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ECOLOGICAL INNOVATION AS A PATHWAY TO A JUST FUTURE: COLLABORATION FOR SHARED PROSPERITY

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Abstract:
This study examines the concept of ecological innovation as a strategy toward a just future through multi-stakeholder collaborative approaches to achieve shared welfare. Using qualitative research methods with a library research approach, this study analyzes the integration of social justice principles in the development and implementation of ecological innovation. Research findings indicate that ecological innovation has evolved from technology-centric approaches to holistic paradigms integrating social, economic, and environmental dimensions. Multistakeholder collaboration involving academia, business, communities, and government proves to be key to success in creating conducive innovation ecosystems. Effective collaborative governance models require the role of intermediaries and catalyst organizations in facilitating knowledge and technology transfer. Implementation in Indonesia shows great potential, particularly in sustainable tourism and responsible digital transformation contexts, but faces structural and institutional challenges such as gender inequality and ineffective coordination. This research recommends policy reformulation that integrates local wisdom and environmental justice, as well as developing comprehensive success indicators to support achieving Sustainable Development Goals through just ecological innovation.

Keywords: *Ecological Innovation, Social Justice, Multi-Stakeholder Collaboration, Sustainable Development, Digital Transformation*

INTRODUCTION

In the Anthropocene era, marked by the acceleration of global environmental change, the concept of ecological innovation has become a key paradigm in the pursuit of sustainable solutions to address the complexity of contemporary socio-ecological challenges. The transformation towards a just future requires a holistic approach that integrates principles of social justice with environmentally friendly technological innovations within an effective multi-stakeholder collaborative framework. Ecological innovation, defined as the development of products, processes, and systems that significantly reduce environmental impact while creating economic and social value, has undergone a conceptual evolution leading to the recognition of the importance of justice dimensions in its implementation (Grossmann et al., 2022).

The sustainable development paradigm embodied in the 2030 Agenda for Sustainable Development underscores the urgency of collaborative approaches in achieving the Sustainable Development Goals (SDGs), particularly through multi-stakeholder partnerships articulated in SDG 17. Recent studies show that collaborative innovation plays a strategic role in facilitating the achievement of sustainable development goals through mechanisms that connect various actors

in the innovation ecosystem to create more comprehensive and sustainable solutions (Mariani et al., 2022). These findings affirm that the collaborative process among actors within the innovation ecosystem is iterative and facilitated by intermediaries who, by linking diverse actors, support the diffusion of innovations with significant implications for building long-term sustainability.

The theoretical framework of ecological innovation has evolved from approaches focused solely on technological efficiency toward a more holistic understanding of just socio-ecological transformation. Research by Haskell et al. (2021) on social innovation related to the ecological crisis reveals that new technologies, market-based solutions, and regulations are inadequate to address the human-induced ecological crisis, highlighting the need for a more fundamental approach to understanding the relationship between social and ecological systems. This aligns with the concept of social-ecological justice, which emphasizes the importance of integrating social justice dimensions into all conservation and ecological restoration efforts.

The collaborative dimension in ecological innovation requires an in-depth understanding of the dynamics of multi-stakeholder partnerships involving government, private sector, academia, and civil society in creating a conducive innovation ecosystem. Haskell et al. (2021) show that multi-stakeholder partnerships in sustainability-oriented innovation initiatives can facilitate sustainable development achievement, with a particular focus on the role of nonprofit organizations as catalysts in the collaboration process. These findings indicate that nonprofits play a key role in connecting various actors and facilitating the transfer of knowledge and technologies necessary for creating sustainable and just innovations.

The justice perspective in ecological innovation also encompasses considerations regarding the distribution of benefits and risks from the implementation of sustainable technologies and practices. Research by Menton et al. (2020) on the relationship between environmental justice and the SDGs reveals that through existing synergies, trade-offs, and contradictions, the SDGs have the potential to create both environmental justice and injustice. However, environmental justice and broader social justice have yet to be fully embedded in the language and spirit of the SDGs, indicating the need for a more explicit approach to integrating justice principles in ecological innovation implementation.

Indonesia's context as a developing country with diverse ecosystems and complex socio-economic conditions presents unique challenges and opportunities for implementing just ecological innovation. Research by Tegethoff et al. (2025) on sustainable development through eco-innovation focusing on small and medium enterprises in Colombia demonstrates that eco-innovation positively influences both environmental and socio-economic performance, with environmental performance improvements driven by resource efficiency, emission reduction, and waste management. These findings illustrate the potential for adapting ecological innovation implementation to Indonesia's context by considering specific local characteristics.

The concept of ecosocial innovation introduced by Matthies et al. (2019) offers an integrated framework combining ecological, economic, and social sustainability transitions into a holistic approach. This approach stresses the importance of building local structural foundations for economic change through grassroots initiatives adopting a social provisioning perspective. In this context, ecological innovation is not only viewed as a technological solution but as a

systemic transformation involving changes in social, economic, and political structures that support long-term sustainability and distributive justice.

The collaborative framework in ecological innovation also requires understanding the role of intermediaries in facilitating knowledge and technology transfer among diverse stakeholders. Research by Kovanen (2021) on long-term sustainability collaboration patterns in community social enterprises reveals that effective collaboration requires developing sustainable partnership patterns involving multiple actors in the innovation process. These findings underscore the importance of building strong and sustainable collaborative networks in implementing just ecological innovation.

The global dimension of contemporary ecological challenges necessitates approaches integrating local and global perspectives in developing innovative solutions. Research by Rojas Luiz et al. (2021) on pro-poor innovation to promote instrumental freedom reveals that justice-oriented innovation requires systematic approaches that consider local contexts and the specific needs of vulnerable communities. This aligns with the "leaving no one behind" principle of the 2030 Agenda for Sustainable Development, emphasizing the importance of ensuring that the benefits of ecological innovation are accessible to all societal layers, especially the most vulnerable and marginalized.

Given the complexity of challenges faced in implementing just ecological innovation, this study identifies several fundamental questions that need addressing. First, how can the conceptual framework of ecological innovation be integrated with social justice principles to create sustainable and inclusive development models? Second, what collaborative mechanisms are most effective in facilitating the implementation of ecological innovation that fairly benefits all stakeholders, especially vulnerable and marginalized communities? Third, what roles do intermediaries and nonprofit organizations play in catalyzing multi-stakeholder collaboration processes to create an innovation ecosystem conducive to achieving a sustainable and just future?.

This study aims to develop a comprehensive theoretical and practical framework for implementing ecological innovation as a pathway toward a just future through collaboration for shared welfare. Specifically, it seeks to analyze the integration of social justice principles in the development and implementation of ecological innovation, identify the most effective collaborative mechanisms in facilitating the achievement of equitable sustainable development goals, and formulate policy recommendations and implementation strategies that support the creation of a sustainable and inclusive innovation ecosystem. Furthermore, the research aims to contribute to the development of ecological innovation theory and practice that integrates social justice dimensions within the context of sustainable development.

This research is expected to make significant contributions in several respects. From a theoretical perspective, it will enrich the literature on ecological innovation by integrating social justice and multi-stakeholder collaboration dimensions within a comprehensive analytical framework. Practically, it will provide guidance for practitioners, policymakers, and other stakeholders in developing and implementing ecological innovation that is both just and sustainable. Additionally, the study is anticipated to serve as a reference for future research focusing on integrating technological innovation, social justice, and sustainable development within an increasingly complex and interconnected global context.

RESEARCH METHODS

This study employs a qualitative approach using the library research method to analyze the concept of ecological innovation as a pathway toward a just future through multi-stakeholder collaboration. The qualitative research paradigm is selected due to its ability to provide an in-depth understanding of complex phenomena involving social, ecological, and political dimensions within the context of sustainable innovation. This approach allows the researcher to explore nuances and complexities that cannot be revealed through purely quantitative methods, especially in understanding the dynamics of collaboration and justice dimensions in the implementation of ecological innovation (Lim, 2024).

The library research method is used as the primary strategy for collecting and analyzing relevant secondary data related to the research topic. This method is chosen based on the need to comprehensively review conceptual and theoretical developments concerning ecological innovation, social justice, and multi-stakeholder collaboration disseminated across various scientific literatures. The literature-based approach enables the researcher to identify knowledge gaps, analyze theoretical trends, and construct a robust conceptual framework based on the synthesis of existing literature (Snyder, 2019).

The data collection process involves systematic searches of various primary and secondary literature sources, including international scientific journals, academic books, research reports, and policy documents relevant to the research topic. Inclusion criteria include publications in English and Indonesian from 2015 to 2025, with a particular focus on literature discussing ecological innovation, social justice, sustainable development, and multi-stakeholder collaboration. Databases used for literature searches include Scopus, Web of Science, Google Scholar, and various academic repositories accessible through digital library services (Mamta & Kumar, 2023).

Data analysis is conducted through thematic analysis, which facilitates the identification of patterns, themes, and key concepts emerging from the reviewed literature. The analytical process begins with open coding to identify basic concepts found in the literature, followed by axial coding to connect these concepts into broader categories, and concludes with selective coding to build an integrated theoretical framework. This approach enables the development of a holistic understanding of the relationships among ecological innovation, social justice, and collaboration within the context of sustainable development (Kiger & Varpio, 2020).

Research validity is ensured through data source triangulation involving various types of literature and differing theoretical perspectives. Additionally, the study applies the principle of reflexivity in the analytical process to ensure that the interpretations produced are unbiased and accurately reflect the complexity of the phenomena studied. Limitations of this research are mainly related to dependence on secondary data and potential publication bias in the available literature; however, these are minimized through comprehensive search strategies and stringent inclusion criteria (Braun & Clarke, 2021).

RESULTS AND DISCUSSION

The Concept of Ecological Innovation from a Social Justice Perspective

Ecological innovation has developed as a response to increasingly complex global environmental challenges. This concept not only focuses on the

development of environmentally friendly technologies but also integrates social and economic dimensions into every process. Drastic and gradual transformation of companies is made possible by network infrastructure supported by environmentally friendly business strategies, where "digital entrepreneurship acts as a catalyst for the digitalization process" (Aprillia et al., 2023). New business models are developed through machine data analysis, sensor utilization, and intelligent real-time big data processing in the cloud, creating opportunities for more sustainable and inclusive innovations. The evolution of the ecological innovation concept reflects a shift from a technology-centric approach toward a more holistic perspective. Education must prepare future generations to face increasingly complex global challenges with a "focus on strengthening 21st-century skills, integrating technology into learning, and developing inclusive and adaptive character" (Nur & Tamam, 2024). This indicates that ecological innovation is not merely about technology but also about character building and adaptive capacities required to address environmental changes.

Social justice serves as a fundamental foundation in the development of sustainable ecological innovation. Research shows that "environmental injustice is a tangible violation of the right to a healthy environment as well as a hindrance to the fulfillment of environmental rights" (Afinas, 2023). In this context, ecological innovation must consider the equitable distribution of environmental benefits and risks, not solely focus on technological efficiency. Integrating social justice principles requires a multidimensional approach encompassing distributive, corrective, procedural, and social justice. Distributive justice relates to the fair allocation of environmental benefits and risks, corrective justice concerns legal protection of community environmental rights, procedural justice addresses barriers to information access, participation, and legal recourse, while social justice tackles issues persisting in the other three aspects (Afinas, 2023).

The relationship between environmental justice and socio-ecological innovation is reflected in how policies and innovation practices impact local communities. A case study in Mantangai District, Central Kalimantan, demonstrates that "policies based on the Human Exemptionalism Paradigm ignore the complexity of community socio-ecological relations that reflect the New Environmental Paradigm" (Meilinda et al., 2025). This underscores the importance of understanding the complex socio-ecological relationships when designing just innovations. The study reveals three major transformations resulting from the policy banning land burning: a shift in human-environment relationships from integrated systems to fragmented ones, socio-economic structure transformations from collective to individualistic, and a food security crisis due to loss of access to traditional agricultural systems. These transformations highlight that ecological innovation must consider social and cultural impacts, not only environmental aspects.

Implementing just ecological innovation faces various complex challenges. One main challenge is "how to build effective new business models based on new technologies or expand their current business models" (Aprillia et al., 2023). This challenge becomes more complex when social justice aspects must be considered at every stage of development and implementation. Another challenge is the criminalization of traditional practices, which creates systemic environmental injustice. Modernization programs such as food estates have failed due to ignoring local knowledge, while criminalizing traditional practices leads to systemic environmental injustice (Meilinda et al., 2025). This underscores the importance of approaches that respect local wisdom and ensure that ecological

innovation does not harm already vulnerable communities.

Multi-Stakeholder Collaboration Model for Sustainable Innovation

The ecological innovation ecosystem requires effective collaboration among various stakeholders. A national innovation system needs to be established to promote innovation and socio-economic development, where "the most important thing in the innovation system is the collaboration of academic, business, community, and government in the innovation ecosystem" (Choeriyah & Noviaristanti, 2021). This typology of collaboration encompasses various forms of partnerships that can be adapted to the specific contexts and needs of each ecological innovation initiative. Collaboration within the ecological innovation ecosystem can be categorized based on the level of involvement, types of shared resources, and coordination mechanisms employed. Each typology possesses unique characteristics that influence the effectiveness and sustainability of the collaboration. A deep understanding of these typologies is essential for designing appropriate collaborative strategies aligned with the ecological innovation goals to be achieved.

The role of intermediaries and catalyst organizations is crucial in facilitating multi-stakeholder collaboration. Research at Bandung Techno Park indicates that "BTP's role as Technology Transfer Officer still has shortcomings to align the results of research from academic with business needs" (Choeriyah & Noviaristanti, 2021). This highlights the importance of strengthening the capacity of catalyst organizations in connecting various stakeholders. Catalyst organizations function as bridges linking academia, business, community, and government. They play a strategic role in identifying collaboration opportunities, facilitating knowledge transfer, and ensuring that innovations produced meet societal needs. The effectiveness of catalyst organizations significantly determines the overall success of the ecological innovation ecosystem.

Effective partnership mechanisms require a deep understanding of the interests and capacities of each sector. Studies show that "government regulation has not fully sided with domestic technological innovations to develop" (Choeriyah & Noviaristanti, 2021). This points to the need for policy reformulation that better supports domestic innovation and cross-sector collaboration. Effective partnerships also require mechanisms capable of overcoming differences in perspectives and interests among government, private sector, and civil society. The government sector typically focuses on public interest and social stability; the private sector prioritizes efficiency and profitability; while civil society emphasizes justice and sustainability. A good partnership mechanism must be able to integrate these diverse interests within a mutually beneficial framework.

Long-term sustainability requires collaboration patterns that can adapt to environmental changes and societal needs. The lean startup methodology can be employed to "develop environmentally friendly business models" (Aprillia et al., 2023), enabling the development of innovations that are more responsive to market and community needs. Effective collaboration patterns must consider long-term dynamics and the capacity to adapt to changes in technology, regulation, and societal demands. This requires flexibility in organizational structures, participatory decision-making mechanisms, and comprehensive monitoring and evaluation systems to ensure that collaboration remains relevant and effective over the long term.

Framework for the Implementation of Equitable Ecological Innovation

The integration of social and ecological dimensions in innovation requires a holistic approach that considers the complexity of socio-ecological relationships. Research indicates that transformations in human-environment relations can lead to "the shift in human-environment relations from an integrated to a fragmented system" (Meilinda et al., 2025). Therefore, integration strategies must be designed to maintain the interconnectedness between social and ecological dimensions. Effective integration strategies should take into account local wisdom and traditional knowledge as integral parts of the innovation process. This requires recognition of cultural values and traditional practices that have proven sustainable, alongside efforts to integrate them with modern technologies and approaches. Such integration not only enhances the effectiveness of innovation but also ensures that the innovation process does not harm local communities.

Equitable distribution of benefits is key to the long-term success of ecological innovation. Distributive justice in the context of ecological innovation relates to "the unfair sharing of environmental benefits and risks" (Afinas, 2023). Fair distribution mechanisms must ensure that the benefits of ecological innovation are not enjoyed only by certain groups but also reach the communities most in need. Effective distribution mechanisms require transparent monitoring and evaluation systems to ensure that the benefits of innovation genuinely reach the intended targets. This also necessitates active community involvement in decision-making processes related to benefit distribution, enabling them to have a voice in determining priorities and the most appropriate distribution mechanisms for their needs.

Collaborative governance models are essential foundations for achieving shared welfare through ecological innovation. Research emphasizes the need for "policy reformulation that integrates local wisdom and environmental justice to strengthen community socio-ecological resilience" (Meilinda et al., 2025). Effective governance models must integrate diverse perspectives and interests within an inclusive and participatory framework. Collaborative governance requires structures and processes that allow active participation from all stakeholders. This includes democratic decision-making mechanisms, transparent communication systems, and fair conflict resolution procedures. Good governance models must also be adaptable to environmental changes and community needs, ensuring their continued relevance and effectiveness in the long term.

Measuring the success of just ecological innovation implementation requires comprehensive and multidimensional indicators. Indicators should not only measure environmental impacts but also the social and economic effects of the innovation. This aligns with the principle of environmental justice, which encompasses "distributive justice, corrective justice, procedural justice, and social justice" (Afinas, 2023). Success indicators must include both quantitative and qualitative aspects and involve perspectives from various stakeholders. Quantitative indicators may include measurements of environmental impact, levels of community participation, and distribution of economic benefits. Qualitative indicators may include assessments of the quality of participatory processes, community satisfaction levels, and alignment with local cultural values.

Challenges and Opportunities in the Indonesian Context

Indonesia, as an archipelagic country with extraordinary biodiversity, faces unique challenges in implementing ecological innovation. The socio-ecological context of Indonesia reveals complexities that require a holistic approach in developing sustainable innovations. In the era of the Industrial Revolution 4.0 moving towards Society 5.0, higher education institutions in Indonesia are required to transform through Outcome-Based Education (OBE)-based curricula that support the Merdeka Belajar Kampus Merdeka (MBKM) program (Antoni et al., 2025). The digital transformation occurring in Indonesia has brought significant changes to human life, ranging from interaction methods to data-driven decision-making. However, the rapid pace of technological innovation also raises various ethical challenges that demand special attention, such as privacy, justice, and social responsibility (Nurul Aini et al., 2024). This indicates that ecological innovation in Indonesia is not solely related to technology but also requires the integration of ethical frameworks in technology development to ensure positive impacts on the global community.

Indonesia holds great potential for implementing ecological innovation, especially in the context of sustainable tourism. The development of Bajo Mola tourism in Wakatobi exemplifies how collaborative governance involving state and non-state actors can create effective sustainable development models (Sudirman & Susilawaty, 2022). This collaborative governance process has engaged various stakeholders such as the British Council, Bank Mandiri, the Wakatobi Regency Tourism and Creative Economy Office, as well as local communities and the Bajo Mola Tourism Management Institution. The success of ecological innovation implementation in Indonesia also depends on the ability to create sustainable competitive advantages through the adoption of green innovation. Research indicates three main pillars to achieve greater excellence, namely environmental health, social health, and economic health aligned with the operational activities of organizations (Friska Mastarida, 2022). This demonstrates that ecological innovation in Indonesia needs to integrate environmental, social, and economic aspects in a balanced manner.

Despite its great potential, the implementation of ecological innovation in Indonesia faces various structural and institutional barriers. One major challenge is gender inequality, which remains an issue in sustainable development. Gender equality (SDG 5) is among the goals to be achieved within the Sustainable Development Goals (SDGs) agenda; however, numerous problems persist in the form of discrimination and gender-based inequality in society (Sudirman & Susilawaty, 2022). Other obstacles relate to the lack of effective collaboration among various stakeholders. In the context of revitalizing the OBE-based curriculum in the Islamic Education Management Study Program, active stakeholder involvement—especially their shift toward the Promoters quadrant in the Mendelow Stakeholder Matrix—is a key to success (Antoni et al., 2025). This indicates that structural barriers often relate to ineffective coordination and communication among the involved parties.

To support the implementation of just ecological innovation in Indonesia, comprehensive and integrated policies are required. First, the government needs to develop a regulatory framework that supports digital transformation while addressing the ethical aspects of technology. Integrating ethical frameworks into technology development must be a priority to ensure positive impacts on the global society (Nurul Aini et al., 2024). Second, higher education policies need to be strengthened to support the transformation towards the Industrial Revolution

4.0 and Society 5.0 era. Effective multi-stakeholder collaboration in revitalizing OBE-based curricula should be encouraged to produce superior human resources (HR) that support achieving the vision of Golden Indonesia 2045 (Antoni et al., 2025). Third, collaborative governance models proven successful in sustainable tourism development should be adopted and expanded to other sectors. Approaches emphasizing face-to-face dialogue, building trust among all involved actors, and achieving sustainable outcomes should serve as models in implementing ecological innovation (Sudirman et al., 2022).

Implications for Sustainable Development

Ecological innovation makes a significant contribution to achieving the Sustainable Development Goals (SDGs), particularly in the context of gender equality and sustainable economic development. Research indicates that gender equality is a prerequisite for achieving sustainable development goals, with a focus on the participation of women and girls to ensure they enjoy equal access to education, economic resources, and political participation (Sudirman & Susilawaty, 2022). The adoption of green innovation also contributes to the achievement of the SDGs through three main pillars: environmental health, social health, and economic health. The integration of these three pillars into organizational operational activities can create sustainable competitive advantages that support the attainment of various SDG targets (Friska Mastarida, 2022).

The synergy between ecological innovation and the sustainable development agenda is created through collaborative approaches involving various stakeholders. The development experience of Bajo Mola tourism in Wakatobi demonstrates that effective collaborative governance can enhance community capacity in managing tourism businesses, waste management, and increasing community income (Sudirman & Susilawaty, 2022). In the context of higher education, this synergy is realized through the transformation of Outcome-Based Education (OBE)-based curricula supporting the Merdeka Belajar Kampus Merdeka (MBKM) program. Multi-stakeholder collaboration in curriculum revitalization not only improves the quality of higher education but also supports the achievement of the Indonesia Golden Vision 2045 (Antoni et al., 2025).

Global best practices in implementing ecological innovation highlight the importance of integrating ethical aspects in technology development. The digital transformation occurring in various countries has brought significant changes to human life, but it also presents ethical challenges requiring special attention (Nurul Aini et al., 2024). These lessons demonstrate that ecological innovation is not solely related to technology but also requires comprehensive ethical considerations. Best practices also show that gender equality is a key factor in the successful implementation of ecological innovation. Global research indicates that women's participation in the economy, organizational leadership, political involvement, empowerment, and reproductive health significantly impact equality in employment opportunities (Sudirman & Susilawaty, 2022).

The future direction of ecological innovation development should focus on creating unique business value through a holistic and sustainable perspective. This research area demands greater theoretical and empirical attention to analyze and develop new antecedents of green innovation (Friska Mastarida, 2022). Future development must also consider the integration of digital technology with strong ethical principles. Responsible digital transformation requires attention to

privacy, justice, and social responsibility at every stage of technology development (Nurul Aini et al., 2024).

Effective leadership in managing multi-stakeholder collaboration will be key to the successful implementation of future ecological innovation. The role of leadership in managing communication strategies to create sustainable collaboration must be strengthened to ensure success in the transformation toward a just and sustainable future (Antoni et al., 2025). In conclusion, ecological innovation as a pathway to a just future requires strong collaboration among various stakeholders, the integration of ethical aspects in technology development, and commitment to gender equality and sustainable development. Through a holistic and sustainable approach, Indonesia can become a model in implementing just ecological innovation that contributes to shared prosperity.

CONCLUSION

This study reveals that ecological innovation as a pathway toward a just future requires a paradigm shift from a technology-centric approach to a holistic approach that integrates social, economic, and environmental dimensions. Social justice serves as the fundamental foundation in developing sustainable ecological innovation, encompassing distributive, corrective, procedural, and social justice, all of which must be considered at every stage of implementation. Multi-stakeholder collaboration has proven to be the key to success in creating a conducive innovation ecosystem, involving academics, businesses, communities, and government in harmonious synergy. An effective collaborative governance model requires intermediaries and catalyst organizations that play a role in facilitating the transfer of knowledge and technology among various stakeholders.

The implementation of ecological innovation in Indonesia holds great potential, especially in the context of sustainable tourism and responsible digital transformation. Structural and institutional challenges remain major obstacles, including gender inequality and a lack of effective coordination among stakeholders. To achieve long-term success, policy reformulation is needed that integrates local wisdom and environmental justice, as well as the development of comprehensive and multidimensional success indicators.

The contribution of ecological innovation to achieving the Sustainable Development Goals demonstrates a strong synergy between technological transformation and the sustainable development agenda. Lessons from global best practices indicate the importance of integrating ethical aspects into technology development and the active participation of women in the innovation process. Future development directions should focus on creating sustainable unique business values while considering privacy, justice, and social responsibility aspects in the increasingly complex era of digital transformation.

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