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Developing AI and Augmented Intelligence Dynamic Capabilities for Sustainable Development Goal 13 (Climate Action): A Mixed Method Study

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ABSTRACT

This study develops a capability model that integrates Artificial Intelligence (AI) for autonomous data processing and Augmented Intelligence (AugI) for enhanced human-AI collaboration, creating a synergistic dynamic capability for climate action (SDG 13). Further, the study examined the effect of AI and AugI capability for climate action on firm performance. In Study 1, focus groups were used to identify the dimensions of AI and AugI dynamic capability. In Study 2, an empirical design using a survey was employed to test the model. The findings of Study 1 show that regulatory and standards compliance, climate and environmental data management, AI and AugI tools, climate science knowledge and analytics, and human-AI collaboration for climate solutions are first-order reflective constructs that are combined to develop a second-order formative AI and AugI dynamic capability (DCC) construct. The findings of Study 2 show that the relationship between AI and AugI dynamic capability (DCC) and firm performance is positive and statistically significant.

KEYWORDS

Artificial Intelligence and Augmented Intelligence, Emerging Economy, Information Management, SDG13, Dynamic Capability

INTRODUCTION

In the digital age, artificial intelligence (AI) is used in every domain of science and technology, and its use in climate change prediction and adaptation is no exception (Ågerfalk et al., 2022; Bag et al., 2024; Chaudhary, 2023; Nguyen et al., 2022; Wang & Lin, 2023). In addition, augmented intelligence (AugI) supports human decision-making using digital tools (Loebbecke et al., 2020).

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AI typically refers to machine-based systems capable of performing tasks with a degree of autonomy by processing data, identifying patterns, and making predictions (Gupta & Panigrahi, 2022). In contrast, AugI emphasizes the enhancement of human decision-making through AI-enabled tools while retaining human oversight and interpretive judgment (Hassani et al., 2020; Loebbecke et al., 2020). AugI is not a subset of AI but rather a complementary paradigm that reinforces the role of humans in complex, high-stakes contexts such as climate action, where accountability, ethical judgment, and domain expertise are critical.

While AI systems can analyze large-scale climate datasets autonomously, AugI ensures that insights are filtered through human expertise before informing strategic decisions. Many firms in the medical field and manufacturing domains have adopted human-AI collaboration models rather than replacing humans. AI and AugI intersect with Sustainable Development Goal 13 (Climate Action) in various ways. For instance, AI and AugI can help policymakers analyze findings from large datasets on climate change and draft mitigation strategies that can be used for enhanced decision-making. In addition, automating repetitive tasks allows policymakers, scientists, and researchers working on Climate Action to focus on creative and strategic tasks. Additionally, errors will be reduced or eliminated through the integration of AI and AugI.

Incorporating AI and AugI technologies into sustainable development and climate action offers tremendous potential but also has notable challenges. Overcoming these obstacles demands a comprehensive approach, including enhanced collaboration across disciplines, investments in responsible AI systems, and the promotion of supportive regulatory policies. By addressing issues such as data accessibility, ethical dilemmas, scalability hurdles, and financial limitations, organizations can harness the power of these technologies to make meaningful strides in advancing climate action. Achieving this requires ongoing dedication, innovative thinking, and a steadfast commitment to fairness and transparency in the pursuit of sustainable development (https://www.lse.ac.uk/granthaminstitute/explainers/what-opportunities-and-risks-does-ai-present-for-climate-action/).

The literature on AI, sustainability, and SDGs reveals a growing body of relevant research suggesting AI as a driver for SDG achievement, including AI's role in climate modeling, carbon capture, and emissions reduction (e.g., Manikandan et al., 2024; Raman et al., 2024; Schoormann et al., 2023; Singh et al., 2024). Several studies highlight the importance of AI-driven innovations for environmental sustainability, identifying AI as a tool for tackling environmental challenges such as carbon capture and climate change mitigation (Manikandan et al., 2024; Priya et al., 2023). The studies suggested that advanced AI techniques have been proposed to optimize carbon-capturing materials and processes (Manikandan et al., 2024; Priya et al., 2023); support climate adaptation using machine learning models by predicting climate trends and impacts on policy (Biesbroek et al., 2020; Singh et al., 2024); and enhance energy efficiency using AI solutions for reducing energy waste and enhancing smart infrastructure solutions (Kulkarni et al., 2023).

There are also studies available that examine AI-enabled decision-making and policy integration. For instance, AI tools have been used to analyze climate adaptation policies (Biesbroek et al., 2020), while predictive analytics support informed policy development (Nourani et al., 2024). Another set of research discussed ethical considerations related to AI deployment. For example, Hassani et al. (2020) and Mazzi and Floridi (2023) addressed ethical and regulatory challenges, suggesting the need for ethical frameworks and standards to ensure transparency and fairness (Hassani et al., 2020; Mazzi & Floridi, 2023). In addition, Kumari and Pandey (2023) pointed out that the potential misuse of AI and its resource-intensive nature may raise concerns about unintended environmental impacts.

Another stream of research discussed public awareness and visualization. AI-powered visualization is crucial for bridging the gap between awareness and action on climate change (Luccioni et al., 2021). Additionally, interactive and personalized platforms are shown to enhance individual engagement by contextualizing the impacts of climate change for individuals (Dhanda, 2019; Luccioni et al., 2021).

The literature reveals that some work has addressed essential areas related to business and technological integration for sustainability (Annu & Tripathi, 2024). For instance, researchers have