5.0 on Healthcare', *Infrastructure Possibilities and Human-Centered Approaches with Industry 5.0* pp. 182-198.