

Editorial

Towards a Sustainable Digital Ecosystem: Exploring New Frontiers in Information Systems

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1. Sustainable Information Systems (SIS)

The digital revolution has undeniably propelled us forward, but not without a hidden cost. Imagine a complex orchestra—a symphony of data centers, devices, and processes—keeping our world connected. However, like any powerful performance, it requires significant resources. This is where Sustainable Information Systems (SIS) step in, offering a way to harmonize this digital orchestra with the needs of our planet. Think of traditional information systems (IS) as complex orchestras with five key instruments: people, hardware, software, data, and processes. Sustainable Information Systems (SIS) require us to view these instruments not in isolation but as a harmonious ensemble working in concert for a sustainable future. SIS goes beyond mere adjustments; they are about conducting the entire IS symphony with the environment, economic well-being, and social good in mind. This holistic approach guarantees that stakeholder needs are met while minimizing the environmental impact and maximizing the economic and social benefits. It is about adding a powerful instrument—sustainability—to the existing IS management toolbox.

Technology's environmental impact is undeniable. SIS goes beyond this by acknowledging that every component of an IS—from hardware to people—influences how data and processes are built, used, and shared. This, in turn, shapes an organization's overall sustainability.

SIS is a cornerstone of corporate social responsibility. Take Big Data, a goldmine of information. SIS asks us to refine this resource into "Sustainable Data," ensuring that it does not come at the cost of environmental harm. Cloud computing, for example, demonstrates how sustainable management practices can deliver an efficient computing power with lower energy consumption. However, even cloud solutions require innovation to further improve data center energy efficiency.

Imagine an information system that helps businesses optimize their supply chains, reducing waste and transportation emissions, or a platform that connects communities with sustainable practices and resources. These are just a few examples of the potential of SIS.

Building a sustainable future requires a concerted effort, and information systems play a crucial role. By embracing SIS, we can harness the power of technology for positive change, ensuring a thriving digital landscape that works in harmony with our planet and society.

2. An Overview of Published Articles

The Special Issue "Sustainable Information Systems" in the MDPI *Sustainability* journal compiles fourteen enlightening articles published from 2020 to 2023. These submissions cover a broad spectrum of subjects within sustainable IS, incorporating theoretical models, real-world case studies, and evidence-based surveys. By exploring different methodologies and practical implementations, the issue scrutinizes how information systems can be structured, executed, and overseen to foster a sustainable future, considering the environmental, social, and economic dimensions of well-being.



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Muhammad et al. (Contribution 1) assessed the quality of web-based e-learning systems using a hierarchical model. This study identifies and ranks key factors affecting the design quality of e-learning platforms, with a particular emphasis on content emerging as the foremost determinant. Employing surveys and leveraging the analytical hierarchical process (AHP), the research endeavors to deepen understanding regarding methods to enhance the caliber of e-learning websites. The pursuit of refining e-learning system quality can foster sustainable educational practices by bolstering accessibility, efficiency, and effectiveness in educational service delivery.

AlSukhayri et al. (Contribution 2) discussed the development of data-oriented sustainable systems, mainly focusing on the case study of the public's response to women's driving in Saudi Arabia. The authors present the Saudi Linked Open Government Data Cloud Framework (SLOGDCF), which aims to provide transparency, accountability, and a single point of query for asking integrated and intelligent queries. The framework involves extracting, cleaning, and classifying government data from different sources. The study also includes an analysis of various factors influencing women's driving in Saudi Arabia, such as education, social status, job statistics, and economic status. The sustainable aspect of the article lies in the development of sustainable, open, data-oriented information systems and the potential benefits of data-oriented sustainable systems for decision-making and policy formulation.

Ganesan et al. (Contribution 3) emphasized the importance of energy-efficiency, resource utilization, and provisioning in the context of green IoT- and cloud-based data centers. It addresses data centers' significant energy consumption, environmental impact, particularly in the ICT industry, and the potential for virtual machine (VM) consolidation to create more energy-efficient cloud infrastructures. The research methodology involves evaluating dynamic VM consolidation approaches to real, physical cloud infrastructure, focusing on the SLA metrics and energy usage of compute hosts. The study aims to identify the best combination of algorithms for VM consolidation in the context of IoT big data workloads.

Dolmark et al. (Contribution 4) investigated the impact of an individual's technological belief and usage on their absorptive capacity regarding their learning behavior in a learning environment. The study explores how factors such as technology readiness, tools for knowledge sources, social influences, and social networks influence an individual's absorptive capacity, affecting their learning behavior. The study emphasizes the importance of technology in empowering individuals to learn rapidly in the knowledge society. This focus on leveraging technology for learning and knowledge transfer aligns with sustainability goals by promoting efficient and effective ways of acquiring knowledge and skills in a rapidly changing world.

Muhammad et al. (Contribution 5) assessed the usability of academic websites, particularly within higher education institutions. Their assessment underscores the pivotal role of user-friendly and efficient academic websites in advancing education and facilitating diverse academic functions. The study delves into the challenges users encounter due to usability shortcomings on educational websites, stressing the imperative of evaluating and refining website design to enhance user experience. The study focuses on improving the efficiency and effectiveness of academic websites that resonate with sustainability principles by advocating for digital solutions that conserve time and resources in the education sector.

The central focus of the study by Shahzad et al. (Contribution 6) revolves around crafting a Resource Optimization-Based Software Risk Reduction Model tailored for Large-Scale Application Development. The proposed model endeavors to refine resource allocation strategies and mitigate software risks, streamlining the software development lifecycle. The model empowers software practitioners to mitigate or eliminate risks through risk categorization and prioritized resource allocation, fostering more streamlined and proficient development processes for large-scale applications. The optimization of resources and risk reduction advocated by the model align with sustainable software development

principles, fostering efficiency gains and waste reduction, thus contributing to sustainable development practices within the software industry.

Dong et al. (Contribution 7) examined how the organizational information security climate impacts information security policy compliance (ISPC) among healthcare nurses, mainly focusing on the mediating role of social bonding. This underscores the crucial role of social bonding and the organizational climate in shaping employees' adherence to IS security policies, particularly within healthcare settings. The study strives to enhance ISPC among nurses by leveraging organizational information security (OCIS) factors and social bonding as mediators, thereby tackling the behavioral challenges regarding information security faced by healthcare organizations. Regarding sustainable practices, the study emphasizes the significance of bolstering information security practices to safeguard sensitive patient data and fortify organizational security measures.

Alghazzawi et al. (Contribution 8) proposed a platform-independent mobile learning tool for use in Saudi universities, specifically emphasizing m-learning and its implications for higher education. Additionally, the article underscores the significance of sustainability within education and using technology to enrich learning environments. The study highlights the pivotal role of technology in granting access to diverse fields of research and developing m-learning platforms tailored to support a wide array of courses.

Ghaleb et al. (Contribution 9) highlighted the adoption of big data technology in the healthcare sector, particularly concerning sustainability, including the importance of financial support, data skills, data resources, and technical capacity for successful adoption. Another critical aspect is the positive effect of government IT policies on big data readiness in the healthcare sector, emphasizing the role of regulatory and competitive environmental support in driving innovation uptake. Additionally, the impact of existing laws and regulations and government support on adopting new technologies like big data in healthcare is crucial for encouraging or discouraging businesses from adopting big data.

Khan et al. (Contribution 10) conducted a systematic literature review on the challenges facing public cloud computing (PCC) clients. The review also helps to explain the challenges clients face in adopting sustainable public cloud computing, which is essential for developing organizational capabilities in the context of PCC. By analyzing the critical challenges identified in the literature review, the study lays the foundation for creating a public cloud client adoption model that assesses client organization capabilities and provides potential solutions to the highlighted challenges, such as lack of security, privacy, and data loss.

The study conducted by Abied et al. (Contribution 11) highlights the importance of exploring key factors for cloud adoption in e-government, such as data storage, internet connectivity, cost, and integration. It also emphasizes the significance of perceived rewards, organizational risk culture, and observed risks in the UK government. Cloud services provide advantages like enhanced efficiency, cost reduction, and increased mobility, which are pivotal in promoting sustainability. The factors that impact the adoption of cloud computing across different sectors, including e-government, are essential considerations for decision-makers aiming to incorporate sustainable practices.

Wang et al. (Contribution 12) proposed a multimedia platform that contributes to sustainable information systems by providing a user-friendly interface for accessing cultural heritage information, which increases awareness and preservation efforts. Additionally, the platform allows users to upload their experiences to enrich the database, enhancing the overall content and user engagement. Furthermore, the platform can be extended to include new media such as VR models and augmented reality, making it more interactive and engaging for users, thus contributing to sustainable information systems.

Alghamdi et al. (Contribution 13) explored how social media analysis enhances sustainable knowledge management practices. Organizations can derive valuable insights, make real-time decisions, foster collaboration, and spur innovation through techniques such as natural language processing and sentiment analysis. The study highlights the positive influence of social network analysis on sustainable knowledge sharing, creativ-

ity, productivity, and knowledge creation. Moreover, it identifies challenges integrating social media analysis into sustainable knowledge management, such as data overload, standardization issues, privacy concerns, and costs. The article emphasizes the significance of leveraging social media analysis to enhance knowledge management practices and facilitate sustainable decision-making within organizations.

Gan et al. (Contribution 14) explored integrating intelligent technology and sustainable development principles in English teaching to achieve sustainable economic, social, and environmental development. The proposed framework focuses on intelligent recommendation algorithms based on students' learning history information and using an autoencoder to enhance teaching efficiency and ensure the sustainable development of English teaching. By incorporating innovative technology in English education, the study emphasizes the importance of personalized education support, resource optimization, increased student participation, improved education quality, and adaptation to future needs for sustainable information development.

3. Conclusions

The investigation into Sustainable Information Systems (SIS) featured in the Special Issue "Sustainable Information Systems" of the MDPI *Sustainability* journal has shed light on a journey toward a future where technology and sustainability can both thrive. Over fourteen enlightening articles published between 2020 and 2023, a range of viewpoints and approaches have been showcased, showcasing the intricate complexity of sustainable IS. The reviewed studies delve into various aspects of SIS, from evaluations of e-learning platform quality to examinations of how organizational information security climate impacts healthcare data protection. This breadth of research demonstrates the extensive reach of SIS principles.

Furthermore, the articles emphasize practical strategies for integrating sustainability into the design and operation of information systems. Examples include resource optimization in software development, leveraging big data for improved healthcare outcomes, and enhancing knowledge management through social media analysis. This focus on actionable strategies underscores the pragmatic application of SIS principles.

In conclusion, the contributions highlight the critical transition from perceiving Sustainable Information Systems (SIS) solely as a theoretical concept to recognizing them as a practical solution for contemporary challenges. Embracing SIS principles enables organizations to reduce their environmental impact and stimulate innovation, improve operational efficiency, and foster greater societal inclusivity.

Looking ahead, the findings from this research serve as a valuable guide for future endeavors in the field of SIS. The continuous exploration and application of SIS principles are imperative for constructing a digital environment that meets present demands while safeguarding the welfare of future generations. Essentially, SIS provide a transformative framework for leveraging technology to build a sustainable and fair world.

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List of Contributions:

1. Muhammad, A.H.; Siddique, A.; Youssef, A.E.; Saleem, K.; Shahzad, B.; Akram, A.; Al-Thnain, A.-B.S. A Hierarchical Model to Evaluate the Quality of Web-Based E-Learning Systems. *Sustainability* **2020**, *12*, 4071. <https://doi.org/10.3390/su12104071>.
2. AlSukhayri, A.M.; Aslam, M.A.; Saeedi, K.; Malik, M.S.A. A Linked Open Data-Oriented Sustainable System for Transparency and Open Access to Government Data: A Case Study of the Public's Response to Women's Driving in Saudi Arabia. *Sustainability* **2020**, *12*, 8608. <https://doi.org/10.3390/su12208608>.
3. Ganesan, M.; Kor, A.-L.; Pattinson, C.; Rondeau, E. Green Cloud Software Engineering for Big Data Processing. *Sustainability* **2020**, *12*, 9255. <https://doi.org/10.3390/su12219255>.
4. Dolmark, T.; Sohaib, O.; Beydoun, G.; Wu, K. The Effect of Individual's Technological Belief and Usage on Their Absorptive Capacity towards Their Learning Behaviour in Learning Environment. *Sustainability* **2021**, *13*, 718. <https://doi.org/10.3390/su13020718>.
5. Muhammad, A.; Siddique, A.; Naveed, Q.N.; Khaliq, U.; Aseere, A.M.; Hasan, M.A.; Qureshi, M.R.N.; Shahzad, B. Evaluating Usability of Academic Websites through a Fuzzy Analytical Hierarchical Process. *Sustainability* **2021**, *13*, 2040. <https://doi.org/10.3390/su13042040>.
6. Shahzad, B.; Fazal-e-Amin; Abro, A.; Imran, M.; Shoaib, M. Resource Optimization-Based Software Risk Reduction Model for Large-Scale Application Development. *Sustainability* **2021**, *13*, 2602. <https://doi.org/10.3390/su13052602>.
7. Dong, K.; Ali, R.F.; Dominic, P.D.D.; Ali, S.E.A. The Effect of Organizational Information Security Climate on Information Security Policy Compliance: The Mediating Effect of Social Bonding towards Healthcare Nurses. *Sustainability* **2021**, *13*, 2800. <https://doi.org/10.3390/su13052800>.
8. Alghazzawi, D.M.; Hasan, S.H.; Aldabbagh, G.; Alhaddad, M.; Malibari, A.; Asghar, M.Z.; Aljuaid, H. Development of Platform Independent Mobile Learning Tool in Saudi Universities. *Sustainability* **2021**, *13*, 5691. <https://doi.org/10.3390/su13105691>.
9. Ghaleb, E.A.A.; Dominic, P.D.D.; Fati, S.M.; Muneer, A.; Ali, R.F. The Assessment of Big Data Adoption Readiness with a Technology–Organization–Environment Framework: A Perspective towards Healthcare Employees. *Sustainability* **2021**, *13*, 8379. <https://doi.org/10.3390/su13158379>.
10. Khan, M.J.; Ullah, F.; Imran, M.; Khan, J.; Khan, A.; AlGhamdi, A.S.; Alshamrani, S.S. Identifying Challenges for Clients in Adopting Sustainable Public Cloud Computing. *Sustainability* **2022**, *14*, 9809. <https://doi.org/10.3390/su14169809>.
11. Abied, O.; Ibrahim, O.; Kamal, S.N.-I.M.; Alfadli, I.M.; Binjumah, W.M.; Ithnin, N.; Nasser, M. Probing Determinants Affecting Intention to Adopt Cloud Technology in E-Government Systems. *Sustainability* **2022**, *14*, 15590. <https://doi.org/10.3390/su142315590>.
12. Wang, B.; Dai, L.; Liao, B. System Architecture Design of a Multimedia Platform to Increase Awareness of Cultural Heritage: A Case Study of Sustainable Cultural Heritage. *Sustainability* **2023**, *15*, 2504. <https://doi.org/10.3390/su15032504>.
13. Alghamdi, A.M.; Pileggi, S.F.; Sohaib, O. Social Media Analysis to Enhance Sustainable Knowledge Management: A Concise Literature Review. *Sustainability* **2023**, *15*, 9957. <https://doi.org/10.3390/su15139957>.
14. Gan, S.; Yang, X.; Alatas, B. A Multi-Module Information-Optimized Approach to English Language Teaching and Development in the Context of Smart Sustainability. *Sustainability* **2023**, *15*, 14977. <https://doi.org/10.3390/su152014977>.

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