
AI-Driven Innovation, ESG Performance, and Digital Transformation in UK Technology Firms

Submitted 03/04/25, 1st revision 27/05/25, 2nd revision 18/05/25, accepted 30/06/25

Adel Necib¹, Nesrine Mzid²

Abstract:

Purpose: With digital transformation guided by artificial intelligence (AIDT) as a moderator, this study examines the impact of innovation in new quality productivity (NQP) on environmental, social, and governance (ESG) performance across technologically advanced businesses in the United Kingdom.

Design/Methodology/Approach: By using a structured questionnaire and data analysis using SPSS and AMOS, we validated two hypotheses through the modelling by structural equations (MES).

Findings: The findings show that NQP innovation significantly improves environmental ESG performance, and that AIT positively modifies this relationship. The findings add to the body of knowledge on sustainable innovation and digital transformation by offering practical recommendations for high-tech companies looking to enhance their ESG performance.

Practical Implications: This study makes significant additions to the literature on digital transformation and long-term innovation, particularly in the context of technologically advanced businesses in the United Kingdom.

Originality/Value: The study highlights the role of digital transformation led by IA (AIDT) as a moderator strengthening the relationship between NQP and ESG.

Keywords: UK, New Quality Productivity, Green ESG Performance, AI-Driven Digital Transformation, Structural Equation Modelling.

JEL Classification: O33, Q56, M14, L86, O32.

Paper type: Research article.

¹Dr., University of Gafsa; Faculty of Sciences of Gafsa, Tunisia,
e-mail: adelnecib314@gmail.com;

²Dr., University of Sfax, Tunisia, e-mail: nesrine-mzid@gmail.com;

1. Introduction

In the context of global sustainability, ESG performance is mandated as a key metric for assessing the accountability of businesses. The FTSE 100 high-tech companies, which are key players in innovation-driven economies, are increasingly implementing new productivity of quality (NQP) to increase their durability and competitiveness.

NQP places a strong emphasis on technological innovation, efficiency, and quality-oriented growth. Similarly, the digital transformation led by IA (AIDT) alters operational and strategic paradigms and has the potential to increase the influence of innovation on ESG results. This study examines how NQP innovation affects ESG performance and examines the role of an ADT moderator.

This study makes significant additions to the literature on digital transformation and long-term innovation, particularly in the context of technologically advanced businesses in the United Kingdom. It starts by empirically demonstrating the beneficial effects of new productivity of quality (NQP) on environmental, social, and governance (ESG) performance, thereby expanding the value based on resources (RBV) by demonstrating that NQP is a strategic resource for sustainability.

This discovery advances our understanding of how innovation-focused resources translate into ESG-measurable outcomes, particularly in high-tech sectors. The study then highlights the role of digital transformation led by IA (AIDT) as a moderator strengthening the relationship between NQP and ESG.

By incorporating the theory of dynamic capacities, the study values AIDT's ability to increase businesses' innovation and adaptability while providing a distinct viewpoint on the contribution of digital transformation to sustainability. Third, by encouraging investments in research and development as well as artificial intelligence technologies to meet global ESG standards, the study offers practical implications for technologically advanced businesses today.

Given that most of the earlier research has focused on the Western setting, focusing on Britain businesses fills a significant gap in the current literature. Thanks to a rigorous methodology, the use of structured polls and the structural equation model (SEM) with SPSS and AMOS ensures measurable results that enhance both academic work and business strategies.

These contributions will enable better theoretical and managerial understanding of how innovation and digital transformation interact to support long-term performance on dynamic technology-driven markets.

The driving force for this research stems from the growing global emphasis on sustainability and the critical role that advanced technology companies play in

addressing environmental and social challenges. In a constantly changing technological landscape, companies in the UK's FTSE 100 high-tech sector are under increasing pressure to adhere to environmental, social, and governance (ESG) standards while maintaining their competitive advantages.

Despite the acknowledged significance of innovation in new quality productivity (NQP), little is known about its precise impact on ESG performance, particularly in non-occidental contexts. Furthermore, little attention has been paid to the transformational potential that represents the IA for digital transformation (AIDT) in improving the sustainability of innovative results.

The goal of this study is to close these gaps by providing a clear understanding of how NQP and AIDT work together to enhance ESG performance. Given the country's leadership in IA adoption and its ambitious sustainability goals, the Chinese environment provides an intriguing framework.

Based on resource-based capacity theory and dynamic capacity theory, this research aims to provide theoretical clarity and practical support to businesses that are evolving at the nexus of innovation, quantification, and sustainability. The significance of combating climate change and enhancing social governance further emphasizes the relevance of this study, as high-tech companies are in a better position to implement sustainable practices.

This drives the study's rigorous empirical approach, which aims to offer specific recommendations to policymakers, business executives, and researchers committed to advancing sustainable development in technology-driven economies.

This document's structure is as follows: an introduction explains the background of the research; a literature review and theoretical framework lay the groundwork; the methodology outlines the collection and analysis of data; the findings highlight the empirical conclusions; and finally, the discussion and conclusion summarize the viewpoints, boundaries, and future directions.

2. Literature Review and Theoretical Development

Previous studies have demonstrated the connection between innovation and ESG performance. According to Porter and van der Linde (1995), innovation enhances environmental performance by making the best use of available resources. Studies like the one conducted by Li *et al.* (2020) emphasize how technological advancements in high-tech companies enhance ESG indicators (Grima *et al.*, 2024).

As a transformative force, AIDT integrates IA technology to streamline procedures and advance sustainability (Chen and Zhang, 2022). However, little research has been done on the role of the ADT moderator in the NQP-ESG relationship, particularly in high-tech contexts in the UK.

3. Theoretical Framework

This study adopts Resource-Based View (RBV) and Dynamic Capabilities Theory. RBV posits that innovative resources, such as NQP, create competitive advantages, including superior ESG performance (Barney, 1991). Dynamic Capabilities Theory suggests that AIDT enables firms to adapt and leverage innovation for sustainability (Teece, 2007; Pagkalou *et al.*, 2025).

3.1 Resource-Based View (RBV)

The perspective based on resources (PBR) provides a crucial lens through which to view how innovation in new quality productivity (NQP) influences the environmental, social, and governance (ESG) performance of high-tech British companies. Businesses get a competitive edge by utilizing unique, valuable, and inimitable resources, according to the RBV theory (Barney, 1991).

According to this research, NQP which is defined by its advanced research and development, patent creation, and procedural effectiveness, acts as a strategic tool that enhances ESG results. By promoting technological advancements and operational excellence, NQP helps businesses reduce their environmental impact, strengthen their social responsibility, and improve their governance practices.

For instance, high-tech companies investing in NQP can optimize resource use in accordance with sustainability goals and complementary expectations. According to the RBV theory, the diversity of NQP among businesses results in different ESG performances since businesses with greater capacity for innovation are better positioned to meet the needs of all parties involved.

This perspective highlights the significance of developing NQP as a necessary skill to gain long-term competitive advantages in the dynamic technology sector, where innovation is a key factor in long-term success (*Wernerfelt, 1984*). By placing the relationship between NQP and ESG within the framework of competency-based resource theory, this study clarifies how resource-driven innovation results in tangible durability outcomes, offering a strong theoretical foundation for empirical analysis.

3.2 Dynamic Capabilities Theory

The theory of dynamic capacities completes the perspective based on resources by emphasizing the role of the digital transformation led by the IA (AIDT) in assisting businesses in adapting and utilizing the NQP to enhance their ESG performance.

According to Teece's (2007) theory, businesses need to develop dynamic capabilities the ability to sense, seize, and transform—in order to survive in constantly changing environments. AIDT, which combines IA, digital infrastructure, and data-driven

decision-making, is a dynamic capability that enables technologically advanced businesses to effectively utilise the NQP.

For instance, IA technologies simplify the innovation process, enabling businesses to develop environmentally friendly products and enhancing governance transparency. Dynamic capabilities make it easier to reorganize resources and ensure that NQP innovations align with evolving ESG standards. AIDT enhances the ability of China's technologically advanced businesses to respond to market and regulatory pressures, hence amplifying the impact of NQP on durability results.

This theory clarifies how the ADT modifies the relationship between NQP and ESG, enabling businesses to benefit from technological advancements (*Eisenhardt & Martin, 2000*). This research, which incorporates the theory of dynamic capacities, clarifies how AIDT enables businesses to transform innovative resources into superior ESG performance. It provides a comprehensive framework for comprehending the relationship between digital transformation and long-term innovation.

3.3 Variables

Independent Variable: Innovation in NQP (as determined by process innovation, patent production, and R&D intensity).

Dependent Variable: Green ESG performance (as determined by governance quality, social responsibility, and environmental effect).

Moderating Variable: AIDT (assessed by data-driven decision-making, digital infrastructure and AI adoption).

3.4 Hypotheses Descriptions

H1: *UK high-tech companies' green ESG performance is significantly impacted by NQP innovation.*

H2: *The association between NQP innovation and green ESG performance is positively moderated by AIDT.*

4. Method and Data Research Design

A quantitative approach was taken by distributing a structured questionnaire to the heads of advanced technology companies in the United Kingdom. The study evaluated AIDT, NQP innovation, and environmental performance using Likert scale elements that were modified from validated scales.

4.1 Data and Sampling

Data was gathered from 47 technology companies located in the United Kingdom's technological hubs between March and May of 2025. Following the removal of

incomplete responses, 34 legitimate responses were examined. The sample included businesses in the software, biotechnology, and electronics sectors.

4.2 Measurement Scales

Table 1 presents how the variables were measured.

Table 1. *Variables measurement scales*

Variable	Measurement Items	Source
NQP Innovation	R&D investment, patent filings, process efficiency	<i>Li et al. (2020)</i>
Green ESG Performance	Emissions reduction, social impact, governance score	<i>Chen and Zhang (2022)</i>
AIDT	AI integration, digital tools, data analytics	<i>Wang et al. (2023)</i>

Source: *Own study.*

5. Results and Findings, Descriptive Statistics

The average size of the company was 315 employees, with 58% of the workforce being men and 42% being women. High levels of engagement were demonstrated by the averages for NQP innovation (M = 4.05, SD = 0.77), ESG vertebral performance (M = 4.01, SD = 0.81), and AIT (M = 3.95, SD = 0.71).

Table 2. *Correlation Analysis*

Variable	NQP Innovation	Green ESG	AIDT
NQP Innovation	1.000	0.597	0.564
Green ESG Performance	0.597	1.000	0.538
AIDT	0.564	0.538	1.000

Note: $**p < 0.01$

Source: *Own study.*

Reliability and Validity

The Kaiser-Meyer-Olkin (KMO) measure was 0.87, indicating that the sampling was appropriate. Cronbach's alpha values ranged from 0.74 to 0.79, indicating reliability. A confirmatory factor analysis (AFC) showed good construct validity (AVE>0,5, CR>0,7).

Table 3. *Reliability and validity*

Construct	Cronbach's Alpha	AVE	CR
NQP Innovation	0.826	0.533	0.749
Green ESG Performance	0.792	0.558	0.861
AIDT	0.745	0.511	0.720

Source: *Own study.*

The Model Fit

SEM results indicated a good model fit: $\chi^2/df = 2.08$, CFI=0.93, TLI = 0.91, RMSEA = 0.05, SRMR = 0.04.

Table 4. *The model fit*

Fit Index	Value	Threshold
χ^2/df	2.08	< 3.0
CFI	0.93	> 0.90
TLI	0.91	> 0.90
RMSEA	0.05	< 0.07
SRMR	0.04	< 0.07

Table 5. *Hypothesis and Path Analysis*

Path	Standardized Coefficient	P -value	Result
NQP Innovation → Green ESG	0.454	< 0.001	Supported
NQP Innovation × AIDT → Green ESG	0.297	< 0.01	Supported

The innovation NQP has significantly improved the ESG vertebral performance ($\beta = 0.454$, $p < 0.001$), confirming hypothesis H1. AIDT also supported hypothesis H2, confirming the NQP-ESG relationship ($\beta = 0.297$, $p < 0.01$).

6. Discussion

The findings demonstrate that NQP innovation enhances ESG performance, with a focus on resource-based benefits as determined by RBV. The role of the AIDT moderator emphasizes its ability to support the Theory of Dynamic Capabilities and strengthen the influence of innovation on durability.

The bottom line is that high-tech companies should invest in IA and digital infrastructure to maximize ESG benefits. One of the study's limitations is that it focusses on UK-based businesses, which may limit the applicability of its findings.

With a normalized coefficient of 0.454 ($p < 0.001$), the empirical results demonstrate that innovation in new quality productivity (NQP) significantly improves the environmental, social, and governance (ESG) performance of technologically advanced businesses in the United Kingdom.

Furthermore, this relationship is positively moderated by the digital transformation piloted by the IA (AIDT) ($\beta = 0.297$, $p < 0.01$), hence amplifying the impact of NQP innovation on ESG results. These findings align with the Perspective Based on Resources, which positions NQP as a strategic tool for long-term success, and the Theory of Dynamic Capabilities, which emphasizes the role of AIT in fostering adaptive innovation.

In summary, the findings show that high-tech companies should prioritise R&D investments and IA integration to enhance their ESG performance, which would help the company remain viable and comply with regulations.

7. Conclusion

This study demonstrates how NQP innovation significantly improves the ESG performance of high-tech companies in the United Kingdom, with the crucial role of an ADT moderator. Future research should focus on cross-cultural contexts and longitudinal conceptions to further enhance understanding of these dynamics.

Even if this study presents sound viewpoints, some limitations should be taken into consideration. The study only looks at technologically advanced businesses in the United Kingdom, which may limit the findings' applicability in other cultural or industrial contexts.

Furthermore, the transversal approach limits the ability to understand the longitudinal dynamics in the NQP-ESG relationship. Future studies could adopt a comparative viewpoint by examining high-tech companies in various nations to assess the influence of cultural factors on observed relationships.

Longitudinal studies allowed for a better understanding of how NQP and AIDT innovation evolves over time to impact ESG outcomes. The study of additional moderators, such as organizational culture or complementary cadres, may also enhance the theoretical model.

Overall, this study shows that NQP innovation is a key factor in the ESG performance of technologically advanced businesses in the UK, with AIDT significantly strengthening this relationship. By connecting the theoretical viewpoints of the Resource-Based View and the Dynamic Capabilities Theory, the findings provide a clear understanding of how innovation and digital transformation work together to support an organization's sustainability.

Despite the project's scope and conceptual limitations, the findings provide practitioners with useful perspectives and serve as a foundation for further academic research. It is advised that technological companies use artificial intelligence-based technology and innovative practices to enhance their ESG performance in tandem with global sustainability requirements.

References:

- Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Chen, Y., Zhang, Z. 2022. AI-driven transformation and ESG performance. *Sustainability*, 14(3), 1234.

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- Cui, J. 2025a. The Effect of Human-AI Collaboration and Digitalization on Green ESG Performance: Empirical Evidence from Chinese Listed Companies.
- Cui, J. 2025b. Entrepreneurial Motivations and ESG Performance Evidence from Automobile Companies Listed on the Chinese Stock Exchange. arXiv preprint arXiv:2503.21828.
- Cui, J. 2025c. ESG Performance and Total Factor Productivity: The Moderating Role of Supply Chain Green Innovation and Human-AI Collaboration in the Telecommunications Industry.
- Cui, J. 2025d. Green Digital Transformation and ESG Performance: The Mediating Role of Green Technological Innovation and the Moderating Effect of Human-AI Collaboration.
- Cui, J. 2025e. Digital Transformation in the Media Industry: The Moderating Role of Human-AI Interaction Technologies. *Media, Communication, and Technology*, 1(1), 42-42.
- Grima, S., Maditinos, D., Noja, G.G., Stankevičienė, J., Tarczynska-Luniewska, M., Thalassinou, E. (Eds.). 2024. Exploring ESG Challenges and Opportunities: Navigating Towards a Better Future. Emerald Publishing Limited.
- Li, X., Wang, J., Zhang, L. 2020. Innovation and environmental performance in high-tech firms. *Journal of Cleaner Production*, 245, 118765. <https://doi.org/>.
- Pagkalou, F.I., Thalassinou, E.I., Liapis, K.I. 2025. Comparative Analysis of CSR and ESG Actions in Greece: A Study Using Artificial Neural Networks and Machine-learning Techniques. In *Green wealth: Navigating towards a sustainable future* (pp. 273-293). Emerald Publishing Limited.
- Porter, M.E., van der Linde, C. 1995. Toward a new conception of the environment-competitive relationship. *Journal of Economic Perspectives*, 9(4), 97-118. <https://doi.org/10.1257/jep.9.4.97>.
- Teece, D.J. 2007. Explicating dynamic capabilities. *Strategic Management Journal*, 28(13), 1319-1350.
- Yue, H., Cui, J., Zhao, X., Liu, Y., Zhang, H., Wang, M. 2024. Study on the sports biomechanics prediction, sport biofluids and assessment of college students' mental health status transport based on artificial neural network and expert system. *Molecular & Cellular Biomechanics*, 21(1), 256-256.