Artificial Intelligence as an Enabler of the Circular Economy

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What did this research aim to address?

Artificial intelligence (AI) and the circular economy (CE) are increasingly on the agenda for both businesses and the public sector, yet these concepts are often explored separately. There is an intersection between business needs and CE goals that can be enabled by AI, which remains largely untapped in Ireland. The Artificial Intelligence for the Circular Economy (AI4CE) research project explored how AI could enable CE implementation in Irish businesses and aimed to:

- identify potential opportunities for using AI in Irish industry to prevent or reduce waste generation and material, water and energy use;
- identify barriers to and enablers of the wider implementation of AI technologies for circularity in Irish industry, with a particular focus on cross-sectoral manufacturing;
- develop a portfolio of AI4CE case studies and policy recommendations for using AI in CE implementation within Irish industry.

The AI4CE project used a variety of approaches to achieve its aims. The overarching methodology focused on engaging key stakeholders (members of Irish industry) to explore the intersection of AI and the CE and provide insights and inputs into the project outputs.

What did this research find?

The AI4CE research project concluded, from desk-based research and stakeholder engagement, that Irish industry is largely unaware of AI's potential for enabling circularity. While Ireland's rate of adoption of AI surpasses the EU average, its application of AI to circularity remains in the early stages and is primarily limited to the waste management and recycling sectors.

Reported barriers to manufacturers adopting AI for CE purposes include limited awareness of AI and CE synergies, financial constraints (particularly for small and medium-sized enterprises), lack of data and data governance systems, shortages of skills, and organisational resistance to change.

Key insights and recommendations from the AI4CE project include:

- Utilisation of AI as an enabler of the CE will require investment in collaboration, knowledge sharing, training and education, and AI infrastructure.
- Industry adoption of AI for CE implementation will hinge on there being a good business case (e.g. creating new revenue streams, reducing costs/waste, increasing production efficiency).
- Policymakers should provide guidance to industry to help it follow scientifically supported best practices when using AI for CE implementation and implement AI effectively as an enabler of the CE.
- Collaboration between government departments and public entities responsible for AI and CE legislation, regulation and market surveillance should be encouraged to ensure alignment at the intersection of AI and the CE.

How can the research findings be used?

To support the development of AI as a key enabler of the Irish CE, the research project developed the following resources for policymakers and Irish industry professionals considering adopting AI and CE practices into their business:

- The AI4CE Decision Support Tool, to enable industry to explore how AI could support businesses' CE goals through a selection of case studies relevant to their needs and interests.
- The AI4CE – Best Practice & Policy Guide, to help industry stakeholders and policymakers understand the core concepts behind AI and the CE and give guidance on how the two can work together. It also details the relevant Irish and EU regulations and legal considerations regarding AI and the CE.
- The AI4CE – Status and Use of AI for Circular Economy in Ireland report, which summarises insights into industry's usage of AI in the context of scaling up the CE. It is intended for those who are interested in the opportunities at the intersection of the concepts of AI and circularity.