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AI-DRIVEN SUSTAINABILITY DECISION-MAKING AND THE SOCIAL IMPACT OF DIGITAL DEPLOYMENT: THE MEDIATING ROLE OF DIGITAL-INDUCED SUSTAINABILITY CULTURE AND DIGITAL SUSTAINABILITY READINESS IN EMERGING ECONOMIES

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ABSTRACT

This study applied the Socio-Technical System theory to examine the influence of AI-driven sustainability decision-making and the social impact of digital deployment, considering digital-induced sustainable culture and digital sustainable readiness as mediators. Data obtained from 335 managers in Ghana's financial and telecommunication sectors were analyzed using structural equation modelling in SMARTPLS version 4.1.1.4 and Harman's single-factor test in SPSS version 24. The findings revealed a significant and positive influence of AI-driven decision-making on the social impact of digital deployment, digital-induced sustainability culture, and digital sustainable readiness. Further, the study showed that both digital-induced sustainable culture and digital sustainable readiness significantly and positively influenced the social impact of digital deployment. Finally, the study indicated that both digital-induced sustainable culture and digital sustainable readiness partially mediated the relationship between AI-driven sustainability decision-making and the social impact of digital deployment. This study contributes to existing knowledge by highlighting that a successful digital transformation for sustainability requires an optimal balance of technological capabilities, organizational culture, and readiness. It provides managers and policymakers with valuable insights on utilizing AI for socially responsible and sustainable digital initiatives.

KEYWORDS: AI-Driven Sustainability Decision-Making, Social Impact of Digital Deployment, Digital-Induced Sustainable Culture, Digital Sustainable Readiness, Sustainable Management.

1. INTRODUCTION

The rapid integration of digital technologies into business processes enhances the pursuit of sustainability (Schneider, 2019; Raihan, 2024). However, there is a pressing need for further research in this area (Bohnsack et al., 2022; Wei et al., 2023). Organizations are increasingly struggling to reconcile digital advancement with their objectives for sustainable management amid rising global demands for social and environmental responsibility and technological innovation (Alamandi, 2025). As organizations leverage artificial intelligence (AI) to enhance social and environmental outcomes, the digitalization of sustainability initiatives has emerged as an essential aspect of organizational development. AI-driven sustainability decision-making has gained prominence in recent years as a strategy for organizations to leverage vast data sets to make informed decisions around sustainable development (Khalid et al., 2024). AI-driven sustainability decision-making involves employing AI systems to identify, prioritize, and implement decisions that facilitate the attainment of sustainability objectives across several domains (Kulkov et al., 2024) [7]. Despite its increasing significance, researchers have yet to fully understand how AI-driven sustainability decision-making might advance society, particularly in emerging economies where institutional readiness and corporate culture can either facilitate or hinder its impact.

The influence of organizational factors on the effectiveness of AI-driven sustainability decision-making is inadequately studied (Khalid et al., 2024). However, the role of digital sustainability readiness and digital-induced sustainability culture cannot be overstated. These factors have emerged as significant instruments in this domain, and their understanding and implementation are urgent. Digital sustainability readiness encompasses an organization's technological competencies, digital proficiency, and executive dedication, facilitating the integration of sustainability into digital operations (Wut et al., 2021). Simultaneously, a Digital-Induced sustainability culture emphasizes the collective values, norms, and behaviors within an organization influenced by technology, which promotes sustainability across all tiers (Gaonkar and Sukthankar, 2025). Both concepts provide valuable insights into the influence of organizational culture and competencies on the outcomes of AI-driven sustainability decision-making.

The social impact of digital deployment measures the extent to which the utilization of digital technology fosters positive societal transformations,

including inclusivity, well-being, and equity. This has emerged as a significant field of research for scholars examining sustainable performance (Nosratabadi et al., 2023). Nonetheless, it remains ambiguous how organizations utilize AI to inform sustainability decisions that significantly affect social impact of digital deployment (Zhao et al., 2023), particularly in developing regions. This gap is intensified in sub-Saharan Africa, where digital transformations occur amidst significant political, social, and infrastructural challenges. The financial and telecommunications sectors in Ghana, with their pioneering use of AI technologies and significant contributions to national development and multiple societal domains, serve as a crucial and relevant context for studying AI approaches.

This study examines the relationship between AI-driven sustainability decision-making and the social impact of digital deployment. It underscores the crucial roles of digital sustainability readiness and digital-induced sustainability culture in this relationship. These factors are not just additional elements; they are the backbone of the digital revolution, significantly influencing the social impact of digital deployment. This study indicates that effective decision-making technology can affect outcomes and the internal elements that enhance an organization's sustainability. It establishes the direct impact of AI-driven sustainability decision-making on the social consequences of digital sustainability readiness, digital-induced sustainability culture, and digital implementation. The findings suggest that digital sustainability readiness and digital-induced sustainability culture significantly influence the social impact of digital deployment. This indicates that they hold intrinsic significance as mechanisms for digital enterprises to generate social value. The study suggests digital-induced sustainability culture and digital sustainability readiness influence the relationship between AI-driven sustainability decision-making and the social impact of digital deployment. This indicates the social advantages of AI are contingent upon a firm's digital maturity and the extent to which its culture adheres to sustainability principles. These concepts enhance socio-technical systems theory by illustrating how the interplay of technology, readiness, and culture influences societal consequences within the framework of the digital revolution, particularly in sub-Saharan Africa.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1. Theoretical Foundation

The Socio-Technical Systems theory (Emery and Trist, 1960) provides a robust framework for examining

the interplay among AI-driven sustainability decision-making, digital sustainability readiness, digital-induced sustainability culture, and the social impact of digital deployment—the theory of socio-technological systems aimed to assist organizations in optimizing their technology and social subsystems. The concept posits that organizations can attain their maximum potential and accomplish significant objectives only when their technological and social systems are synergistically aligned and mutually supportive (Bednar and Welch, 2020). This duality renders the concept particularly advantageous in contexts where digital technologies, such as AI, are anticipated to enhance both company success and societal well-being (Yu *et al.*, 2023).

The Socio-Technical Systems theory elucidates the interplay between AI-driven sustainability decision-making and organizational dynamics, leading to outcomes that impact society. AI-driven sustainability decision-making, the technical subsystem, encompasses digital technology, data analytics, and algorithmic decision-making used to achieve sustainability objectives (Kulkov *et al.*, 2024; Khalid *et al.*, 2024). However, the effectiveness of technology utilization is not solely dependent on new technologies. The organization's social frameworks and competencies play a crucial role, underscoring their significance in this context. Here, digital sustainability readiness and digital-induced sustainability culture are of paramount importance.

Digital sustainability readiness indicates an organization's preparedness to utilize digital tools in its pursuit of enhanced environmental sustainability (Wut *et al.*, 2021). This encompasses possessing appropriate infrastructure, digital competencies, and leadership support. According to the Socio-Technical Systems theory, technological systems such as AI-driven sustainability decision-making are unlikely to exert a significant impact unless they are built upon a robust technical basis that is also socially integrated, exemplified by leadership advocacy or capacity-building initiatives (Dai *et al.*, 2025). Digital sustainability readiness serves as an essential connection between the technological subsystem (AI technologies) and the social subsystem (organizational capabilities). It enhances the efficacy of AI-driven sustainability decision-making in attaining societal goals such as equity, inclusivity, and social wellness (Jain and Mitra, 2025).

The Digital-induced sustainability culture constitutes a significant aspect of society, encompassing shared beliefs, habits, and traditions that have been transformed by technology while maintaining a focus on sustainability (Tsao *et al.*, 2025; Valta *et al.*, 2024). The Socio-Technical Systems

concept posits that culture can either facilitate or impede the utilization of technology within enterprises. The digital-induced sustainability culture provides employees with the psychological and ethical reinforcement necessary to advocate for digital technologies that enhance sustainability (Mahboub and Sadok, 2024). It ensures that AI-driven sustainability decision-making transcends mere technical imposition, fostering extensive adoption throughout the organization that reflects a collective dedication to social responsibility (Gupta *et al.*, 2023; Valta *et al.*, 2024). The digital-induced sustainability culture integrates AI-driven sustainability decision-making with the social impact of digital deployment by ensuring that digital technologies prioritize societal well-being.

The Socio-Technical Systems theory is particularly beneficial in Ghana, where the swift advancement of digital technology frequently transcends the capacity of institutions and organizations to adjust accordingly. Most organizations in Ghana's telecommunications and financing sectors are employing AI technologies to enhance the sustainability of their operations. Their limited resources, differing levels of digital literacy, and shifting cultural perspectives on innovation and sustainability, however, make this difficult for them to do. The Socio-Technical Systems theory clarifies that merely incorporating AI is insufficient. In the absence of supportive social institutions, digital readiness, and a culture that prioritizes sustainability, technical projects may fail to deliver the anticipated social advantages. Socio-Technical Systems theory posits that global technological advancements influence local organizations (Appelbaum, 1997). It enables the examination of the interplay between technology and individuals in developing economies, resulting in diverse trajectories toward sustainability.

Socio-Technical Systems theory suggests that AI-driven sustainability decision-making does not directly or automatically influence social outcomes; instead, it is mediated by digital sustainability readiness and digital-induced sustainability culture. This theoretical framework is particularly significant in Ghana, where organizations need to simultaneously enhance their technological competencies and social structures to ensure that digital transformations result in equitable and sustainable development.

2.2. Hypothesis Development

AI-Driven Sustainability Decision-Making and Social Impact of Digital Deployment, Digital-Induced Sustainability Culture, Digital

Sustainability Readiness

AI-driven sustainability decision-making refers to the strategic application of AI technology to assist organizations in making informed decisions regarding environmental, social, and governance (ESG) issues. Empirical studies indicate that AI can influence society, particularly in its application to advance sustainable development goals (Mikalef et al., 2022). AI-enabled systems in sectors such as healthcare, agriculture, and finance have been shown to enhance service equity, increase accessibility for marginalized groups, and optimize resource utilization for societal benefit (Wamba et al., 2021). Organizations employing AI tools by sustainability principles have enhanced stakeholder engagement, transparency, and ethical governance (Janssen et al., 2020).

When individuals perceive AI as more than merely a tool and recognize it as a means to generate social value, the connection between AI-driven sustainability decision-making and the social impact of digital implementation intensifies. Duan et al. (2021) discovered that organizations employing AI for environmental, social, and governance (ESG) compliance and risk evaluation exhibited greater accountability to their employees and enhanced stakeholder satisfaction. The capacity of AI to assess complex sustainability data in real time enables firms to make more inclusive and timely decisions, hence enhancing community health and environmental justice (Panyaram and Hullurappa, 2025). The significance of AI-driven sustainability decision-making in fostering inclusive digital outcomes remains underexplored as AI proliferates in Ghana's finance and service sectors. This offers a significant research potential.

The Digital-induced sustainability culture examines the extent to which digital technologies promote collective perspectives and actions that benefit the environment (Gupta et al., 2023; Valta et al., 2024). AI-driven sustainability decision-making is integral to fostering a culture that routinely employs technology to formulate, assess, and implement ecologically friendly decisions (Khalid et al., 2024; Santos and Carvalho, 2025). Research indicates that using AI for both efficiency and ethical inclusivity may result in cultural transformations across all organizational tiers (George et al., 2021). Li and Jin (2021) and (Jerez-Jerez, 2025) found that organizations integrating AI into their sustainability strategies experienced shifts in employee attitudes and behaviors, indicating heightened commitment to sustainability.

AI-driven sustainability decision-making can foster a culture of transparency and accountability, essential components of a sustainability ethos, by providing individuals with data-driven insights regarding environmental impacts and social risks

(Margherita and Braccini, 2020) [32]. The capacity of AI to produce forecasts and adhere to stringent guidelines can prompt individuals to re-evaluate their existing perspectives and motivate them to make informed, responsible choices (Popovič et al., 2021). In Ghanaian enterprises characterized by hierarchical and ambiguous decision-making, the use of AI-driven sustainability decision-making facilitates the dismantling of traditional practices. It promotes enhanced social awareness and engagement throughout all departments.

Digital sustainability readiness refers to the extent to which an organization is ready to use digital tools to achieve its sustainability objectives. This encompasses elements such as infrastructure, personnel, leadership styles, and digital governance. Researchers found that organizations employing AI for sustainability decision-making frequently exhibit a significant degree of digital readiness. For effective utilization of AI systems, organizations need to invest in data infrastructure, employ proficient personnel, and enhance process adaptability (Mikalef et al., 2018; Sestino et al., 2020).

Ghasemaghaei (2019) stated that companies with well-defined AI decision frameworks show greater digital maturity and enhanced capacity to address sustainability requirements. Zaki (2020) asserted that digital transformation strategies grounded in sustainability principles enhanced individuals' preparedness for digital technology, particularly when artificial intelligence was employed in alignment with long-term social and environmental performance metrics. In Ghana and other nations with fragile economies, the preparedness for digital sustainability varies significantly across industries. Organizations that employ AI for sustainable decision-making are more inclined to invest in competencies such as predictive analytics, cloud-based systems, and data ethics (Rajagopal et al., 2022; Trunk et al., 2020; Abina et al., 2022). These constitute the fundamental components of preparedness for digital sustainability (Akomea-Frimpong et al., n.d).

From the discussion above, the following hypotheses were developed:

- H1:** AI-driven sustainability decision-making significantly and positively influences social impact of digital deployment
- H2:** AI-driven sustainability decision-making significantly and positively influences digital-induced sustainability culture
- H3:** AI-driven sustainability decision-making significantly and positively influences digital sustainability readiness

2.3. Digital-Induced Sustainability Culture and

Social Impact of Digital Deployment

Increasingly, scholars such as (Gupta et al., 2023; Li and Jin 2021) are examining the relationship between digital-induced sustainability culture and the social impact of digital deployment. This is particularly significant for organizations that leverage digital transformation to drive societal change. A growing body of studies indicates that an organization's culture is crucial for transforming technological utilization into societal advantages (Azeem et al., 2021; Cabrera et al., 2008). When an organization's digital culture is founded on sustainability principles, the likelihood of digital implementations resulting in equitable and inclusive societal outcomes significantly increases (Gaonkar and Sukthankar, 2025; Nosratabadi et al., 2023).

Research indicates such as (Ispiryan et al., 2024; Qadri et al., 2025) that a digital culture prioritizing sustainability enhances employee awareness of ethical concerns, fosters greater concern for social and environmental issues, and promotes the development of digital initiatives centered on social inclusion and equity. Tang and Yang (2022) found that in Chinese manufacturing firms, a digital culture emphasizing environmental responsibility significantly enhanced employee well-being and community engagement through digital technologies. Soomro et al. (2021) discovered that the sustainability culture influenced the impact of digital transformation on social value creation in small and medium-sized enterprises in Pakistan. This suggests that culture is not merely a by-product of technology; it can also positively facilitate societal advancement.

The sustainability induced by digital culture significantly influences the social impact of digital deployment, since it defines collective human behavior. An effective digital-induced sustainability culture is present in organizations that promote cross-functional collaboration, transparency, and inclusivity in their digital decision-making processes (Schuster et al., 2023). These behavioral criteria enhance the likelihood that emerging technologies such as AI, automation, and cloud computing will be utilized in a manner that considers marginalized populations, the potential for job displacement, and the deficiency in digital literacy (Hamdan and Anshari, 2024). This enhances the equity of social gains associated with digital deployment, such as improved access to services, digital financial inclusion, and superior health and education results.

In emerging economies, where structural inequities are more pronounced, the culture of sustainability arising from digital advancement is far more critical. Mensah and Adukpo (2025) conducted

a study in Ghana's fintech sector. They discovered that firms with robust sustainability cultures were more effective in aligning their AI and mobile services with national development objectives, such as assisting youth and integrating rural populations into the banking system. The authors indicated that such groups were more inclined to collaborate with community members, incorporate sustainability KPIs into their digital strategy, and consider social objectives alongside financial ones. This demonstrated that the social impact of digital deployment was more effective.

Research indicates that a digital-induced sustainability culture facilitates individuals' abilities to manage the risks associated with unanticipated uses of digital technology Li and Jin (2021). Goni et al. (2021) assert that organizations with a robust digital sustainability culture were more inclined to implement inclusive data governance practices, assess algorithmic bias, and establish safeguards to ensure the inclusion of underrepresented groups. These initiatives enhanced the societal acceptance and legitimacy of their online enterprises.

The literature collectively supports the notion that digital-induced sustainability culture not only embodies a company's intrinsic values but also employs digital capabilities for socially responsible objectives (Gupta et al., 2023; Schuster et al., 2023; Wang et al., 2025). Digital-induced sustainability culture transforms digital technology from mere instruments for operational efficiency to catalysts for social justice and empowerment (Hamdan and Anshari, 2024). This connection is particularly significant in low-income countries such as Ghana, where the social costs of digitalization, encompassing both its advantages and drawbacks, are heightened by inadequate infrastructure and adverse socioeconomic conditions.

The following hypothesis was developed from the discussion above:

H4: Digital-induced sustainability culture significantly influences social impact of digital deployment

2.4. Digital Sustainability Readiness and Social Impact of Digital Deployment

A growing body of research indicates that enhancing the social impact of digital deployment requires digital sustainability readiness. This is especially relevant as organizations endeavor to integrate digitization with objectives for sustainable development. Studies consistently argue that an organization's readiness to use sustainable digital practices significantly influences the societal impact

of those technologies (Qadri et al., 2025; Raimo et al., 2022). Digital sustainability readiness is essential for ensuring that technological advancements extend beyond just operational efficiency to genuinely benefit individuals.

Research such as Djatmiko et al. (2025) indicates that organizations prepared for digital sustainability are more adept at aligning their digital strategies with ethical standards, principles of social inclusion, and the long-term welfare of the community. Sacavém et al. (2025) discovered that European firms undergoing digital transformation and preparing for sustainability—assessed through employee digital literacy, managerial endorsement of green IT, and the provision of sustainable digital infrastructure—exhibited significantly improved community engagement results and stakeholder perceptions. The impacts were especially evident in sectors such as healthcare, education, and public services, where societal repercussions are readily observable.

Digital sustainable readiness is particularly crucial in emerging economies to ensure that digital implementation yields equitable outcomes for everybody. Asamoah et al. (2022) conducted a study involving banks in Ghana. The findings indicated that those businesses proficient in digital sustainability effectively utilized mobile platforms and AI tools to engage previously underserved demographics, such as women entrepreneurs and rural farmers. The research revealed that these groups employed community needs assessments and stakeholder discussions in their digital planning strategies. This enabled technologies to address genuine societal issues, such as market access, knowledge disparities, and educational inequalities.

Digital sustainability readiness also influences the regulations governing the social impact of digital deployment. Organizations possessing strong digital sustainability frameworks often implement data policies that are more transparent and inclusive, ensure the protection of vulnerable individuals online, and adopt participatory methodologies in their technological applications Djatmiko et al. (2025) and Saner et al. (2020). This governance planning fosters trust among stakeholders, which is essential for maximizing the benefits of digital implementations for society. These governance solutions resulted in increased adoption rates among marginalized populations and a diminished risk of digital exclusion, which is significant.

The readiness of a firm influences its management of the risks associated with digital technology. An organization that is prepared for the digital landscape and equipped with the necessary tools is

more likely to effectively address challenges such as job displacement, digital fatigue, or algorithmic bias (Lent, 2018). These initiatives to mitigate harm safeguard workers and communities while enhancing the legitimacy and societal value of digital interventions.

Qadri et al. (2025) asserts that digital sustainability readiness is a crucial competency that determines whether digital adoption yields equitable, ethical, and socially sustainable outcomes. In developing nations such as Ghana, whose infrastructure and institutions vary in their developmental stages, enhancing digital sustainability readiness transcends mere technical concerns.

It is a strategic need that will maximize the social advantages of digitalization. From the discussion above, the following hypothesis was developed:

H5: Digital sustainability readiness significantly influences social impact of digital deployment

2.5. Mediating Role of Digital-Induced Sustainability Culture

Employing AI to inform sustainability decisions can significantly impact society at large. The culture surrounding the utilization of AI tools may determine the extent to which this promise is fulfilled. Digital-induced sustainability culture serves as an essential mediator in this context, influencing how individuals recognize, utilize, and align AI-generated decisions with objectives that yield social benefit.

AI-driven sustainability decision-making equips enterprises with the necessary capabilities to enhance sustainability decisions through data analytics, machine learning, and other contemporary technologies (Wamba et al., 2021). Certain decisions pertain to improving energy efficiency, reducing carbon footprints, initiating a circular economy, and ensuring universal access to digital technology. However, unless the organization's culture prioritizes sustainability, these decisions do not inherently result in a significant social impact from digital deployment. Digital tools may foster a culture of sustainability, which is essential for linking individuals (Martínez-Peláez et al., 2023).

A digital culture prioritizing sustainability ensures that AI-driven sustainability decision-making processes are both technically reliable and ethically sound, aligning with societal needs (Raimo et al., 2022). This culture promotes the integration of sustainability concepts in the workplace, such as environmental stewardship, equitable access to technology, and stakeholder engagement. This

cultural integration enables employees to evaluate AI-generated recommendations from a sustainability perspective and select the most significant outcomes that benefit the collective (Murire, 2024). In the absence of this cultural filter, AI decisions may diverge from the needs of the local populace, resulting in technocratic solutions that exert minimal impact on society.

Fundira *et al.* (2024) discovered that organizations with robust digital sustainability cultures were more inclined to transform AI-driven sustainability decision-making suggestions into community-oriented initiatives such as local renewable energy grids, e-health platforms, and ethical digital financial services. Conversely, organizations lacking a digital-induced sustainability culture struggled to convert valuable knowledge into societal benefits while employing modern AI techniques (Yawson and Lewis, 2025).

In Ghana's digital landscape, intermediaries are increasingly gaining significance. Asamoah *et al.* (2022) examined the impact of digital technology on the operational dynamics of West African administrations. Research indicated that AI solutions designed to enhance rural areas, increase educational accessibility, and integrate healthcare were more effective when schools and businesses fostered a culture that prioritized both digital innovation and sustainability (Amankona *et al.*, 2025). The digital-induced sustainability culture enables employees to perceive AI tools not as isolated technologies, but as instruments for achieving socially responsible objectives. In regions without this cultural framework, AI technology was frequently underutilized or employed solely for limited activities, resulting in minimal impact on the culture.

Stakeholders, including digital strategists, governmental bodies, and civil society organizations, emphasized the necessity of cultivating digital cultures centered on sustainability to optimize the societal benefits of AI systems (Nkwo *et al.*, 2025). In cultures indifferent to sustainability, AI decisions are more prone to exacerbate the plight of marginalized individuals or exclude them entirely.

AI-driven sustainability decision-making provides the intellectual and analytical foundation essential for innovation centered on sustainability. The digital-induced sustainability culture ensures that decisions are taken with social responsibility considered. The culture of sustainability imbues AI-driven decisions in society with significance, legitimacy, and authority (Bin-Nashwan and Li, 2025). The digital-induced sustainability culture is crucial in Ghana as it ensures that AI-driven digital

initiatives yield significant and enduring societal benefits. This is particularly significant in Ghana, where environmental issues, social cohesion challenges, and technological access converge.

From the discussion above, the following hypothesis was developed:

H6: Digital-induced sustainability culture mediates the relationship between AI-driven sustainability decision-making and social impact of digital deployment

2.6. Mediating Role of Digital Sustainability Readiness

AI-driven sustainability decision-making provides the necessary tools to achieve sustainability objectives; nevertheless, its tangible impact on society largely hinges on the efficacy with which organizations utilize and implement the insights generated through AI (Singh *et al.*, 2025). Digital sustainability readiness is an essential instrument for ensuring optimal outcomes in this context. Digital sustainability readiness assesses an organization's capacity to adapt, integrate, and utilize emerging digital technologies in alignment with its sustainability objectives (Martínez-Peláez *et al.*, 2023). It demonstrates that organizations possess not only technological expertise but also the strategic, infrastructural, and human resources essential for leveraging AI for the greater benefit.

AI technology can facilitate robust decisions on sustainability; yet, in the absence of appropriate digital infrastructure, change management protocols, and sustainability-focused digital strategies, these decisions may fail to yield the intended societal advantages (Pan and Nishant, 2023). In this context, digital sustainability readiness is significantly crucial. At a strategic level, digital sustainability readiness entails employing appropriate technologies, recruiting qualified personnel, and establishing adaptable governance frameworks to implement AI-driven sustainability decisions (Singh *et al.*, 2025).

Wamba *et al.* (2021) discovered that AI-driven sustainability initiatives exerted a greater societal impact when the organization was prepared for digital technologies, particularly with IT agility, data infrastructure, and digital competencies. The authors further reported that companies in certain nations that were unprepared for Digital Sustainability could not fully capitalize on the societal advantages of AI-driven sustainability initiatives. This occurred frequently due to the misalignment between their digital tools and execution capabilities.

Digital sustainability poses a significant challenge in Africa, particularly in Ghana, where firms often lack preparedness, and digital infrastructure is not uniformly distributed (Acquah, 2024). To amalgamate AI-driven sustainability decision-making with the social impact of digital deployment, preparedness is essential. Appiahene et al. (2022) examined Ghanaian municipal authorities. They discovered that AI tools for sustainability, such as waste reduction algorithms and climate forecasting models, enhanced social outcomes—such as health, environmental awareness, and public service delivery—only when institutions invested in the fundamental components of digital readiness (Adu et al., 2025). This included dependable internet connectivity, proficient personnel, interoperable technologies, and a strategy for integrating digital and environmental objectives.

Digital sustainability readiness facilitates the conversion of AI discoveries into socially beneficial actions. Through its sustainability strategy, a city can utilize AI to pinpoint areas vulnerable to flooding. However, if individuals lack access to resources such as digital mapping tools, community alert systems, and adaptive governance frameworks, their ability to respond promptly and inclusively may be hindered. Raimo et al. (2022) assert that digital readiness ensures that informed decisions result in solutions that are both inclusive and feasible, hence enhancing their social relevance.

Digital sustainability readiness also mitigates the

risk of individuals being excluded from the digital realm in reality. It ensures that AI-driven sustainability solutions are not only technically robust but also user-friendly, equitable, and contextually pertinent (Nkwo et al., 2025; Hammerschmidt et al., 2025). AI solutions for sustainable agriculture will impact rural communities only if farmers have access to mobile platforms, digital literacy initiatives, and supportive ecosystems, all integral to the digital sustainability readiness domain.

Digital sustainability readiness serves as a mediator, harnessing the transformative potential of AI-driven sustainability management. It bridges the divide between intention and action, transforming prudent sustainability decisions into outcomes that benefit the entire community (Zhanbayev et al., 2023). In the Digital Age, readiness ensures that AI's potential for sustainability is actualized in a manner that benefits individuals and communities, particularly in Ghana, where the digital divide remains an issue. From the ongoing discussion, the following hypothesis was developed:

H7: Digital sustainability readiness mediates the relationship between AI-driven sustainability decision-making and social impact of digital deployment

The study model shown below was developed using the hypotheses and the literature review (Figure 1):

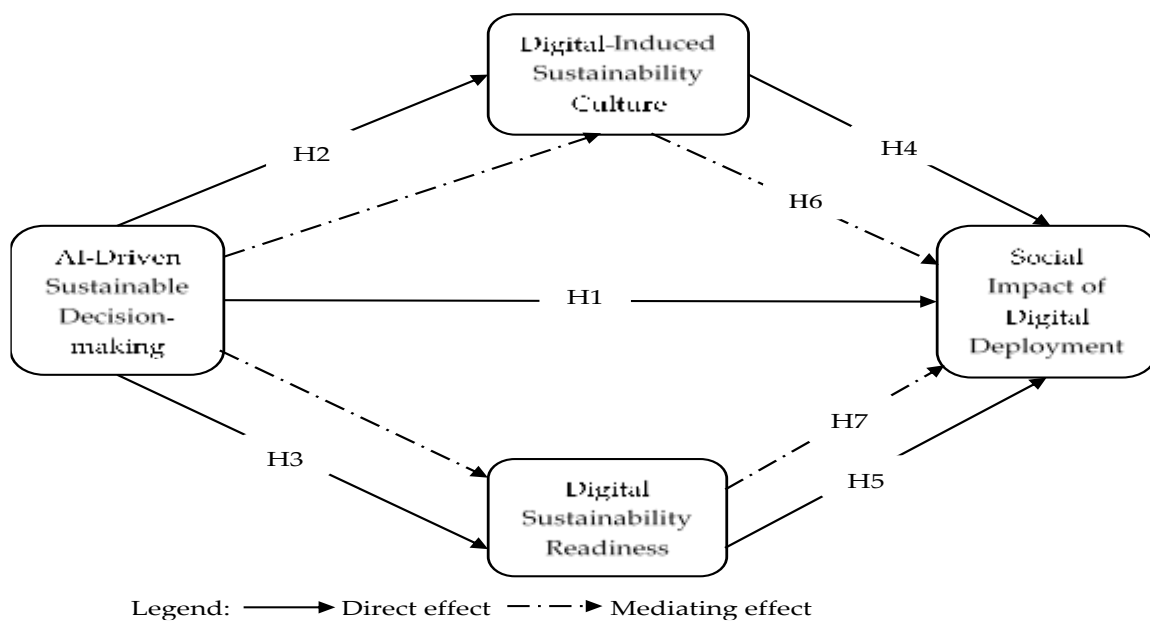


Figure 1: Conceptual Model.
Source: Authors Own Construct.

3. MATERIALS AND METHODS

3.1. Study Design and Sample

This study employed a descriptive cross-sectional analytical design. This technique was considered suitable as it gathers data on relevant variables at a single point in time, enabling the examination of correlations and trends within a large sample. This strategy allows for investigators to understand the relationships among multiple constructs of the research environment (Takona, 2024; Obeng, 2023).

This study focused on managers within Ghana's financial and telecommunications sectors, which are essential for national economic advancement and socio-economic transformation. These sectors contribute significantly to GDP, deliver basic services, and establish digital links that benefit various organizations. Nevertheless, organizations in these sectors often struggle to reconcile their sustainability objectives with the rapid pace of technological advancement, explore cultural adaptation amidst global digital trends, and confront legislative and market challenges unique to developing nations.

This study considered managers across several industries to attain a complete understanding of the effects of leadership and decision-making in AI-driven sustainability contexts on organizational preparedness, cultural transformation, and societal implications. Managers in the telecommunications and financial sectors possess the authority to make critical decisions, thereby steering their organizations through significant transformations in technology, operations, and culture. To positively impact society, it is essential to integrate digital sustainability readiness with a culture that prioritizes sustainability. This is particularly significant in resource-scarce and rapidly evolving marketplaces such as Ghana's.

The study required respondents to be managers employed at licensed and operational financial institutions or telecommunications companies registered with Ghana's Registrar General's Department and regulated by relevant authorities, including the Bank of Ghana or the National Communications Authority. Managers must have held their current positions for a minimum of one year to ensure a comprehensive understanding of the company's strategies, culture, and decision-making processes related to sustainability. Respondents were required to engage actively in strategic planning, sustainability initiatives, or digital transformation projects to ensure their responses aligned with the study's objectives.

To prevent obtaining information from individuals lacking substantial organizational experience, managers from sectors outside

telecommunications and finance, along with those in temporary or transitional management positions, were excluded. We excluded organizations that have operated for less than a year due to their insufficient digital and cultural sustainability frameworks for our investigation. Ultimately, managers who were unable or unwilling to participate due to their workload or other factors were excluded from the study to ensure the results were authentic, profound, and dependable.

A priori G*Power analysis for three predictors was conducted to determine the sufficiency of the sample size. The study indicated that a minimum of 119 respondents was required for determining a medium effect size with 95% statistical power (Memon *et al.*, 2020) [refer to **Appendix A**]. This strategy ensured that the selected sample size was both methodologically and statistically robust, hence enhancing the reliability of the results and reducing the likelihood of Type II errors. This improved the robustness of the study's conclusions.

3.2. Sampling Strategy and Procedure of Data Collection

This study employed convenience sampling to distribute 350 questionnaires to managers in the telecommunications and financial sectors in Ghana. Data was collected through computer-assisted online interviews. This strategy facilitated the efficient and rapid collection of data from a geographically dispersed group of managers. Given the technical difficulties and time constraints in accessing respondents across various branches and locations, convenience sampling provided a practical solution to enhance data collection efficiency (Johnston *et al.*, 2009).

Biases such as selection bias may be present in convenience sampling, which reduces the sample's representativeness of the broader management population. Nevertheless, this issue was mitigated by implementing specific measures. Managers from various companies, operational tiers, and regions of Ghana were incorporated to obtain a diverse array of perspectives. An exhaustive data-cleaning procedure enhanced the accuracy and reliability of the results.

Thirteen (13) responses were deemed inadequate or inconsistent and hence excluded from the study. Consequently, 335 valid responses were retained, indicating an exceptionally high response rate of 95.7%. The substantial participation signifies that the respondents were sincerely committed to the survey, hence enhancing the reliability of the data. The study offers significant insights into the impact of AI-driven sustainability decision-making,

organizational preparedness, and sustainability culture on the social consequences of digital implementation in Ghana's financial and telecommunications industries, by actively mitigating potential biases and highlighting a diverse management team.

3.3. Study Instruments

This study employed validated measures (refer to **Appendix B**) that have been rigorously tested in prior research and are grounded in existing literature to assess the variables. A five-point Likert scale, where 1 represents "Strongly Disagree" and 5 denotes "Strongly Agree," was employed to evaluate respondents' attitudes, as recommended by Nyarko et al. (2024) and Birinci et al. (2025) for research conducted in Ghana. The constructs were executed in the following manner: We employed the scale developed by Khalid et al. (2024) [6] to assess AI-driven sustainable decision-making, which demonstrated a Cronbach's alpha of 0.865. The social impact of digital deployment was adapted from Nosratabadi et al. (2023), with reported alpha values ranging from 0.513 to 0.937. We employed instruments from Wut et al. (2021) to assess digital-induced sustainability culture, with alpha values ranging from 0.866 to 0.911. We employed the instrument developed by Wang et al. (2025) to evaluate digital sustainability readiness. The alpha values varied from 0.866 to 0.925.

These instruments signify attributes that are more vital in Ghana's social, economic, and technological landscape, particularly as enterprises undergo digital transformation and strive to achieve sustainability objectives. The original scales have strong internal consistency and construct validity across several cultural contexts, suggesting they can be adapted to the Ghanaian environment with few contextual modifications. This cross-cultural robustness ensures that the evaluations appropriately represent the intended concepts while also encapsulating the unique experiences of Ghanaian participants.

3.4. Data Analysis Tools

Partial Least Squares Structural Equation Modeling (PLS-SEM) and SPSS were utilized to examine the presented data. SMARTPLS 4.1.1.4 was used because of its efficiency in handling complex models characterized by several constructs and small to medium sample sizes (Hair, 2014). To assess for common technique bias, we used SPSS to run

Harman's single-factor test, which follows the guidelines provided by Podsakoff et al. (2003). This dual-tool approach ensured thorough validation of the study's measurement and structural models.

3.5. Ethical Consideration

The study was conducted by the ethical standards outlined in the Helsinki Declaration, which sets forth guidelines for research involving human participants. Before data collection, participants were informed of the study's purpose and methodology and assured that their responses would remain entirely confidential. All participants engaged voluntarily and provided informed consent before completing the survey electronically.

4. RESULTS AND FINDINGS

4.1. Common Method Bias

To address common method bias (CMB), Harman's single-factor test was conducted in SPSS (see **Appendix C**). The unrotated principal component analysis produced 50 components, with the first factor accounting for 31.21% of the total variance, which falls significantly below the recommended 50% threshold (Podsakoff et al., 2003; Asare Obeng et al., 2025a). This indicates that no singular factor was more significant than the others, hence diminishing the relevance of worries over the elevated CMB in the sample.

A marker variable analysis was performed in SmartPLS to validate these findings, utilizing a theoretically unrelated random construct as the marker variable (Lindell and Whitney, 2001; Asare Obeng et al., 2025b). The variance inflation factor (VIF) values for the relationships between the substantive components and the random marker variable varied from 1.414 to 1.732, remaining below the 3.3 criterion established by Kock (2015) for identifying collinearity-related CMB (refer to **Table 1**). The alignment between Harman's single-factor tests and the marker variable approach provides strong evidence that common method bias is unlikely to distort the results significantly.

These steps ensure that the relationships identified among AI-driven sustainability decision-making, digital sustainability readiness, digital-induced sustainability culture, and the social impact of digital deployment are reliable and not merely evidence of the data collection methods employed with managers in Ghana's financial and telecommunications sectors.

Table 1: Marker Variable Analysis (CMB).

Construct/Indices	VIF
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AI-Driven Sustainability Decision-Making → RANDOM	1.732
Digital-Induced Sustainability Culture → RANDOM	1.414
Digital Sustainability Readiness → RANDOM	1.588
Social Impact of Digital Deployment → RANDOM	1.609

4.2. Measurement Model

4.2.1. Model Fit

Table 2 presents the results of the model fit. A wide range of indicators was employed to assess the quality of the saturated model fit. The metrics comprised the Standardized Root Mean Square Residual (SRMR), squared Euclidean distance (d_uls), geodesic distance (d_g), and Normed Fit Index (NFI). The SRMR value of 0.059 is below the recommended threshold of 0.08, indicating a strong correspondence between the empirical and model-

implied correlation matrices (Hu and Bentler, 1999; Henseler et al., 2016). The d_uls (0.314) and d_g (0.151) values are notably low, indicating a high similarity between the observed and expected covariance structures. This serves as more evidence that the model is effective (Henseler et al., 2016). The NFI score of 0.901 is above the standard cutoff of 0.90, indicating that the model has a satisfactory overall fit (Bentler and Bonett, 1980; Hair, 2014; Asare Obeng and Atan, 2025). The indices collectively indicate that the suggested PLS-SEM model demonstrates a strong fit and is effective for examining the relationships above.

Table 2: Model Fit.

Indices	Value
SRMR	0.059
d_uls	0.314
d_g	0.151
NFI	0.931

4.3. Model Validity and Reliability

Table 3 displays the results of the construct validity and reliability of the model. The findings of the Confirmatory Factor Analysis (CFA) indicate that all constructs exhibit strong reliability and convergent validity. The standardized loadings for all items range from 0.735 to 0.888, above the recommended minimum of 0.70 (Hair et al., 2021; Obeng et al., 2025a) [refer to Figure 2]. This indicates that the indications we observed effectively represent what they are intended to measure.

Cronbach's alpha values span from 0.796 (AI-driven sustainable decision-making) to 0.920 (digital sustainability readiness), exceeding the 0.70 threshold established by Atan and Obeng (2024). This indicates that the data has a high degree of internal consistency. The Composite Reliability (CR) scores, ranging from 0.882 to 0.936, suggest that the constructs are reliable and consistent (Hair et al., 2021).

The Average Variance Extracted (AVE) values for

convergent validity span from 0.599 to 0.783, above the recommended minimum of 0.50 (Fornell and Larcker, 1981). This indicates that each concept significantly contributes to the volatility of its indicators. Despite having a slightly lower AVE (0.599) than other constructs, DPS is nevertheless deemed acceptable because of its strong CR, which bolsters the notion of sufficient convergent validity (Hair et al., 2021; Edonomokumor et al., 2025; Obeng et al., 2025b).

The results indicate that the measurement model is both reliable and valid, establishing a solid foundation for examining the relationships among AI-driven sustainability decision-making, digital sustainability readiness, digital-induced sustainability culture, and the social impact of digital deployment. The findings indicate that the constructs are accurately and consistently measured, facilitating progression to the subsequent phase of structural model research in Ghana's telecommunications and financial industries.

Table 3: Construct Validity and Reliability.

Construct And Items	Standardized Loadings	Cronbach's Alpha	CR	AVE
AI-Driven Sustainable Decision-making				
SDM1	0.856	0.796	0.880	0.711
SDM2	0.839			
SDM3	0.834			
Social Impact of Digital Deployment				

DI1	0.838	0.865	0.908	0.712
DI2	0.822			
DI3	0.854			
DI4	0.860			
DPS1	0.765	0.866	0.899	0.599
DPS2	0.795			
DPS3	0.735			
DPS4	0.754			
DPS5	0.790			
DPS6	0.801			
DS1	0.863	0.899	0.923	0.667
DS2	0.864			
DS3	0.811			
DS4	0.829			
DS5	0.752			
DS6	0.775			
Digital-Induced Sustainability Culture				
CON1	0.809	0.888	0.918	0.692
CON2	0.870			
CON3	0.785			
CON4	0.846			
CON5	0.845			
TEC1	0.885	0.884	0.920	0.742
TEC2	0.861			
TEC3	0.883			
TEC4	0.847			
PRES1	0.783	0.820	0.882	0.651
PRES2	0.865			
PRES3	0.819			
PRES4	0.757			
PROM1	0.880	0.804	0.884	0.719
PROM2	0.865			
PROM3	0.795			
Digital Sustainability Readiness				
EMP1	0.789	0.920	0.936	0.677
EMP2	0.769			
EMP3	0.824			
EMP4	0.861			
EMP5	0.861			
EMP6	0.834			
EMP7	0.818			
LED1	0.881	0.907	0.935	0.783
LED2	0.888			
LED3	0.875			
LED4	0.895			
INT1	0.845	0.878	0.916	0.732
INT2	0.868			
INT3	0.887			
INT4	0.820			

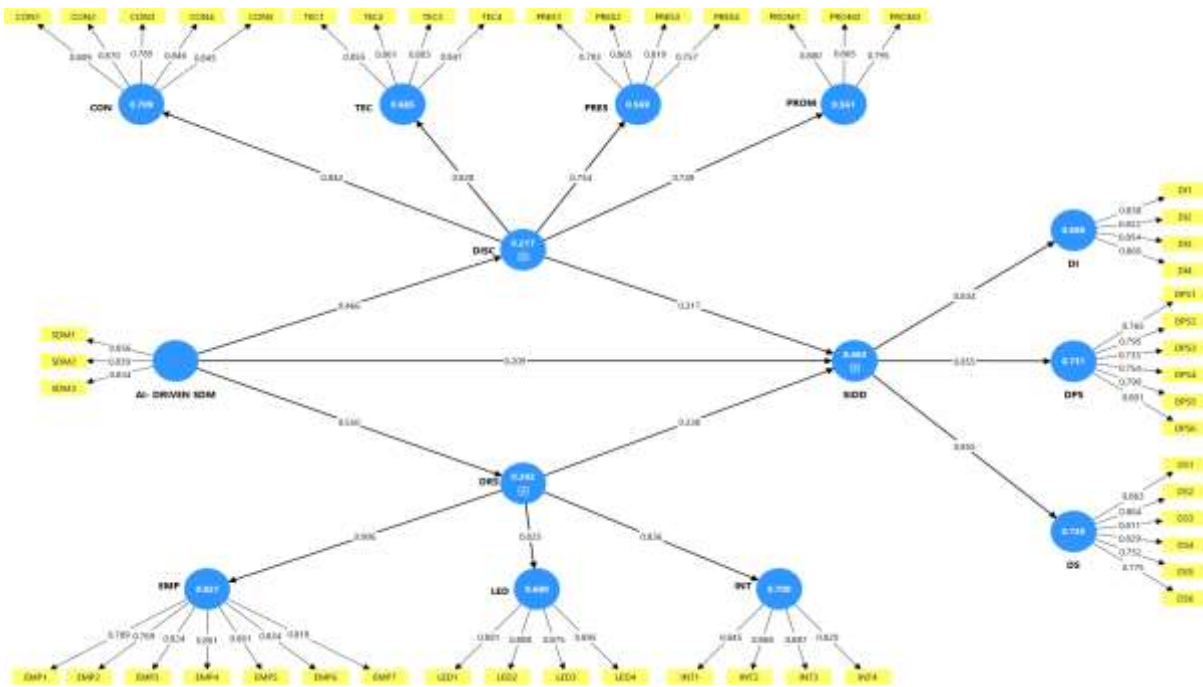


Figure 2: Measurement Model.

4.4. Discriminant Validity

To test for discriminant validity, we employed the Heterotrait-Monotrait ratio of correlations (HTMT). This method effectively determines whether constructs differ from one another (Henseler et al., 2015). All of the HTMT values are below the recommended threshold of 0.85, as indicated in Table 2 (Kline, 2015; Henseler et al., 2015; Obeng et al., 2025c). This shows that the components of the model are distinct. The highest HTMT score, 0.704, is observed between DPS and DI. This is well below the 0.85 criterion. This indicates that the digital-induced sustainability Culture (DPS) and social impact of digital deployment (DI) metrics are sufficiently distinct from one another.

Similarly, all other pairs of constructs, including

the relationships among the digital sustainability readiness sub-dimensions (EMP, INT, LED) and other constructs, fall below the required threshold. This indicates minimal overlap between the constructs. The results demonstrate that the constructs consistently integrate multiple components of organizational digital and sustainability processes, enabling precise interpretation of the structural model links.

The HTMT results offer robust empirical evidence for discriminant validity in the measurement model, aligning with the CFA findings for reliability and convergent validity. This ensures a precise characterization of the model, enabling subsequent structural studies (including mediation and direct effects) to be significant and free from construct multicollinearity complications.

Table 4: Discriminant Validity.

Item	CON	DI	DPS	DS	EMP	INT	LED	PRES	PROM	SDM	TEC
CON											
DI	0.462										
DPS	0.481	0.704									
DS	0.416	0.662	0.619								
EMP	0.23	0.447	0.528	0.428							
INT	0.27	0.459	0.497	0.385	0.695						
LED	0.213	0.446	0.46	0.391	0.648	0.682					
PRES	0.543	0.346	0.433	0.256	0.198	0.218	0.236				
PROM	0.618	0.447	0.465	0.325	0.273	0.265	0.238	0.597			
SDM	0.472	0.554	0.607	0.494	0.571	0.577	0.52	0.404	0.498		
TEC	0.638	0.393	0.461	0.349	0.249	0.274	0.247	0.618	0.591	0.436	

4.5. Structural Model and Hypothesis

The coefficient of determination (R²) and the

predictive relevance (Q²) were used to assess the explanatory and predictive efficacy of the structural model (Hair, 2014; Henseler et al., 2009; Obeng et al.,

2024a). The R² values indicate the extent to which the predictors account for variations in each endogenous component. This study revealed that digital-induced sustainability culture has an R² value of 0.221, signifying that about 22.1% of the variance in digital-induced sustainability culture is due to AI-driven sustainability decision-making. Digital sustainability readiness attained an R² value of 0.302, indicating that the model accounts for 30.2% of its variability. The social impact of digital deployment exhibited an R² of 0.378, indicating that AI-driven sustainability decision-making, digital-induced sustainability culture, and digital sustainability readiness collectively account for 37.8% of its variance. These results suggest a modest degree of explanatory power, typical of models in social science and management research (Hair, 2014; Arhinful et al., 2025a; Obeng et al., 2025d).

The Stone-Geisser Q² values, obtained by a blindfolding method, were employed to assess predictive relevance. The Q² values for digital-induced sustainability culture (0.216), digital sustainability readiness (0.299), and social impact of digital deployment (0.295) are all positive, indicating that the model can predict these endogenous components (Geisser, 1974; Stone, 1974; Obeng et al., 2024b). The findings suggest that the structural model accounts for a significant portion of the variance in outcomes and yields precise forecasts. This verifies that the model effectively assesses the relationships among AI-driven sustainability decision-making, organizational mediators, and social impact outcomes in Ghana.

The analysis of the structural model included multicollinearity diagnostics, effect size assessment (f²), and hypothesis testing using the bootstrapping

method with 5,000 resamples. The values of the variance inflation factor (VIF) ranged from 1.000 to 1.669, which is significantly less than the conservative threshold of 5.0 (Hair, 2014; Obeng and Atan, 2024). This indicates that multicollinearity is not an issue in this model.

AI-driven sustainable decision-making exerted a substantial direct effect on the social impact of digital deployment ($\beta = 0.197, p < 0.001, f^2 = 0.050$); however, the effect magnitude was minimal. Thus confirming H1. Sustainable decision-making exhibited a strong and statistically significant positive influence on both digital-induced sustainability culture ($\beta = 0.470, p < 0.001, f^2 = 0.282$) and AI-driven digital sustainability readiness ($\beta = 0.549, p < 0.001, f^2 = 0.432$). All of these impacts were substantial (Cohen, 2013; Obeng et al., 2024c; Arhinful et al., 2025b). Hence validating H2 and H3 respectively

Both digital-induced sustainability culture ($\beta = 0.278, p < 0.001, f^2 = 0.148$) and digital sustainability readiness ($\beta = 0.304, p < 0.001, f^2 = 0.147$) showed significant positive effects on the social impact of digital deployment, exhibiting moderate effect sizes. Therefore, supporting H4 and H5.

Regarding the specific indirect effects, AI-driven sustainable decision-making affected the social impact of digital deployment indirectly through digital-induced sustainability culture ($\beta = 0.131, p < 0.001$) and digital sustainability readiness ($\beta = 0.167, p < 0.001$). Both mediation pathways were significant, validating the hypothesized (H6 and H7) mediating roles of digital-induced sustainability culture and digital sustainability readiness in the relationship between sustainable decision-making and social impact of digital deployment.

Table 5: Structural Model and Hypothesis.

Hypothesis	Path	β	Sample mean (M)	SD	T -values	P values	VIF	f-squared	Decision
Direct effect									
H1	AI-DRIVEN SDM → SIDD	0.197	0.197	0.052	3.802	0.000	1.669	0.050	Supported
H2	AI-DRIVEN SDM → DISC	0.470	0.472	0.038	12.366	0.000	1.000	0.282	Supported
H3	AI-DRIVEN SDM → DRS	0.549	0.55	0.032	17.122	0.000	1.000	0.432	Supported
H4	DISC → SIDD	0.278	0.28	0.041	6.825	0.000	1.289	0.148	Supported
H5	DRS → SIDD	0.304	0.303	0.042	7.182	0.000	1.44	0.147	Supported
Specific Indirect effect									
H6	AI-DRIVEN SDM → DISC → SIDD	0.131	0.132	0.023	5.795	0.000			Supported
H7	AI-DRIVEN SDM → DRS → SIDD	0.167	0.167	0.026	6.500	0.000			Supported

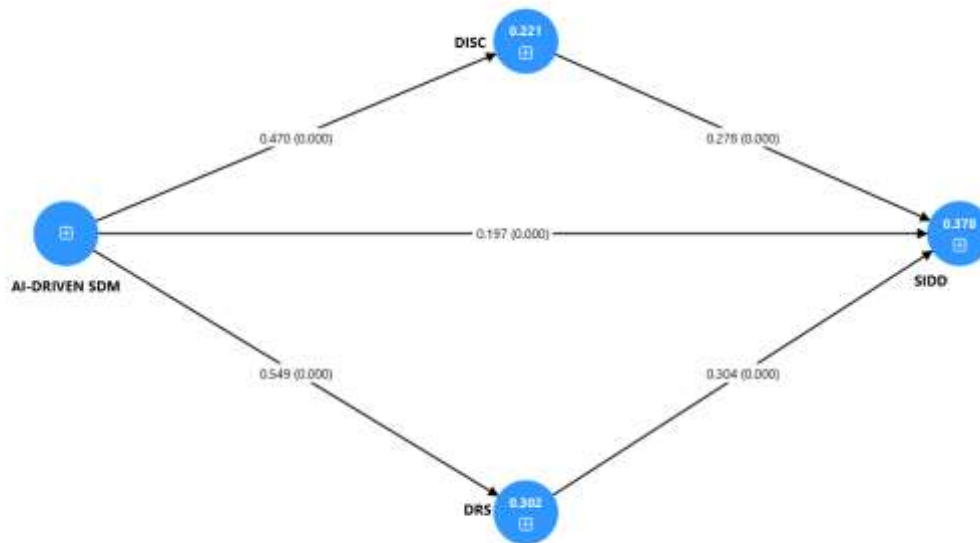


Figure 3: Structural Model.

5. DISCUSSION

This study examined the direct and indirect relationships between AI-driven sustainable decision-making, a digital-induced sustainability culture, digital sustainability readiness, and the social impact of digital implementation. The results reveal multiple substantial direct and indirect correlations, all consistent with the anticipated path. This suggests that AI-driven decision-making processes can have a significant impact on cultural and preparedness dimensions, thereby influencing the societal implications of digital initiatives.

The findings indicate that AI-driven sustainable decision-making significantly enhances the social impact of digital implementation, fosters a culture of sustainability induced by digital technologies, and improves preparation for digital sustainability. AI-driven decision-making amplifies the societal impact of digital implementation, suggesting that methods integrating sustainability criteria are more likely to yield positive societal outcomes in digital firms. This aligns with the assertions of Nosratabadi *et al.* (2023) regarding the role of sustainability analytics in promoting socially responsible digital implementations, as well as the claims of Khalid *et al.* (2024) that sustainable frameworks must be equitable, transparent, and accessible. The minimal magnitude of the direct effect contrasts with previous research, which indicated more substantial

consequences (e.g., Dubey *et al.*, 2019). In Ghana, institutional and physical limitations may hinder the swift transformation of sustainability-focused decisions into societal advantages, underscoring that technology alone is insufficient. To achieve optimal societal outcomes, firms must invest in education and cultural enhancement. From a Socio-Technical Systems (STS) perspective, this highlights the imperative for AI-driven decision-making to be embedded inside comprehensive social subsystems—such as culture, training, and preparedness—to exert substantial impact.

Furthermore, AI-driven sustainable decision-making significantly enhanced both digital-induced sustainability culture and digital sustainability readiness. Incorporating sustainability considerations into AI-assisted decision-making can transform individuals' perceptions, behaviors, and actions. This integrates sustainability as a fundamental aspect of the business rather than a mere afterthought. This aligns with Wut *et al.* (2021) on decision-making as a cultural catalyst and Aboelmaged (2018) on leadership commitment to sustainability, which fosters employee acceptance of sustainable practices. In Ghana's evolving sustainability context, leadership behavior is paramount. AI-driven decision-making can expedite the alignment of individuals in Ghana with sustainability ideals. Organizations that prioritize sustainability via AI are more proficient in executing

digital initiatives, since AI enhances the synergy of resources, infrastructure, and staff competencies. This finding aligns with Wang et al. (2025), who asserted that sustainability-focused decisions improve the congruence between strategy and capacity. The research advances the resource-based perspective within the STS framework (Emery & Trist, 1960) by illustrating that in Ghana, AI-driven decision-making promotes preparedness, unlike scenarios where readiness is crucial (Kumar et al., 2024; Arhinful et al., 2025c). Managers can intentionally utilize AI to benefit the environment. This enables them to allocate funds towards technology, training, and processes, so accelerating the assimilation of new cultures and preparing the firm for sustained digital transformation.

The findings indicate that both a digitally induced sustainability culture and digital sustainability readiness have a significant and positive influence on the social impact of digital deployment. A strong culture of sustainability is essential for the success of socially advantageous technical initiatives. Businesses that integrate accountability, inclusivity, and long-term thinking into their core principles are more likely to achieve favorable outcomes from digital transformation. This corresponds with the findings of Dubey et al. (2019) and Wut et al. (2021), who emphasized the importance of culture in fostering responsible digital innovation, and Alemu (2025), who noted that a sustainability-focused culture affects the utilization of technology in addressing social issues. In Ghana, where regulations and infrastructure are frequently inadequate, emphasizing culture may mitigate the risks associated with noncompliance and substandard public facilities (Konadu et al., 2025). Culture functions as a "soft control" mechanism, exerting a significant yet informal influence on decision-making and ensuring that digital projects align with community demands. Managers who incorporate sustainability into their mission statements, training programs, and performance metrics can foster trust, enhance community engagement, and increase the societal value of digital deployments. Simultaneously, preparedness for digital sustainability emerged as a crucial aspect of social influence, indicating that organizations must be equipped to achieve significant digital outcomes. Wang et al. (2025) and Nosratabadi et al. (2023) argue that organizations with appropriate talent, infrastructure, and governance structures are more effective at translating digital solutions into tangible social benefits. Readiness enables enterprises to mitigate implementation risks, foster inclusion, and

facilitate digital access, particularly in developing nations. In Ghana, where organizations often encounter challenges such as inadequate infrastructure, limited digital literacy, and ineffective governance (Ohemeng & Ofosu-Adarkwa, 2014), meticulous preparation distinguishes successful digital initiatives from those that falter. Ghanaian organizations must strategize and invest in initiatives that maximize their social impact and contribute to the betterment of society. Conversely, digital skills are already robust in industrialized nations. For managers, this entails perceiving expenditures on training, infrastructure, and governance not merely as costs, but as opportunities to distinguish themselves and contribute positively to society in the long term. By fostering a culture that prioritizes sustainability and ensuring preparedness for change, companies can ensure that their digital transformation initiatives yield enduring and socially beneficial outcomes.

The mediation analysis revealed that both digital-induced sustainability culture and digital sustainability preparation serve as partial mediators between AI-driven sustainable decision-making and the societal impacts of digital implementation. AI-driven sustainable decision-making has a significant influence on societal outcomes, primarily through indirect mechanisms related to culture and preparedness. When an organization's values, conventions, and shared understandings incorporate sustainability themes, they have a significant influence on its culture. This aligns with the core principles of Socio-Technical Systems theory, which recognizes social subsystems, such as culture, as essential factors in converting technical or structural decisions into broader organizational and societal impacts (Trist & Bamforth, 1951). Wut et al. (2021) similarly demonstrated that sustainability-oriented decision-making influences group norms and values, thereby fostering socially responsible digital innovation. In contrast, Nosratabadi et al. (2023) emphasized the need for cultural integration, even in technologically advanced environments. The findings suggest that technology, regardless of its sophistication, cannot yield positive societal outcomes unless it operates within a cultural framework that endorses it and is grounded in shared values.

Simultaneously, digital sustainability readiness partially mediated the relationship, indicating that preparedness enhances the likelihood of AI-driven sustainability decisions yielding beneficial societal outcomes. Assessments to determine if employees, infrastructure, and resources align with

sustainability objectives, enabling organizations to execute digital initiatives effectively. This aligns with Wang *et al.* (2025), who discovered that decision-making grounded in sustainability compels enterprises to improve their resource utilization and operational practices, resulting in improved digital outcomes for society. In Ghana, where infrastructure and skills remain deficient, preparedness is paramount. AI-driven sustainable decision-making improves preparation by enabling firms to anticipate challenges, develop new competencies, and improve their strategies (Rajagopal *et al.*, 2022). Managers have to perceive readiness not as a mere byproduct of decision-making, but as a purposeful strategic imperative. To ensure that digital initiatives genuinely benefit society, AI-driven sustainability solutions must encompass training, infrastructure enhancements, and governance frameworks.

The results significantly reinforce the fundamental tenets of Socio-Technical Systems theory. Enhancing an organization's efficacy necessitates simultaneous improvement of its social and technological subsystems (Trist and Bamforth, 1951). This study demonstrates that in emerging economies, AI-driven sustainable decision-making functions as a catalyst for technology. At the same time, culture and preparation operate as the social mechanisms that enable digital initiatives to yield tangible societal advantages. This enhanced understanding not only strengthens the theoretical foundations of Socio-Technical Systems within the discussion on digital sustainability but also highlights its significance outside affluent countries.

5.1. Theoretical Contribution

This study significantly advances the Socio-Technical Systems theory by empirically uncovering the intricate interplay between AI-driven sustainable decision-making and the social and technical subsystems. The resulting sustainable digital outcomes, including the societal impact of digital deployment, present a novel perspective. The Socio-technical Systems theory, which emphasizes the concurrent improvement of social and technological subsystems for enhancing organizational performance (Trist and Bamforth, 1951; Pasmore, 1982), is confirmed and enriched within the context of digital transformation, with a strong emphasis on sustainability.

The direct impact of AI-driven sustainable decision-making on the social fabric, as illustrated by the social impact of digital deployment, underscores the societal relevance of this research. It shows that technological decision-making systems, when

guided by sustainability principles, can independently generate socially positive impacts without intermediary processes. This extends the scope of previous research on Socio-technical Systems (Mumford, 2006) by demonstrating that sustainability-focused frameworks for technology decision-making can directly influence society at large.

The significant impact of AI-driven sustainable decision-making on digitally induced sustainability culture and digital sustainability readiness illustrates how technological decision-making can foster social subsystems (culture) and technical preparedness (readiness). These findings augment Socio-technological Systems theory by demonstrating that the technological subsystem (AI-driven decision frameworks) can act as a catalyst for the progression of the social subsystem, rather than merely serving as an adjunct, a dynamic not consistently emphasized in prior models (Cherns, 1987).

The significant relationships between digitally induced sustainability culture and the social impact of digital implementation, and between digital sustainability readiness and the social impact of digital deployment, reinforce the practical implications of Socio-Technical Systems. This theory posits that social and technical subsystems mutually influence performance outcomes. The findings of this study suggest that culture serves as an intricate control mechanism guiding value-driven execution, while preparation ensures the technical proficiency to transform intentions into results.

The partial mediation effects provide a significant theoretical advancement. The mediations confirm that the impact of AI-driven sustainable decision-making on the social effects of digital implementation is partially mediated by cultural and readiness pathways, aligning with the Socio-Technical Systems principle that socio-technical integration is multidimensional (Rosenbloom *et al.*, 2016). Nevertheless, the partial characteristics of both mediations challenge a possible oversimplification in Socio-Technical Systems theory, particularly the claim that results require total alignment. This circumstance includes both direct technical-to-outcome connections and indirect socio-technical associations. In digital ecosystems prioritizing sustainability, optimization can occur concurrently through many methods.

This study also provides a contextual advancement for Socio-technological Systems theory in developing nations, where limited resources and institutional deficiencies frequently disturb the expected balance between social and technological

subsystems. This study demonstrates that AI-based decision-making can help address existing gaps, leading to socially beneficial outcomes. This suggests that, in these situations, the technology subsystem may be more critical for making systemic changes in the short term. It further strengthens the theory's explanatory capacity, extending its relevance from advanced economies to contexts where digital preparedness and environmental imperatives converge. This study not only confirms but also reinterprets the theory as a flexible framework suitable for diverse institutional and developmental settings.

5.2. Practical Implications

This study's results have important practical implications for managers and policymakers seeking to enhance sustainable performance through the equal integration of social and technical systems. The findings indicate that managers must improve both the technical infrastructure and the social environment to facilitate the discovery, sharing, and dissemination of new ideas among a larger audience. Facilitate collaboration among individuals, disseminate information, and demonstrate your capacity for transformation. Executives in companies must employ management strategies that integrate technical developments and human factors as interdependent components that must develop concurrently to get optimal outcomes (Baxter and Sommerville, 2011). For instance, when organizations acquire new systems or digital tools, it is essential to ensure that staff receive adequate training, are involved in decision-making processes, and that supportive leadership frameworks are established to facilitate effective utilization of these technologies.

The findings indicate that policymakers must establish regulations that promote the adoption of a socio-technical approach by companies. This may involve establishing regulations, allocating funds, or granting awards to organizations that effectively integrate new technology with initiatives that engage individuals and facilitate their development (Carayon et al., 2015). Policies that promote industry-specific standards for technology adoption, facilitate organizational learning, and empower people may expedite sectors' attainment of sustainable development goals. The findings of this study indicate that sustained enhancement relies not solely on technological advancement, but also on the integration of human and technical subsystems. This significantly influences the strategic decisions of enterprises and governments.

5.3. Limitations and direction for future studies

This study, although offering valuable insights, is not without limitations. The reliance on self-reported data may have led to CMB, since respondents likely provided socially desirable answers or inflated their behaviors and perceptions (Podsakoff et al., 2012). Although statistical analyses were employed to mitigate this risk, future research should incorporate multi-source data, such as supervisor evaluations, peer assessments, or objective performance metrics, to enhance the reliability of the findings.

Secondly, the study employed a cross-sectional design, constraining the ability to deduce causal correlations among the examined variables. Future study may employ longitudinal or experimental methodologies to establish temporal precedence and substantiate claims of causality.

Third, the research was conducted within a specific sector and cultural context, thereby limiting the generalizability of the results to other industries or countries. An analysis across different sectors and cultural contexts may clarify the enduring relationships identified in various situations.

Lastly, the employed model failed to account for all factors that potentially influence the correlations among the analyzed variables. Future studies may integrate further variables, such as leadership style, organizational culture, or environmental volatility, to deepen the comprehension of fundamental dynamics. By overcoming these constraints, additional research could validate the existing findings and augment the applicability of socio-technical systems theory to broader contexts.

6. CONCLUSION

This study examined the relationships among AI-driven sustainable decision-making, the social impacts of digital implementation, the sustainability culture fostered by digital technology, and the preparedness for digital sustainability. The findings validate the theory's assertion that the alignment of social and technical subsystems is crucial for optimal organizational results. The study demonstrated that AI-enhanced sustainable decision-making significantly enhances the social impact of digital implementation and critical organizational enablers, such as a digitally cultivated sustainability culture and digital sustainability preparedness. The findings indicate that AI-driven sustainable decision-making directly facilitates socially beneficial digital projects and indirectly improves performance by enhancing the company's culture and preparedness. The study further revealed that a digitally fostered sustainability culture and digital sustainability

preparedness partially alleviate the relationship between AI-driven sustainable decision-making and the social consequences of digital implementation. AI-driven judgments directly influence the societal ramifications of digital implementation. They are particularly beneficial when they foster a culture of sustainability and enhance organizational adaptability. This illustrates the significance of integrating cultural and structural preparedness with AI-driven decision-making to achieve substantial outcomes in digital initiatives. In Ghana's financial and telecoms sectors, these findings highlight that incorporating sustainability into AI-driven choices can catalyze organizational transformation and the

creation of social value. This study, grounded in Socio-technological Systems theory, confirms that the interaction between social subsystems (culture, skills, and preparedness) and technical systems (AI-driven processes) is crucial for realizing the broader societal benefits of digital implementation. This study contributes to the existing knowledge by demonstrating that for digital transformation to effectively promote sustainability, technological capabilities, organizational culture, and preparedness must be aligned. It provides managers and policymakers seeking to utilize AI for socially responsible and sustainable digital initiatives with valuable insights.

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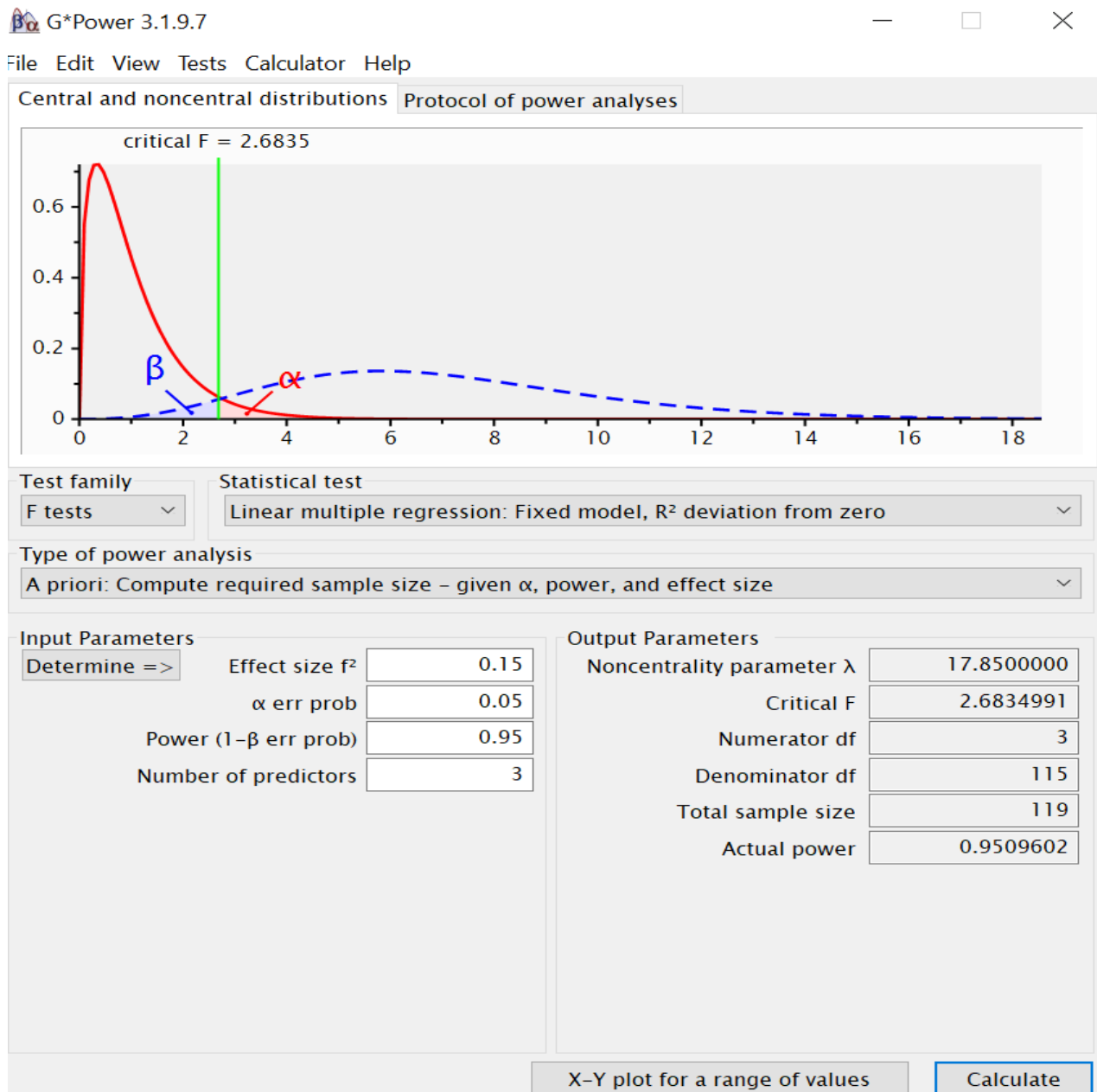
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APPENDIX A: SAMPLE SIZE CALCULATION BASED ON G*POWER



APPENDIX B: QUESTIONNAIRE

Construct	Dimension/Items	Source
Artificial Intelligence Sustainable Decision-making	Managers or entrepreneurs in our firm recurrently involve employees or workers in critical decisions to adopt eco-innovation practices (SDM1)	Khalid et al. (2024)
	Our firm policies are considerably affected by the view of employees about eco-innovation (SDM2) Employees or workers realize that they are involved in crucial enterprise's decisions to adopt eco-innovation practice (SDM3)	
	Our firm policies are considerably affected by the view of employees about eco-innovation (SDM2) Employees or workers realize that they are involved in crucial enterprise's decisions to adopt eco-innovation practice (SDM3)	
Social Impact of Digital Deployment	Digital Inclusion (DI)	Nosratabadi et al. (2023)
	Use of ICT at work and activities performed (DI1)	
	Work from home, from an external site or on the move (DI2)	
	Internet use by individuals (DI3)	
	Individuals frequently using the internet (DI4)	
	Digital privacy and security (DPS)	

	Smartphone has some security system, installed automatically or provided with the operating system (individuals who used internet in the past 3 months) (DPS1)	
	Individuals know that cookies can be used to trace movements of people on the internet (3 months) (DPS2)	
	Individuals manage access to personal data on the internet (3 months): read privacy policy statements before providing personal data (DPS3)	
	Smartphone has some security system, installed automatically or provided with the operating system (All individuals) (DPS4)	
	Smartphone has some security system, installed by somebody or subscribed to it (3 months) (DPS5)	
	Individuals already lost information, documents, pictures or other kind of data on their smartphone as a result of a virus or other hostile type of programs (3 months) (DPS6)	
	Digital Skills (DS)	
	Individuals' level of digital skills (from 2021 onwards) (DS1)	
	Individuals who have used a search engine to find information Individuals who have sent an email with attached files (DS2)	
	Individuals who have posted messages to chat rooms, newsgroups or an online discussion forum (DS3)	
	Individuals who have used the internet to make phone calls (DS4)	
	Individuals who have used peer-to-peer file sharing for exchanging movies, music, etc. (DS5)	
	Employed ICT specialists – total Enterprises that provided training to develop/upgrade ICT skills of their personnel by NACERev.2 activity (DS6)	
	Empowerment	
	We are committed to introducing, learning from, and utilizing digital technologies to solve business efficiency problems (including R&D, production, and communication efficiency) (EMP1)	
	We are committed to introducing, learning from, and utilizing digital technologies to reduce emissions of wastewater, exhaust, and waste in our operations (EMP2)	
	We are committed to introducing, learning from, and utilizing digital technologies to reduce the negative environmental impact of our products and services (EMP3)	
	We are committed to introducing, learning from, and utilizing digital technologies to reduce energy consumption in our operations (EPM4)	
	We are constantly trying to create more fair, healthy, safe, and stable jobs and working environments for our employees and the local economy through digital transformation (EPM5)	
	We are constantly trying to promote the standardization of the industry by relying on the products and services provided by various digital technologies (EMP6)	
	We are constantly trying to improve the image of our company as perceived by our stakeholders (suppliers, customers, and employees) through digital transformation (EMP7)	
	Leadership (LED)	
	We are orienting our digital innovations toward the realization of sustainable goals for green and social well-being (LED1)	
	For the organization to generate positive environmental and social benefits, we will continue to develop digital literacy learning (LED2)	
	The environmental and social issues posed by business lead us to use digital solutions wherever possible (LED3)	
	The process of digital transformation and upgrading should be promoted through organization-led economic, environmental, and social impact initiatives (LED4)	
	Integration (INT)	
	We will fully consider the input and output of resources when introducing digital technologies (INT1)	
	When we introduce digital technologies, we try to address their negative impacts on society and the environment (INT2)	
	We use digital technologies with due consideration of whether we have the digital capabilities to match (INT3)	
	We will continue to develop and maintain the environmental and social benefits of digital technologies (INT4)	
	Content (CON)	
Digital Sustainability Readiness		Wang et al. (2025)

Digital-Induced Sustainability Culture	Corporate documents should be produced into digital content, actively updated, and publicly available (CON1)	Wut et al. (2021)
	Corporate images and photographs should be produced into digital content, actively updated, and publicly available (CON2)	
	Corporate audio and video materials should be produced into digital content, actively updated, and publicly available (CON3)	
	Corporate websites/web pages should be actively updated, and publicly available (CON4)	
	Sustainable file formats should be used to maintain long-term accessibility of corporate digital content (CON5)	
	Technology (TEC)	
	Technology should be available for development of digital content (TEC1)	
	Technology should be available for storage of digital content (TEC2)	
	Ongoing maintenance for technology used to develop and store digital content should exist (TEC3)	
	Technology should be available for staff to share and access digital content (TEC4)	
	Preservation (PRES)	
	Staff resources should be secured for ongoing support with digital content (PRES1)	
	Financial support should be secured for ongoing maintenance of digital content (PRES2)	
	Digital content should be well documented with descriptive information (PRES3)	
	As users, we can understand, interpret, and discover well documented digital content (PRES4)	
	Promotion (PROM)	
	Organizations should hold activities that raise the engagement with digital content (PROM1)	
	Digital content should be promoted through organization-led initiatives (PROM2)	
Digital content should be promoted through management-led initiatives (PROM3)		

APPENDIX C: COMMON METHOD BIAS-HARMAN'S SINGLE FACTOR TEST

Factor	Total Variance Explained			Extraction Sums of Squared Loadings	
	Total	% of Variance	Cumulative %	Total	% of Variance
1	15.606	31.212	31.212	14.920	29.839
2	5.307	10.615	41.827		
3	3.124	6.248	48.074		
4	1.766	3.531	51.606		
5	1.654	3.308	54.913		
6	1.542	3.084	57.998		
7	1.352	2.705	60.702		
8	1.242	2.484	63.187		
9	1.207	2.413	65.600		
10	1.153	2.306	67.906		
11	1.054	2.107	70.013		
12	.675	1.350	71.363		
13	.637	1.275	72.638		
14	.618	1.237	73.874		
15	.577	1.153	75.028		
16	.570	1.139	76.167		
17	.558	1.115	77.282		
18	.535	1.069	78.351		
19	.511	1.021	79.373		
20	.502	1.004	80.376		
21	.491	.982	81.359		
22	.478	.956	82.315		
23	.459	.919	83.234		
24	.446	.891	84.125		
25	.436	.873	84.998		
26	.427	.854	85.852		
27	.422	.845	86.696		

28	.398	.797	87.493		
29	.390	.781	88.274		
30	.383	.766	89.040		
31	.370	.739	89.779		
32	.353	.707	90.486		
33	.347	.693	91.179		
34	.341	.681	91.860		
35	.330	.661	92.521		
36	.317	.633	93.155		
37	.306	.612	93.766		
38	.290	.581	94.347		
39	.284	.567	94.914		
40	.275	.549	95.464		
41	.270	.540	96.004		
42	.265	.530	96.534		
43	.254	.507	97.042		
44	.248	.496	97.537		
45	.237	.474	98.012		
46	.226	.451	98.463		
47	.207	.413	98.876		
48	.205	.411	99.287		
49	.184	.369	99.655		
50	.172	.345	100.000		

Extraction Method: Principal Axis Factoring.

APPENDIX D: MARKER VARIABLE (RANDOM)

