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Digital Sustainability and Green Economic Transformation in the Digital Economy

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ABSTRACT

The rapid expansion of digital economies has significantly transformed sustainability practices, environmental modernization processes, and green economic development within contemporary technological environments. Digital technologies increasingly influence how organizations, institutions, and economic systems improve resource efficiency, implement sustainable innovation, and support environmentally adaptive transformation strategies. The findings indicate that digital sustainability contributes positively to green innovation capability, environmental efficiency, sustainable operational systems, and resilience-oriented economic modernization. In addition, digitally integrated sustainability systems support environmentally responsible production processes, ESG capability enhancement, and adaptive governance coordination within rapidly evolving digital economies. However, the review also identifies significant sustainability and capability challenges affecting equitable green transformation, including unequal sustainability readiness, governance capability disparities, technological adaptation limitations, and resilience-related constraints across economic systems.

Keywords: *Digital Sustainability, ESG Capability, Green Economic Transformation, Sustainable Development, Sustainable Innovation.*

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1. | INTRODUCTION

Global economic systems are increasingly experiencing structural transformation as digital technologies become integrated into industrial processes, governance systems, business activities, and sustainability initiatives. The expansion of digital economies has accelerated not only technological modernization but also broader transitions toward environmentally oriented development and sustainability-focused economic restructuring. Digital technologies increasingly influence how societies manage environmental resources, optimize production systems, support green innovation, and coordinate sustainability strategies within rapidly evolving economic environments. Kotlarsky et al. (2023) explain that digital sustainability has emerged as an important interdisciplinary concept linking technological advancement with long-term environmental and societal sustainability objectives. Similarly, Rosário and Dias (2022) argue that digital transition processes increasingly reshape sustainable development pathways through the integration of technological capability and sustainability-oriented innovation. These developments indicate that digital economies are no longer evaluated solely based on productivity and efficiency, but also on their contribution to sustainable and environmentally adaptive economic transformation. Consequently, sustainability capability has become increasingly important within digitally evolving economic systems.

The growing interaction between digital transformation and sustainability objectives has intensified attention toward green economic modernization and environmentally responsible innovation. Digital technologies increasingly support energy optimization, environmental monitoring, sustainable production systems, and resource-efficiency improvement across various sectors. Martínez-Peláez et al. (2023) emphasize that digital transformation contributes to sustainability outcomes through stakeholder coordination, technological capability, and adaptive organizational systems. Similarly, Alojail and Khan (2023) identify digital transformation as an important driver of sustainable development because digitally integrated systems strengthen operational efficiency and sustainability-oriented adaptation. In addition, Jovanović et al. (2018) highlight that digitalization increasingly influences societal sustainability through changes in production structures, economic coordination, and technological integration. These findings suggest that sustainable economic transformation increasingly depends on the integration of digital technologies with environmental and sustainability objectives. As a result, digital sustainability has become an important component of long-term economic modernization strategies within contemporary digital economies.

The literature further demonstrates that green economic transformation increasingly relies on digitally enabled innovation and adaptive sustainability capability. Technological integration within industrial and economic systems contributes to environmental modernization by improving green productivity, supporting sustainable innovation, and facilitating resource optimization processes.

Hao et al. (2023) argue that digitalization positively influences green economic growth through industrial structure optimization and innovation capability enhancement. Similarly, Liu et al. (2022) identify digital economy development as an important factor supporting industrial upgrading and green total factor productivity within technologically evolving economic environments. In addition, Khan and Ximei (2022) emphasize that information and communication technologies contribute significantly to environmental sustainability and green economic performance. These findings indicate that digital technologies increasingly function as strategic instruments supporting environmentally oriented economic transformation. Therefore, green economic modernization increasingly depends on innovation capability, digital integration, and sustainability-oriented technological adaptation.

Another important issue emerging within the literature concerns the growing relationship between green innovation and sustainable digital transformation. Sustainability-oriented innovation increasingly involves the utilization of digital technologies to support environmentally adaptive production systems, sustainable operational capability, and resilience-oriented economic transformation. Mäkitie et al. (2023) explain that digital innovation contributes significantly to sustainability transitions through technological adaptation and innovation-driven environmental change. Similarly, Luo et al. (2023) highlight that digital economy development positively affects green innovation capability and sustainable economic transformation within rapidly modernizing economies. Furthermore, Feng et al. (2022) identify digital transformation as an important factor influencing enterprise-level green innovation and sustainability performance. These findings suggest that sustainable innovation increasingly depends on digitally integrated systems capable of supporting adaptive environmental transformation and long-term sustainability capability. Consequently, innovation-driven sustainability has become increasingly important within digitally evolving economic systems.

The literature also identifies ESG capability and sustainability governance as critical components influencing sustainable digital transformation outcomes. Environmental, social, and governance (ESG) considerations increasingly shape how organizations, institutions, and economic systems integrate sustainability principles into digitally enabled transformation strategies. Kwilinski et al. (2023) emphasize that digital transformation significantly influences ESG performance and sustainable value creation within contemporary economic systems. Similarly, Zhou and Liu (2023) argue that digitalization contributes positively to resource efficiency and sustainability capability necessary for achieving ESG-related objectives. In addition, Linkov et al. (2018) highlight that governance strategies are essential for managing sustainable digital systems and environmentally adaptive technological development. These findings indicate that sustainability governance and ESG readiness increasingly influence the effectiveness of sustainable digital transformation. Therefore, sustainability capability extends beyond technological implementation and involves

coordinated governance, institutional adaptation, and environmentally responsible innovation systems.

Despite the opportunities associated with digital sustainability, recent studies consistently identify substantial sustainability and capability challenges affecting equitable green transformation within digital economies. Access to digital technologies alone does not guarantee environmentally sustainable outcomes because institutional readiness, technological capability, and adaptive sustainability systems strongly influence transformation effectiveness. Heeks (2022) argues that unequal technological incorporation may reinforce socio-economic and developmental disparities within digitally evolving environments. Similarly, Balogun et al. (2020) emphasize that digitalization-based climate adaptation strategies require adequate technological infrastructure and institutional capability to support sustainable urban transformation. In addition, Buzzao and Rizzi (2021) identify sustainability capability and dynamic adaptation as important determinants of long-term environmentally oriented competitiveness. These findings indicate that sustainability transitions may simultaneously create opportunities for green development while reinforcing capability inequalities and uneven environmental modernization across economic systems. Consequently, equitable sustainability readiness becomes increasingly important within digitally transforming economies.

Although discussions regarding digital sustainability and green transformation continue to expand rapidly, existing studies often examine sustainability capability, green innovation, ESG readiness, and environmental modernization separately rather than synthesizing these dimensions within a broader sustainable digital economy perspective. Many studies emphasize technological modernization and environmental efficiency while giving less attention to the interconnected relationship between sustainability governance, resilience capability, innovation readiness, and equitable green transition adaptation. This creates fragmented understanding regarding how digital economies simultaneously support sustainability-oriented transformation while generating capability disparities and institutional sustainability challenges. Consequently, there remains a need for a more integrated synthesis of the literature examining the relationship between digital sustainability, green economic transformation, ESG capability, and resilience-oriented adaptation. Addressing this gap is important for understanding how digital economies reshape sustainable development pathways within contemporary technological environments.

Based on these considerations, this study aims to systematically review the literature on digital sustainability and green economic transformation using a qualitative Systematic Literature Review (SLR) approach. The study focuses on analyzing how digital economies influence sustainable innovation, environmental modernization, ESG capability, and resilience-oriented economic transformation within digitally evolving systems. In addition, the review examines sustainability and capability challenges associated with green digital transformation, including unequal

sustainability readiness, institutional adaptation difficulties, governance capability disparities, and environmentally oriented innovation limitations. Snyder (2019) emphasizes that systematic literature reviews support conceptual integration and theoretical development within complex research domains. Furthermore, Page et al. (2021) highlight that PRISMA-based methodologies improve transparency and rigor in evidence synthesis. Through thematic synthesis, this study seeks to provide a more comprehensive understanding of how digital sustainability reshapes green economic transformation and long-term sustainable development within the contemporary digital era.

2. | LITERATURE REVIEW

Digital Sustainability and Green Economic Transformation

Digital sustainability has emerged as an important framework connecting technological advancement with long-term environmental and socio-economic sustainability objectives within contemporary digital economies. Digital sustainability refers to the utilization of digital technologies to support environmentally adaptive development, sustainable resource management, and resilience-oriented economic transformation. Kotlarsky et al. (2023) explain that digital sustainability increasingly functions as an interdisciplinary research domain integrating information systems, sustainability capability, and long-term societal transformation. Similarly, Rosário and Dias (2022) emphasize that digital transition processes significantly influence sustainable development pathways through digitally enabled operational adaptation and sustainability-oriented innovation. These developments demonstrate that digital economies increasingly contribute not only to technological modernization but also to broader sustainability transformation processes. Consequently, sustainable digital transformation increasingly becomes a strategic component of long-term economic development within digitally evolving societies.

The literature further demonstrates that green economic transformation increasingly depends on digitally integrated sustainability systems and environmentally adaptive technological capability. Jovanović et al. (2018) argue that digitalization significantly influences sustainable societal development through technological integration and changing production structures. Similarly, Pappas et al. (2023) emphasize the importance of responsible digital transformation capable of supporting sustainable societies and environmentally balanced technological development. These findings indicate that sustainability-oriented economic transformation requires integrated approaches combining technological advancement with environmental responsibility and long-term resilience capability. Therefore, digital sustainability increasingly functions as both an economic modernization mechanism and a sustainability-oriented transformation process within contemporary digital economies.

Sustainable Digital Transformation and Environmental Adaptation

Sustainable digital transformation increasingly influences how organizations, industries, and economic systems adapt to environmental challenges and sustainability objectives. Digital technologies support sustainability adaptation through operational optimization, technological coordination, environmental monitoring, and resource-efficiency improvement within digitally integrated economic systems. Martínez-Peláez et al. (2023) emphasize that digital transformation contributes to sustainability outcomes through stakeholder coordination, technological capability, and adaptive organizational systems. Similarly, Alojail and Khan (2023) identify digital transformation as an important factor supporting sustainable development and environmentally adaptive operational capability. These findings demonstrate that sustainability transformation increasingly depends on digitally enabled adaptation systems and innovation-oriented technological integration. Consequently, digital transformation increasingly functions as a strategic instrument supporting environmental modernization and sustainable economic restructuring.

The literature also highlights the growing importance of resilience-oriented adaptation within sustainability transformation processes. Hajishirzi et al. (2022) argue that digital transformation contributes to sustainability resilience by strengthening adaptive organizational capability and environmentally responsive operational systems. Similarly, Balogun et al. (2020) emphasize that digitalization significantly supports climate adaptation and sustainable urban transformation through digitally integrated management systems and technological capability enhancement. These developments indicate that sustainable digital transformation increasingly requires adaptive resilience and environmentally responsive technological systems capable of supporting long-term sustainability objectives. Therefore, sustainability adaptation increasingly depends on digitally integrated resilience capability within contemporary economic environments.

Green Innovation and Sustainability Capability

Green innovation increasingly functions as a major component of sustainable economic transformation within digitally evolving economies. Green innovation refers to environmentally oriented technological and operational innovation designed to improve sustainability performance, reduce environmental impact, and strengthen adaptive economic capability. Hao et al. (2023) emphasize that digitalization positively contributes to green economic growth through industrial structure optimization and innovation capability enhancement. Similarly, Liu et al. (2022) identify digital economy development as an important factor influencing industrial upgrading and green productivity improvement. These findings indicate that digital technologies increasingly support environmentally adaptive innovation and sustainability-oriented economic modernization. Consequently, green innovation has become increasingly important within sustainability transformation strategies across contemporary digital economies.

The literature further demonstrates that sustainability capability depends heavily on innovation readiness and adaptive technological integration. Mäkitie et al. (2023) explain that digital innovation significantly contributes to sustainability transitions through environmentally adaptive technological change and innovation-driven transformation processes. Similarly, Luo et al. (2023) argue that digital economy development positively influences green innovation capability and sustainable industrial modernization. In addition, Feng et al. (2022) emphasize that digital transformation strengthens enterprise-level green innovation performance through digitally integrated operational systems and technological adaptation. These findings suggest that sustainable economic transformation increasingly depends on innovation systems capable of integrating digital technologies with environmentally oriented development objectives. Therefore, sustainability capability increasingly relies on continuous innovation and adaptive technological modernization within digital economies.

ESG Capability and Sustainability Governance

Environmental, social, and governance (ESG) capability has become increasingly important in supporting sustainability-oriented digital transformation within modern economic systems. ESG capability refers to the institutional and organizational ability to integrate sustainability principles into governance systems, operational activities, and digitally enabled transformation processes. Kwilinski et al. (2023) emphasize that digital transformation significantly influences ESG performance and sustainable value creation within contemporary economic environments. Similarly, Zhou and Liu (2023) identify digitalization as an important factor supporting resource efficiency and environmentally adaptive economic capability necessary for achieving ESG objectives. These findings demonstrate that sustainable digital transformation increasingly requires coordinated governance systems and sustainability-oriented institutional adaptation. Consequently, ESG readiness has become an important determinant of sustainability transformation effectiveness within digitally evolving economies.

The literature also highlights the importance of governance capability and institutional coordination within sustainable digital systems. Linkov et al. (2018) argue that governance strategies are essential for managing sustainability risks and environmentally adaptive technological systems within digital societies. Similarly, sustainability governance increasingly requires institutions capable of coordinating technological innovation, environmental adaptation, and long-term resilience strategies across interconnected economic systems. These developments indicate that sustainable digital transformation extends beyond technological modernization and involves broader governance coordination and institutional sustainability capability. Therefore, sustainability governance increasingly functions as a central component of environmentally oriented digital transformation within contemporary economies.

Inclusive Sustainability and Environmental Resilience

Despite the opportunities associated with sustainable digital transformation, the literature consistently identifies significant capability disparities and inclusion challenges affecting equitable sustainability outcomes. Digital technologies may improve environmental efficiency and sustainability capability, but unequal technological readiness and institutional adaptation frequently create uneven sustainability transformation outcomes across economic systems and social groups. Heeks (2022) argues that unequal technological incorporation may reinforce broader socio-economic and developmental inequalities within digitally evolving environments. Similarly, sustainability transitions often favor institutions and economic systems characterized by stronger technological capability and greater adaptive readiness. These findings indicate that sustainability-oriented digital transformation may simultaneously create opportunities for green development while reinforcing capability disparities and unequal environmental modernization processes. Consequently, equitable sustainability participation increasingly becomes essential for long-term sustainable development within digital economies.

The literature further demonstrates that environmental resilience increasingly depends on adaptive sustainability capability and inclusive transformation systems. Buzzao and Rizzi (2021) emphasize that sustainability capability requires dynamic adaptation and long-term resilience-oriented operational systems capable of responding to environmental and technological change. Similarly, resilience-oriented sustainability systems strengthen the ability of organizations and economic environments to maintain environmental adaptation and operational continuity within rapidly changing technological conditions. These developments indicate that sustainable digital economies increasingly require integrated systems capable of balancing innovation capability, environmental adaptation, and equitable sustainability readiness. Therefore, inclusive sustainability and resilience capability become increasingly important for supporting sustainable economic transformation within contemporary digital societies.

3. | RESEARCH METHOD

This study employs a qualitative Systematic Literature Review (SLR) approach to examine the relationship between digital sustainability and green economic transformation within contemporary digital economies. A systematic literature review enables researchers to synthesize academic findings from diverse interdisciplinary domains while identifying conceptual patterns, theoretical developments, and broader sustainability-related research trends. Snyder (2019) explains that literature reviews are particularly useful for developing integrated conceptual understanding within emerging and rapidly evolving research fields. Similarly, Linnenluecke et al. (2020) emphasize that systematic review methodologies improve analytical transparency and strengthen research rigor through structured evidence synthesis procedures. Through this approach, the study seeks to develop a comprehensive understanding of how digital

technologies influence sustainability capability, green innovation, environmental modernization, and resilience-oriented economic transformation within digitally evolving systems. Consequently, the review focuses not only on technological advancement but also on sustainability capability and environmentally adaptive transformation processes within digital economies.

The review process follows the PRISMA 2020 framework to ensure consistency, transparency, and methodological rigor throughout the literature identification and selection stages. Page et al. (2021) highlight that PRISMA guidelines improve systematic review quality through structured procedures involving identification, screening, eligibility assessment, and inclusion. Academic literature was collected from major scholarly databases, including Scopus, Google Scholar, ScienceDirect, Springer, Emerald, and Taylor & Francis. The search process utilized combinations of keywords related to digital sustainability, sustainable digital transformation, green economy, environmental modernization, green innovation, ESG capability, sustainability governance, environmental resilience, and inclusive sustainability. Inclusion criteria focused on peer-reviewed journal articles, scholarly books, conference proceedings, and institutional publications published between 2018 and 2024 that directly addressed sustainability-oriented digital transformation and environmentally adaptive economic systems. Studies focusing exclusively on highly technical engineering implementation without broader sustainability or economic relevance were excluded from the analysis. This selection process ensured that the reviewed literature remained aligned with the objectives and sustainability-oriented analytical direction of the study.

Following the literature collection process, the selected studies were analyzed using a qualitative thematic synthesis approach to identify recurring sustainability themes, conceptual relationships, and broader transformation patterns within digital sustainability research. Thematic synthesis enables researchers to compare findings across multiple studies while generating broader interpretations regarding sustainability transformation and environmental adaptation within digital economies. The literature was categorized into several thematic areas, including digital sustainability, green economic transformation, sustainable innovation, ESG capability, sustainability governance, environmental resilience, and inclusive sustainability. This thematic classification enabled the study to examine how digitally integrated systems influence environmentally oriented economic modernization and long-term sustainability capability. In addition, thematic synthesis facilitated the identification of recurring sustainability challenges associated with digital transformation, including unequal sustainability readiness, institutional adaptation limitations, governance capability disparities, and environmentally related resilience issues. Consequently, the study provides an integrated conceptual interpretation of sustainability-oriented digital transformation rather than isolated descriptions of individual studies.

The analytical process further emphasizes the interconnected relationship between sustainability capability, innovation readiness, environmental adaptation, and

resilience-oriented transformation within digitally evolving economic systems. The reviewed studies were examined not only for their discussion of technological modernization and sustainability performance but also for their analysis of governance readiness, adaptive capability, green innovation, and equitable sustainability participation. This approach enabled the study to evaluate both the opportunities and structural limitations associated with sustainable digital transformation. Furthermore, the analysis focused on how organizations, institutions, and economic systems adapt to environmental and technological change through digitally enabled sustainability systems and resilience-oriented operational strategies. By integrating these dimensions, the study seeks to provide a balanced understanding of how digital economies simultaneously support environmentally adaptive transformation while producing capability disparities and sustainability-related challenges within economic systems. Therefore, the qualitative SLR approach enables the study to generate broader insights regarding the resilience-dependent and sustainability-oriented nature of green economic transformation within contemporary digital economies.

4. | RESULTS

The reviewed literature demonstrates that digital economies increasingly contribute to sustainability-oriented economic transformation through environmentally adaptive technological integration and digitally enabled modernization processes. Digital technologies influence how organizations, institutions, and economic systems optimize operational efficiency, improve environmental performance, and coordinate sustainability-oriented activities within rapidly evolving economic environments. The findings indicate that sustainable digital transformation extends beyond technological modernization and increasingly functions as a mechanism supporting long-term environmental adaptation and green economic restructuring. In many contexts, digitally integrated sustainability systems improve operational responsiveness, resource management capability, and environmentally adaptive decision-making processes. These developments suggest that digital sustainability increasingly becomes a strategic component of broader economic modernization and sustainable development initiatives. Consequently, sustainability capability has become closely associated with digitally integrated transformation systems within contemporary digital economies.

The literature further identifies green economic transformation as one of the most important outcomes associated with sustainable digitalization processes. Digitally enabled economic systems increasingly support environmentally oriented industrial restructuring, green productivity improvement, and sustainability-focused operational innovation. The reviewed studies consistently demonstrate that digital technologies positively influence green economic growth by supporting industrial upgrading, improving resource efficiency, and strengthening environmentally adaptive production systems. In addition, technological integration contributes to environmentally sustainable modernization through digitally coordinated operational capability and innovation-driven sustainability practices. However, the findings also indicate that

green transformation outcomes vary significantly across economic systems with different levels of technological readiness and adaptive sustainability capability. These disparities influence the effectiveness of environmental modernization and the long-term sustainability of digitally integrated economic transformation. As a result, sustainability readiness increasingly functions as an important determinant of green economic performance within digital economies.

Another important finding identified in the literature concerns the growing role of green innovation and sustainability capability within digitally evolving economic systems. Sustainable innovation increasingly involves the integration of digital technologies into environmentally adaptive operational systems and resilience-oriented transformation strategies. The reviewed studies indicate that digital transformation strengthens green innovation capability by improving technological coordination, operational flexibility, and sustainability-oriented adaptation processes. In many contexts, digitally capable organizations are more effective in implementing environmentally responsible operational systems and adaptive sustainability strategies than organizations characterized by weak technological readiness and limited innovation capability. Furthermore, sustainability capability increasingly depends on continuous technological adaptation and innovation-oriented resilience systems capable of responding to environmental and economic change. These findings suggest that green innovation has become an essential component of sustainable digital economic transformation. Consequently, innovation readiness increasingly determines the sustainability performance of digitally evolving economic systems.

The findings also demonstrate that ESG capability and sustainability governance play major roles in supporting environmentally oriented digital transformation. Governance systems increasingly require integrated sustainability frameworks capable of coordinating environmental objectives, technological modernization, and long-term resilience strategies within digitally integrated economic environments. The reviewed literature highlights that ESG readiness contributes positively to sustainable value creation, environmental performance, and resource-efficiency improvement within digital economies. In addition, sustainability governance strengthens the ability of institutions and organizations to coordinate adaptive sustainability strategies and environmentally responsible operational systems. However, governance effectiveness frequently depends on institutional capability, policy coordination, and sustainability-oriented strategic integration. These findings indicate that sustainable digital transformation requires not only technological capability but also coordinated governance systems capable of supporting environmentally adaptive economic modernization. Therefore, ESG capability increasingly functions as an important component of sustainability-oriented digital transformation within contemporary economies.

Despite the opportunities associated with digital sustainability, the reviewed literature consistently identifies substantial capability disparities and resilience

challenges affecting equitable sustainability outcomes. Access to digital technologies alone does not ensure environmentally sustainable transformation because institutional readiness, adaptive capability, and sustainability-oriented innovation systems significantly influence transformation effectiveness. In many cases, economically advanced environments with stronger digital infrastructure and sustainability capability are more capable of implementing green transformation successfully than systems characterized by limited technological readiness and weak adaptive resilience. The findings further indicate that sustainability transitions may simultaneously support environmental modernization while reinforcing unequal sustainability participation and capability disparities across regions and institutions. In addition, insufficient resilience capability may reduce the ability of organizations and economic systems to maintain sustainable adaptation during periods of environmental and technological disruption. These developments suggest that equitable sustainability readiness increasingly becomes essential for long-term green economic transformation within digital economies.

5. | DISCUSSION

Overall, the reviewed literature demonstrates that digital sustainability should be understood as an environmentally adaptive and resilience-oriented transformation process rather than merely the technological modernization of economic systems. While digital economies create significant opportunities for green innovation, sustainability capability, and environmentally responsible economic development, successful transformation depends heavily on adaptive resilience, ESG readiness, governance coordination, and sustainability-oriented technological integration. The findings indicate that sustainable digital economic transformation requires integrated strategies capable of balancing technological advancement, environmental modernization, adaptive capability, and equitable sustainability participation. In addition, long-term sustainability increasingly depends on the ability of organizations and institutions to maintain environmentally adaptive operational systems within rapidly evolving technological environments. These findings suggest that sustainable digital economies are determined not only by technological progress but also by resilience capability and sustainability-oriented transformation readiness. Therefore, digital sustainability represents both a strategic opportunity for green economic modernization and a major challenge for equitable and resilience-based sustainable development within contemporary digital economies.

6. | CONCLUSION

This study concludes that digital economies increasingly influence sustainable and green economic transformation through environmentally adaptive technological integration, sustainability-oriented innovation, and digitally enabled modernization systems. The reviewed literature consistently demonstrates that digital technologies contribute positively to environmental efficiency, green innovation capability,

sustainable operational systems, and resilience-oriented economic transformation within contemporary digital economies. In addition, digitally integrated sustainability systems support resource optimization, environmentally responsible production processes, and adaptive economic restructuring capable of strengthening long-term sustainability outcomes. These developments indicate that sustainable digital transformation increasingly functions as an important component of environmentally oriented economic modernization. However, the findings also demonstrate that successful sustainability transformation depends heavily on adaptive capability, ESG readiness, governance coordination, and sustainability-oriented innovation systems rather than technological modernization alone.

The findings further reveal that capability disparities and unequal sustainability readiness remain major challenges affecting equitable green transformation within digital economies. Many organizations, institutions, and economic systems continue to experience limitations related to insufficient digital infrastructure, weak sustainability capability, fragmented governance coordination, and inadequate resilience-oriented operational systems. In addition, unequal technological readiness significantly influences the ability of economic systems to implement environmentally adaptive transformation and sustainable innovation successfully. Environments characterized by stronger sustainability governance, adaptive resilience capability, and digitally integrated innovation systems are generally more capable of supporting long-term green economic modernization than systems with limited sustainability readiness. These findings indicate that digital sustainability may simultaneously create opportunities for environmentally responsible development while reinforcing unequal sustainability participation and capability disparities across economic environments. Consequently, sustainable digital transformation requires integrated strategies capable of balancing technological advancement with adaptive resilience and equitable sustainability participation.

Finally, this study emphasizes that sustainable digital economic transformation requires environmentally adaptive and resilience-oriented approaches capable of integrating green innovation, sustainability governance, ESG capability, and digitally enabled operational modernization within contemporary economies. Policymakers, organizations, and economic institutions should prioritize sustainability capability development, resilience-oriented governance systems, environmentally adaptive innovation, and equitable sustainability readiness to support long-term green economic transformation. In addition, sustainability-oriented digital transformation strategies should integrate technological modernization with broader environmental objectives, institutional adaptation, and inclusive sustainability participation mechanisms. Future research may further explore comparative sustainability governance models, resilience capability differences across regions, and the long-term socio-economic implications of digitally enabled green transformation within emerging digital economies. By synthesizing existing literature, this study contributes to a broader understanding of how digital sustainability influences green economic modernization, resilience

capability, and environmentally adaptive transformation within the contemporary digital era.

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Declaration of Conflicting Interests

The authors declare that there is no conflict of interest.

Ethical Approval and Originality Statement

Ethical approval was obtained for this study. The manuscript represents original work and has not been previously published, nor is it under consideration by another journal.

Data Disclosure Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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