



Review

Managerial Styles and Digital Innovation for Sustainable Business Growth

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Abstract: In the evolving business landscape, managerial styles and digital innovation are crucial drivers of sustainable business growth. Effective management influences decision-making, resource optimization, and adaptability, while digital technologies enhance operational efficiency, automate processes, and improve strategic insights. Transformational and participative management styles foster an environment that supports technological adoption, sustainability initiatives, and innovation. The integration of contemporary information technologies, such as big data analytics, cloud computing, and artificial intelligence, allows organizations to streamline processes, reduce costs, and enhance competitiveness. Additionally, sustainable leadership emphasizes ethical decision-making, corporate responsibility, and long-term business viability. By leveraging digital transformation and effective managerial approaches, organizations can enhance sustainability, improve resilience, and achieve a competitive advantage in a rapidly changing market. This paper explores the dynamic interaction between managerial styles and digital innovation, demonstrating their collective impact on corporate sustainability and business success.

Keywords: *Sustainable business; management style; pyramid of sustainable leadership; contemporary information technologies; decision-making.*

1. Introduction

In the modern business landscape, sustainable growth requires a balanced integration of strategic leadership and digital transformation. Managerial styles shape how organizations manage resources, make decisions, and foster innovation, while digital technologies enhance operational efficiency, productivity, and data-driven decision-making. The interaction between managerial styles and digital innovation is crucial for organizations aiming to achieve sustainable business growth. While leadership approaches determine how businesses embrace change, digital advancements provide the necessary tools to streamline processes and optimize decision-making. Without adaptive leadership, digital transformation initiatives may face resistance, and without technological integration, traditional management strategies may fail to meet contemporary business demands [1].

Modern management approaches, such as participative and transformational leadership, play a key role in facilitating digital innovation and sustainable business practices. Participative management encourages employee engagement and collaboration, while transformational leaders drive organizations toward proactive adaptation through technological integration and innovative strategies [2]. These leadership styles not only influence corporate culture but also determine how effectively businesses integrate digital solutions into their operations. At the same time, digital innovations such as big data analytics, cloud computing, and artificial intelligence are reshaping traditional business models. These technologies enable organizations to reduce costs, improve resource management, and enhance strategic decision-making [3].

However, the mere adoption of technology is insufficient—successful digital transformation depends on leadership that recognizes the value of innovation, mitigates resistance to change, and ensures effective implementation. This paper explores the interplay between managerial styles and digital innovation in the context of sustainable business growth. It examines how managers can leverage digital tools to enhance sustainability and competitiveness, as well as how different leadership styles impact the effectiveness of digital technology adoption in corporate strategy. As organizations embrace digital transformation, managerial styles must also evolve to integrate sustainability and ethical leadership.

2. Green behavior of employees and principles of sustainable and digital management

Employees' Green Behavior (EGB) refers to workplace actions that promote environmental sustainability, such as reducing energy use, recycling, and minimizing waste [4] EGB is shaped by personality traits, motivation, organizational culture, policies, and management practices [5]. In the digital era, technology enhances EGB by enabling smart monitoring, automated reporting, and AI-driven optimization of sustainability efforts. However, the integration of digital tools into corporate sustainability strategies depends on effective management practices that combine traditional principles of sustainable leadership with emerging digital management approaches.

Ethical management fosters EGB by promoting environmental responsibility through goal-setting and strategic decision-making [6]. Ethical managers serve as role models, influencing employee attitudes and ensuring corporate transparency [7]. They establish reward systems that reinforce sustainability-oriented behavior, aligning individual actions with organizational goals [8].

Transformational management also plays a key role in embedding sustainability into corporate culture [9]. By championing green values, transformational managers inspire employees to adopt environmentally responsible behaviors and integrate sustainability into decision-making [10,11]. Incorporating sustainability into management development strengthens long-term employee commitment to green initiatives.

Digital management accelerates sustainable transformation by integrating AI, cloud computing, and big data analytics [12]. These technologies optimize energy use, automate sustainability reporting, and provide real-time insights, reducing environmental impact [13]. Smart grids and IoT-driven monitoring systems enhance efficiency, while automation streamlines supply chain management and carbon footprint reduction [14]. Additionally, digital sustainability strategies enable organizations to anticipate environmental challenges, improve regulatory compliance, and develop data-driven approaches to long-term ecological responsibility.

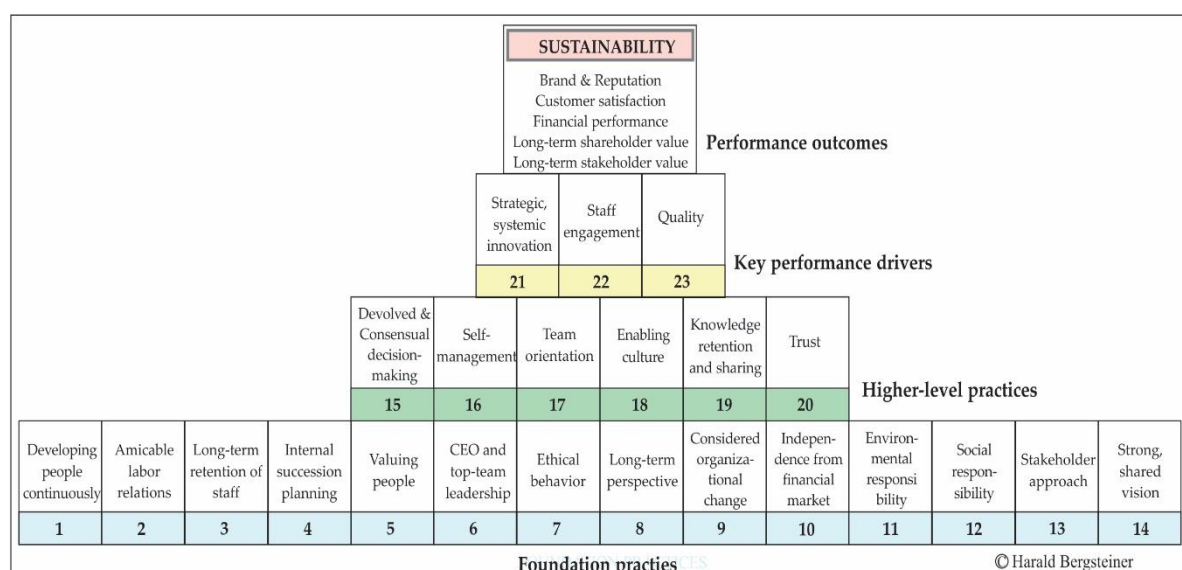


Figure 1. The pyramid of sustainable leadership [15].

The pyramid of sustainable leadership, as outlined by Avery and Bergsteiner [15], provides a comprehensive framework that integrates foundational leadership principles with advanced managerial strategies. This model underscores the importance of aligning leadership and management practices to achieve long-term sustainability. In the era of digital transformation, sustainable leadership must adapt to include digital management approaches, leveraging technologies such as artificial intelligence, big data, and cloud computing. By doing so, organizations can enhance decision-making processes, foster innovation, and ensure a balance between economic, social, and environmental goals. This framework highlights the critical role of management in translating leadership values into actionable strategies, ensuring resilience and competitiveness in an increasingly digital and interconnected world.

As businesses incorporate digital solutions into sustainability initiatives, they must also recognize the challenges associated with ethical management, data governance, and employee engagement. The next section explores how artificial intelligence and digital technologies contribute to data-driven decision-making and enhance organizational agility in an era of rapid technological change.

3. AI and digital technologies in decision-making

The increasing adoption of artificial intelligence (AI) and digital technologies has significantly reshaped decision-making processes, enabling data-driven strategies, automation, and enhanced predictive analytics. As businesses generate vast amounts of structured and unstructured data, leveraging AI-powered analytics, big data processing, and cloud computing has become essential for extracting valuable insights, optimizing resource allocation, and improving operational efficiency. The integration of AI with predictive modeling and automation facilitates a shift from reactive to proactive decision-making, enhancing adaptability and competitiveness in the digital economy.

The expansion of digital technologies has redefined how organizations manage data and make strategic decisions. According to the World Economic Forum [16], the digitization of business operations, the adoption of IP-based communication, and the transition to IPv6 have enabled large-scale connectivity, creating an interconnected environment where real-time analytics drive decision-making. Cloud-based big data services now provide businesses with the computational power necessary to process vast datasets and derive actionable insights. As a result, companies increasingly rely on integrated data platforms that combine information management, predictive analytics, and strategic forecasting to improve decision-making accuracy and efficiency.

Industry 4.0 has significantly increased the demand for scalable and adaptable decision-making systems, requiring organizations to process and interpret massive amounts of data efficiently [17]. Managing these data streams is directly linked to business performance and competitive positioning [18–21]. Effective data governance integrates multi-layered systems that combine sensor-generated data, human inputs, and automated processes, ensuring seamless information flow and enhanced decision-making accuracy [22]. However, as data volume continues to grow, companies face challenges in identifying relevant information, eliminating redundancies, and structuring digital assets for optimal business intelligence. Research suggests that technological solutions alone are insufficient; organizations must implement advanced methodologies to manage data effectively and derive meaningful insights for decision-making [23].

A key advancement in digital decision-making is the application of machine learning (ML) and data mining, which have transformed predictive analytics and business intelligence. Unlike traditional computational models, ML-powered frameworks dynamically adapt to new patterns, improving forecasting accuracy and operational efficiency. Machine learning allows businesses to process extensive datasets, detect trends, and enhance strategic planning, leading to more informed business decisions [24]. Clustering techniques help segment customers based on shared attributes, while regression models support demand forecasting and pricing optimization [25]. Decision trees further refine strategic planning by mapping out various business scenarios and evaluating potential outcomes, enabling organizations to mitigate risks and identify growth opportunities [26].

AI-driven decision-support systems further enhance managerial decision-making by automating the assessment of business environments and recommending optimal strategies [27]. These systems apply rule-based reasoning and AI-powered optimization to evaluate risks, detect inefficiencies, and streamline complex decision-making processes. They are widely used in finance, supply chain management, and customer relationship management, where real-time data analysis and predictive modeling significantly improve operational performance [28]. Organizations that integrate AI-powered decision-support systems gain a competitive advantage by leveraging real-time data for strategic planning, reducing uncertainty, and enhancing efficiency [29].

As businesses continue to embrace AI-driven decision-making, the integration of AI with big data and cloud computing has become a critical factor in shaping modern analytics. Organizations now leverage cloud-based AI systems to enhance data accessibility, optimize processing power, and enable large-scale real-time decision-making. The convergence of big data analytics, cloud-based infrastructure, and AI-driven automation is reshaping how businesses approach strategic forecasting and operational agility. Additionally, the Internet of Things (IoT) facilitates continuous data collection and integration across interconnected devices, further enhancing AI-driven business intelligence.

As organizations increasingly rely on AI for decision-making, managing and analyzing vast amounts of data becomes a fundamental challenge. The role of big data analytics and cloud computing is crucial in extracting actionable insights, enabling businesses to move from intuition-based to evidence-based strategies.

4. Big data and cloud computing: transforming business analytics

The increasing adoption of artificial intelligence and digital technologies has significantly transformed business decision-making, enabling companies to enhance efficiency, optimize resource allocation, and improve predictive analytics. As organizations generate vast amounts of structured and unstructured data, advanced processing and storage solutions have become essential for deriving actionable insights. Big data and cloud computing are at the core of this transformation, allowing businesses to transition from reactive to proactive decision-making while leveraging automation and real-time analytics. Their widespread application across industries has redefined traditional business models, enabling organizations to improve responsiveness, reduce costs, and develop data-driven growth strategies.

Big data encompasses extensive datasets that require advanced analytical techniques to extract relevant business insights. These datasets are characterized by volume, variety, and velocity, collectively known as the "three Vs" [30]. In addition to these dimensions, value has been recognized as a crucial factor, as only a small fraction of collected data contributes to meaningful business improvements [31]. Effective analysis of high-value data enables businesses to refine strategic planning, improve forecasting, and drive innovation, ultimately gaining a competitive edge in the market [32]. Companies that successfully integrate big data analytics into their operations can anticipate market trends, enhance risk management, and develop highly personalized customer experiences, thereby strengthening long-term business sustainability.

The integration of big data analytics with business intelligence, predictive modeling, and customer insights has revolutionized corporate strategies. Companies now rely on sophisticated data-driven approaches to optimize supply chain operations, refine marketing campaigns, and improve decision-making. Furthermore, sustainability initiatives benefit from big data analytics by enabling precise tracking of energy consumption, waste reduction, and increased transparency within supply chains [33]. However, the successful implementation of big data strategies necessitates robust data governance, stringent security protocols, and compliance with regulatory frameworks to ensure ethical and responsible data usage. With increasing concerns over data privacy and cybersecurity risks, businesses must also invest in encryption technologies, blockchain integration, and AI-driven security solutions to protect sensitive information and maintain consumer trust.

Cloud computing has further revolutionized data management by offering scalable and on-demand computing power, allowing businesses to process vast datasets efficiently while reducing infrastructure costs. Organizations increasingly migrate to cloud-based environments to improve operational flexibility and access AI-driven analytics [34]. Cloud solutions vary based on business needs, with public cloud services offering scalable infrastructure at lower costs, private clouds ensuring higher security and control, and hybrid models balancing flexibility with regulatory compliance. With Software as a Service (SaaS) projected to surpass \$170 billion in revenue by 2023, cloud-based business models continue to gain dominance [35]. Leading providers such as Amazon Web Services, Microsoft, IBM, and Google are expanding their cloud offerings, integrating AI, cybersecurity, and automation for optimized enterprise solutions [36]. Additionally, cloud computing facilitates seamless collaboration between globally distributed teams, enhancing productivity and real-time data accessibility.

The convergence of big data and cloud computing has facilitated the emergence of advanced technologies such as edge computing, green cloud solutions, and AI-driven platforms. Edge computing processes data closer to its source, reducing latency and bandwidth constraints while improving real-time analytics. Green cloud computing prioritizes energy-efficient infrastructure, optimizing server performance while minimizing environmental impact. Additionally, AI-powered cloud platforms enable predictive analytics, automated decision-making, and intelligent business solutions, further enhancing organizational adaptability in a rapidly evolving digital landscape. These innovations allow companies to scale their computing capabilities dynamically, ensuring that businesses can handle fluctuating data demands while maintaining cost-effectiveness and operational resilience.

As organizations increasingly rely on data-driven operations, the strategic importance of big data and cloud computing continues to grow. Their integration with emerging technologies such as IoT, blockchain, and quantum computing is revolutionizing security frameworks, enhancing predictive analytics, and refining real-time decision-making. These developments are reshaping corporate resilience, enabling businesses to anticipate disruptions, optimize digital infrastructure, and enhance sustainability efforts. By proactively embedding these technologies into their business models, companies can unlock new efficiencies, accelerate innovation, and maintain a sustainable competitive edge in an increasingly interconnected digital economy, where the IoT plays a crucial role in enabling real-time data exchange and automation. IoT technologies further enhance operational agility by facilitating seamless connectivity, optimizing resource efficiency, and driving intelligent business processes, ensuring businesses can leverage interconnected devices to improve performance and scalability.

5. The role of the Internet of Things in business operations

The Industrial Internet of Things (IIoT) is a key enabler of digital innovation, interconnecting measurement, control, and management devices with sophisticated software, databases, and cloud infrastructure [37]. While IoT broadly refers to the interconnection of devices across various domains, IIoT specifically focuses on industrial applications, optimizing manufacturing processes, supply chain management, and predictive maintenance through real-time data exchange. By integrating IoT with artificial intelligence, big data analytics, and cloud computing, organizations enhance decision-making, automate processes, and improve operational efficiency. Real-time data exchange strengthens business intelligence, enabling managers to refine strategic planning, optimize resource allocation, and mitigate risks.

At its core, IoT transforms managerial decision-making by providing real-time insights, predictive analytics, and automated response mechanisms. By continuously monitoring performance metrics, IoT enables organizations to refine operational strategies, predict equipment failures, and improve supply chain visibility. Through seamless connectivity across cloud-based platforms, businesses can integrate structured and unstructured data, improving responsiveness and data-driven agility [38].

IoT-generated data plays a critical role in digital transformation, feeding into AI-powered analytics that streamline performance tracking, automate maintenance, and enhance business adaptability. As IoT systems become increasingly autonomous, managers must transition toward a data-centric approach, leveraging intelligent automation to drive competitive advantage. Real-time monitoring not only improves system reliability but also enables businesses to anticipate challenges, optimize workflows, and reduce operational costs.

Furthermore, IoT strengthens the synergy between digital technologies by enabling smart infrastructure, advanced data analytics, and cross-system integration. With AI-powered IoT systems, organizations achieve scalable, adaptive, and intelligent business solutions that align with long-term strategic goals [39]. By embedding IoT into digital transformation initiatives, businesses improve efficiency, automate decision-making, and create agile, innovation-driven ecosystems. The convergence of IoT, IIoT, AI, and cloud computing is redefining business operations, providing companies with scalable, intelligent, and automated solutions tailored to both consumer-oriented and industrial environments. As connectivity expands, these technologies facilitate real-time monitoring, remote diagnostics, and predictive optimization across various sectors. However, the effective implementation of these technologies requires a strategic approach to data governance, security, and ethical considerations, all of which will play a pivotal role in the future of sustainable digital transformation.

6. Conclusions

The integration of AI and digital technologies is redefining managerial decision-making, requiring businesses to build advanced digital capabilities, improve data governance, and foster innovation-driven strategies. Sustainable digital transformation goes beyond technological adoption—it necessitates an adaptive management mindset, cross-functional collaboration, and ongoing development of AI literacy. Enhancing employees' ability to analyze complex data and utilize AI-driven insights strengthens decision-making, improves operational efficiency, and enables organizations to proactively navigate market dynamics. AI-powered decision-support systems further refine forecasting, optimize risk assessment, and streamline business processes, providing a foundation for more agile and informed decision-making.

Robust data governance frameworks are essential to maximize AI's potential, ensuring secure, ethical, and transparent data utilization. Standardizing data management protocols enhances business intelligence, facilitates regulatory compliance, and strengthens cybersecurity measures. Effective collaboration between IT specialists, business executives, and operational managers is key to integrating AI and digital tools into corporate strategies. Beyond operational improvements, embedding AI into sustainability initiatives contributes to resource efficiency, cost reduction, and enhanced environmental responsibility, positioning businesses for long-term resilience.

Despite AI's growing role in managerial decision-making, further research is needed to assess its influence on human judgment, ethical implications, and measurable business impact. Striking a balance between AI-generated recommendations and managerial expertise remains an ongoing challenge, particularly as concerns related to algorithmic bias, data privacy, and decision transparency continue to evolve. Establishing stronger regulatory frameworks and ethical guidelines will be critical in addressing these challenges while ensuring fair and accountable AI adoption.

By strategically aligning AI and digital innovations with business objectives, organizations can enhance decision-making processes, strengthen adaptability, and develop sustainable business models. Advancing AI implementation strategies will require a focus on ethical integration, continuous learning, and the refinement of best practices. As businesses navigate an increasingly digital economy, their ability to harness AI-driven insights responsibly will determine their capacity to maintain long-term competitiveness and innovation-led growth.

Conflicts of Interest: The authors declare no conflict of interest.

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