Blockchain Technology for Green Innovation

Subjects: Business, Finance

Contributor: Mohammad Rashed Hasan Polas , Ahmed Imran Kabir , , Ridoan Karim , Mosab I. Tabash

Blockchain technology has been heralded as a game changer for addressing severe environmental and economic sustainability challenges. In response to rising environmental concerns, blockchain technology (BCT) is transforming green innovation, culminating in green economic practices and well-established business models.

blockchain technology green entrepreneurship green innovation green economy sustainability

1. Introduction

Technological advancements have made significant contributions to the development of the economy and the advancement of humanity, such as through blockchain open innovation. Because it is altering how economic transactions are carried out, blockchain open innovation is one of the technological developments that has a lot of promise for this progress [1][2]. Blockchain open innovation is already taking place all around the world; it's just an issue of scale or viewpoint [1][3]. Companies are now broadening its reach, especially through digital tools, into a universal strategy that is spreading in all directions, after keeping it purely for their local partners for so long. Individuals and small businesses are now being targeted by businesses, and users and customers are becoming "cocreators" and are actively involved. Because blockchain open innovation has constraints, it needs to recreate itself on the basis of renewed trust and ideals that prioritize ethics [1][2]. Recognizing that BT is unmistakably occurring everywhere, it's fascinating to observe how blockchain open innovation may interact with blockchain technology, and one of the most intriguing things for researchers is its ability to revolutionize innovation processes [3]. Using BT can help researchers get closer to a fundamental rethink of how researchers conduct business and compete [3], which is one of the primary aims of blockchain open innovation.

Green entrepreneurship is a fundamental driver of the green economy. Rapid economic growth that uses green innovation has resulted in a significant increase in the consequences of environmental concerns in Peru [1][2][4]. As a result, eco-innovation has become a critical component in leveraging ecologically favorable opportunities and ecosystems to offset natural resource depletion [3][5]. Consequently, green innovation is recognized as the primary source of industry advancement, taking a variety of environmental considerations into account. Businesses are seriously considering making green innovation methods mandatory due to increased external demand from consumers (eco-friendly products), the environment (pollution, groundwater quality), the community (health dangers), and the government (governance of revenue). As a result, resource scarcity, expanding human wants

and preferences, community pressure, and government regulations push firms to achieve a balance between long-term development and corporate expansion [2][3].

The notion of green entrepreneurship is growing in response to the need for sustainable development [3][6]. The green economy, on the other hand, is viewed as a means of achieving long-term prosperity and a higher standard of living. A green economy can help with environmental challenges, resource use, and the wellbeing of people at the bottom of the economic pyramid [5][7]. Numerous studies have shown that transitioning to a green economy has far-reaching economic and societal consequences [4][7][8]. With this level of logic, the “go green” message has been resonating all over the world. Green entrepreneurship is also seen as one of the most essential tools used in the transition to a green economy. As a result of the struggle for sustainability, an entrepreneurial attitude based on an intrinsic talent for managing organizations has emerged. Entrepreneurship’s significance in creating a wealthier and more environmentally sustainable society is only now being recognized [7][9].

Blockchain technology is drawing the interest of a diverse variety of businesses, including energy firms, startups, technology developers, and financial institutions, as well as governments and academic institutions globally, as an emerging technology [5][8]. Several industry executives feel that blockchain technology has the potential to deliver significant benefits and innovation. Blockchain technology, for example, was inspired by decentralized digital currency [3][6]. Decentralization and its reliability in distributed systems, as well as its secure data storage technique and zero exchange transaction costs, are just a few of blockchain technology’s noteworthy characteristics. A blockchain is essentially a distributed ledger network in which nodes communicate with one another to directly trade data and transactions. A blockchain’s key characteristics are decentralization and immutability [1][10][11][12].

Blockchain technology has the potential to improve the energy economy’s processes, markets, and users, making it more environmentally friendly as a result. Green energy can help to lessen the greenhouse effect and carbon dioxide (CO2) emissions created by current usage [13][14]. Businesses such as banks, manufacturers, small- and medium-sized firms, and agricultural product manufacturers are already using blockchains to boost green innovation that necessitates automation and remote sensors. Blockchain technology, by establishing a secure and private mesh network, has provided Peruvian green innovation with a new framework that reduces the risks associated with central server architecture. Blockchain technology enables a safe and low-power architecture for remotely monitoring physical activity without the use of traditional centralized cloud servers. This results in a more ecologically friendly IoT ecosystem, also known as green innovation. Blockchain technology is increasingly being employed in green innovation [14][15].

Most importantly, the emphasis on comprehending environmentalism and sustainability strategic initiatives has proven that a green orientation can help firms’ principal concerns and world natural resources. While green entrepreneurship is still seen as an appropriate development strategy, the literature reveals that it is underutilized [16]. A transformation in the public’s perspective and attitude toward green activities, particularly in the workplace, is required for the green economy and sustainable development to take root and take hold [17].

Promoting green innovation is a tough endeavor due to the specific characteristics associated with standardized discoveries [3][18] in SMEs. To break free from the limited sandbox of standards, SMEs must go outside their typical industrial knowledge base for new sources of expertise, both within and externally. Firms, particularly small- and medium-sized enterprises (SMEs), cannot create knowledge solely through their own resources (research and development (R&D)). As a consequence, they communicate and collaborate with rivals and external partners, using each other's expertise, experience, and assets, as outlined by the notion of open innovation using blockchain technology [5][19]. In the case of environmental-related green technologies, where internal and external information borders are becoming permeable, firms are increasingly relying on open green innovation methodologies [6][20] using blockchain technology. A crucial policy concern for addressing environmental challenges is the extent to which green ideas may be improved through blockchain technology. Government authorities must intervene in this area to eliminate the impediments that inhibit the green effect of inventive openness. Such impediments can result in a pattern of failure in innovation [20], which can be avoided by adopting green innovation behavior when working with external partners to extend their knowledge base (and R&D) on green innovation and blockchain technology [6][10][19].

2. Blockchain and Open Innovation

When discussing blockchain and open innovation, the term "coopetition" comes to mind. Indeed, with the new data science, classification algorithms, and artificial intelligence methods, it is clear that for rivals to take advantage of a market, they must pool their data [4][7][9]. To facilitate such sharing, a new type of governance based on the notion of a common data repository is required. Full blockchain open innovation isn't suited for all use cases, isn't straightforward to implement, and won't be achievable if the network has significant competitive pressures [7][11]. However, researchers believe that the most transformative value can be generated when blockchain open innovation, BT, and other intelligent open-source technologies are combined. Transparency and privacy in the service connection between humans and technology are at the heart of the dynamic of individuals and organizations being trust-free in blockchain business services. Because it permanently stores transaction history at every node of the blockchain, BT allows anyone to see the records of each transaction they conduct [6][8][12][21]. Furthermore, because blockchain transactions are recorded using public and private keys (i.e., lengthy strings of characters that no one can read), persons can opt to remain anonymous in order to safeguard their privacy while allowing other parties to authenticate their identity [6][10][22].

3. Sustainability Orientation

There are many various approaches to sustainability today, such as maintaining yield to keep up with increased demand, preserving a desirable way of life for the future, and promoting ecological balance [9][23][24][25]. All of the preceding ideas on sustainability are part of a broader perspective on sustainability that encourages partnering with the environment so that future generations are not deprived [11][26][27]. This approach is also stated to aid in the operationalization of sustainability by capturing the conditions of economic, environmental, and social components

[9][28]. Persons who are more worried about the environment are more inclined to participate in sustainability exercises [12][21][29][30].

It has been discovered that those who consider supporting sustainability while conceiving the activities have a strong appreciation for the movement [11][12][22][31]. A business strategy that integrates environmental and cultural issues is referred to as "sustainable orientation" [25]. An examination of the notion of sustainability orientation reveals that it was created with the sole purpose of supporting sustainable enterprise [21][29][32]. Numerous studies reveal that there is a positive and significant relationship between sustainability orientation and the adoption of green innovation [12][25][29]. Kuckertz and Wagner [26] discovered the beneficial impacts of a sustainability orientation focused on green innovation adoption in a study. Entrepreneurship is also said to have a keen and persuasive influence on sustainability orientation [22][30][31][33].

4. Sustainability Attitude

Attitude is described as "the extent to which a person has a negative or foreboding perception or appraisal of the behaviour under consideration" [22][33][34]. People might have either a positive or negative attitude toward a given object, which influences their motivation to adopt green innovation. Furthermore, numerous studies have found that a person's attitude is a big and powerful motivator of their entrepreneurial urge that affects their intention to adopt green innovation [27][32][35]. According to Tih and Zainol [36][37], attitude is also a significant factor in influencing pro-environmental intention and sustainability commitment [35][38]. People's propensity to engage in specific behaviors is influenced in part by their own mental attitude. Furthermore, their way of thinking has a huge impact on green entrepreneurial ambitions that impacts the adoption of green innovation [39][40][41]. Numerous entrepreneurship studies have found that attitude influences the adoption of green innovation [37][40][42].

According to studies such as [43] and [42], researchers discovered that one's attitude influences one's pro-environmental behavioral intention that leads to green innovation. According to [44], an individual's positive or negative attitude may influence their motivation to execute sustainable actions that lead to green economic sustainability. Ahmad et al. [45] discovered that people's environmental behavior was influenced by their attitude.

5. Social Perception

Individual and group activities are influenced by social perception, which is an external factor. The sense of societal pressure that a person has impacts whether or not they will act [46]. Given that people are more concerned with how their social actions are seen by the general public, researchers investigated the impact of social perception on personal conduct and entrepreneurs' intentions to adopt green innovation that employs green energy technology and leads to green economic sustainability [47][48][49]. In general, social perception is one of the external factors that influences whether or not other people or groups accept or reject an individual's actions or statements that drives them to adopt green innovation that uses green entrepreneurship practices [31][34][41]. Social perceptions are also defined as a person's perception of social pressure to behave, whether positive or negative [27][41].

A growing number of studies claim that people's drive to become more entrepreneurial stems from their self perception in society, which increases their intention to adopt green innovation and causes their green entrepreneurship practices to lead them to adopt green innovation that employs green energy technology. People's decisions to engage in such acts are influenced more heavily by public opinion [41][49]. Today's rural people are more concerned with technological advancement, which gives them the courage to reject the notion that they are on the bottom rung of civilization [34][49][50]. No matter where they live on the planet, everyone has the same opportunities. Some of these people are well ahead of where they would be in the nineteenth century in terms of scientific progress, which was not even a consideration for both men and women. People can have positive emotions in response to the stressors they see in society [48][50]. Rural people's social perceptions of society are becoming more positive and grateful, which affects their adoption of green innovation intentions that use green entrepreneurship practices [31]. As a result, because of social perception, persons in developing countries are more likely to start green innovation adoption where they may use green energy technology that reduces CO2 and leads to green economic sustainability.

6. The Importance of Blockchain Technology in Green Innovation That Employs Green Energy

Renewable energy sources have lately emerged as a crucial consideration for blockchain technology adoption due to their lower environmental impact compared to fossil fuels. Wind, geothermal heat, sunlight, and rain are all renewable energy sources that can be used to generate electricity [18][19][47][51][52][53][54]. Clean, renewable energy is produced as a result of the use of these resources. Due to improvements in renewable energy technologies, people can now generate their own electricity without relying on expensive fossil fuels [34]. This is where the smart grid comes in, allowing us to make use of all of the free and abundant green energy sources surrounding us. The smart grid, which is a modernized electrical system, makes use of information technology and analogue or digital communications [20][41][55][56][57][58][59].

Furthermore, the difficulties of security, interoperability, and data transfer are critical to smart grids. The fluctuating and unpredictable character of renewable energy sources necessitates the incorporation of complex technology into the current network [38][60][61]. A blockchain-based smart-grid design is used to incentivize the use of renewable resources and construct a better environment. The proposed paradigm is based on the inverted application of the recently introduced forking attack to the blockchain. In the energy grid concept, stakeholders are represented by a central authority and distributed peers. This technology is promising and could be used to improve ethical smart grid systems in order to build a greener planet [62][63][64].

The application of green certificates in an industrial operating system may be achieved using blockchain technology. The possibility of peer to peer energy exchanges using a microgrid design and blockchain [65] was investigated. It is believed that a blockchain-based system could be used to accurately assess and monitor the environmental impact of energy-related assets [65][66]. It is possible to go greener as a result of blockchain's potential to improve the energy supply chain. Blockchain technology has enabled energy-sharing economy applications, leading to various authors advocating new market models and the democratization of energy supplies

[67][68][69]. Blockchains, when combined with smart contracts, promise transparent, tamper-proof, and secure platforms capable of delivering creative, environmentally responsible business solutions [70][71].

References

1. Frizzo-Barker, J.; Chow-White, P.A.; Adams, P.R.; Mentanko, J.; Ha, D.; Green, S. Blockchain as a disruptive technology for business: A systematic review. Int. J. Inf. Manag. 2020, 51, 102029.
2. Li, D. Green technology innovation path based on blockchain algorithm. Sustain. Comput. Inform. Syst. 2021, 31, 100587.
3. Jiang, Y.; Zheng, W. Coupling mechanism of green building industry innovation ecosystem based on blockchain smart city. J. Clean. Prod. 2021, 307, 126766.
4. Gao, Y.; Lin, R.; Lu, Y.A. Visualized analysis of the research current hotspots and trends on innovation chain based on the knowledge map. Sustainability 2022, 14, 1708.
5. Hou, R.; Li, S.; Chen, H.; Ren, G.; Gao, W.; Liu, L. Coupling mechanism and development prospect of innovative ecosystem of clean energy in smart agriculture based on blockchain. J. Clean. Prod. 2021, 319, 128466.
6. Khan, S.A.R.; Godil, D.I.; Jabbour, C.J.C.; Shujaat, S.; Razzaq, A.; Yu, Z. Green data analytics, blockchain technology for sustainable development, and sustainable supply chain practices: Evidence from small and medium enterprises. Ann. Oper. Res. 2021, 1–25.
7. Kouhizadeh, M.; Sarkis, J. Blockchain practices, potentials, and perspectives in greening supply chains. Sustainability 2018, 10, 3652.
8. Dong, F.; Zhu, J.; Li, Y.; Chen, Y.; Gao, Y.; Hu, M.; Sun, J. How green technology innovation affects carbon emission efficiency: Evidence from developed countries proposing carbon neutrality targets. Environ. Sci. Pollut. Res. 2022, 1–20.
9. Malhotra, D. Trust and reciprocity decisions: The differing perspectives of trustors and trusted parties. Organ. Behav. Hum. Decis. Processes 2004, 94, 61–73.
10. Schulz, K.; Feist, M. Leveraging blockchain technology for innovative climate finance under the Green Climate Fund. Earth Syst. Gov. 2021, 7, 100084.
11. Aboelmaged, M.; Hashem, G. Absorptive capacity and green innovation adoption in SMEs: The mediating effects of sustainable organisational capabilities. J. Clean. Prod. 2019, 220, 853–863.
12. Turoń, K. Open innovation business model as an opportunity to enhance the development of sustainable shared mobility industry. J. Open Innov. Technol. Mark. Complex. 2022, 8, 37.

13. Gausdal, A.H.; Czachorowski, K.V.; Solesvik, M.Z. Applying blockchain technology: Evidence from Norwegian companies. Sustainability 2018, 10, 1985.
14. Gajdzik, B.; Wolniak, R. Influence of industry 4.0 projects on business operations: Literature and empirical pilot studies based on case studies in Poland. J. Open Innov. Technol. Mark. Complex. 2022, 8, 44.
15. Weinreich, S.; Şahin, T.; Inkermann, D.; Huth, T.; Vietor, T. Managing Disruptive Innovation by Value-Oriented Portfolio Planning. In Proceedings of the Design Society: DESIGN Conference, Online, 26–29 October 2020; Cambridge University Press: Cambridge, UK, 2020; Volume 1, pp. 1395–1404.
16. Hernández-Dionis, P.; Pérez-Jorge, D.; Curbelo-González, O.; Alegre de la Rosa, O.M. The coordinator of information and communication technologies: Its implication for open innovation. J. Open Innov. Technol. Mark. Complex. 2022, 8, 42.
17. Hawaldar, I.T.; Ullal, M.S.; Sarea, A.; Mathukutti, R.T.; Joseph, N. The study on digital marketing influences on sales for B2B start-ups in South Asia. J. Open Innov. Technol. Mark. Complex. 2022, 8, 23.
18. Afshar Jahanshahi, A.; Brem, A. Entrepreneurs in post-sanctions Iran: Innovation or imitation under conditions of perceived environmental uncertainty? Asia Pac. J. Manag. 2020, 37, 531–551.
19. Afshar Jahanshahi, A.; Jia, J. Purchasing green products as a means of expressing consumers' uniqueness: Empirical evidence from Peru and Bangladesh. Sustainability 2018, 10, 4062.
20. Jahanshahi, A.A.; Khaksar, S.M.S.; Yaghoobi, N.M.; Nawaser, K. Comprehensive model of mobile government in Iran. Indian J. Sci. Technol. 2011, 4, 1188–1197.
21. Nurgazina, J.; Pakdeetrakulwong, U.; Moser, T.; Reiner, G. Distributed ledger technology applications in food supply chains: A review of challenges and future research directions. Sustainability 2021, 13, 4206.
22. Millers, M.; Gaile-Sarkane, E. Management practice in small and medium-sized enterprises: Problems and solutions from the perspective of open innovation. J. Open Innov. Technol. Mark. Complex. 2021, 7, 214.
23. Poberezhna, A. Addressing water sustainability with blockchain technology and green finance. In Transforming Climate Finance and Green Investment with Blockchains; Academic Press: Cambridge, MA, USA, 2018; pp. 189–196.
24. Nikolakis, W.; John, L.; Krishnan, H. How blockchain can shape sustainable global value chains: An evidence, verifiability, and enforceability (EVE) framework. Sustainability. 2018, 10, 3926.

25. Gilani, S.A.M.; Faccia, A. Broadband connectivity, government policies, and open innovation: The crucial IT infrastructure contribution in Scotland. JOItmC 2021, 8, 1.
26. Fatoki, O. Environmental orientation and green competitive advantage of hospitality firms in South Africa: Mediating effect of green innovation. J. Open Innov. Technol. Mark. Complex. 2021, 7, 223.
27. Chang, R.D.; Zuo, J.; Zhao, Z.Y.; Soebarto, V.; Lu, Y.; Zillante, G.; Gan, X.L. Sustainability attitude and performance of construction enterprises: A China study. J. Clean. Prod. 2018, 172, 1440–1451.
28. Polas, M.R.H.; Raju, V. Technology and entrepreneurial marketing decisions during COVID-19. Glob. J. Flex. Syst. Manag. 2021, 22, 95–112.
29. Cheng, C.C. Sustainability orientation, green supplier involvement, and green innovation performance: Evidence from diversifying green entrants. J. Bus. Ethics 2020, 161, 393–414.
30. Marchena Sekli, G.F.; De La Vega, I. Adoption of big data Analytics and its impact on organizational performance in higher education mediated by knowledge management. J. Open Innov. Technol. Mark. Complex. 2021, 7, 221.
31. Jiang, Z.; Lyu, P.; Ye, L.; Wenqian Zhou, Y. Green innovation transformation, economic sustainability and energy consumption during China's new normal stage. J. Clean. Prod. 2020, 273, 123044.
32. Wang, C.H. An environmental perspective extends market orientation: Green innovation sustainability. Bus. Strategy Environ. 2020, 29, 3123–3134.
33. Afshar Jahanshahi, A.; Al-Gamrh, B.; Gharleghi, B. Sustainable development in Iran post-sanction: Embracing green innovation by small and medium-sized enterprises. Sustain. Dev. 2020, 28, 781–790.
34. Huong, P.T.; Cherian, J.; Hien, N.T.; Sial, M.S.; Samad, S.; Tuan, B.A. Environmental management, green innovation, and social–open innovation. J. Open Innov. Technol. Mark. Complex. 2021, 7, 89.
35. Sánchez-Bravo, P.; Chambers, E.; Noguera-Artiaga, L.; López-Lluch, D.; Chambers, E., IV; Carbonell-Barrachina, Á.A.; Sendra, E. Consumers' attitude towards the sustainability of different food categories. Foods 2020, 9, 1608.
36. Zhang, B.; Zhang, Y.; Zhou, P. Consumer attitude towards sustainability of fast fashion products in the UK. Sustainability 2021, 13, 1646.
37. Adomako, S.; Amankwah-Amoah, J. Managerial attitude towards the natural environment and environmental sustainability expenditure. J. Clean. Prod. 2021, 326, 129384.
38. Tonglet, M.; Phillips, P.S.; Read, A.D. Using the theory of planned behaviour to investigate the determinants of recycling behaviour: A case study from Brixworth, UK. Resour. Conserv. Recycl.

2004, 41, 191–214.

39. Kim, M.J.; Hall, C.M. Do value-attitude-behavior and personality affect sustainability crowdfunding initiatives? J. Environ. Manag. 2021, 280, 111827.
40. Polenzani, B.; Riganelli, C.; Marchini, A. Sustainability perception of local extra virgin olive oil and consumers' attitude: A new Italian perspective. Sustainability 2020, 12, 920.
41. Arici, H.E.; Uysal, M. Leadership, green innovation, and green creativity: A systematic review. Serv. Ind. J. 2021, 42, 280–320.
42. Zailani, S.; Govindan, K.; Iranmanesh, M.; Shaharudin, M.R.; Chong, Y.S. Green innovation adoption in automotive supply chain: The Malaysian case. J. Clean. Prod. 2015, 108, 1115–1122.
43. Huang, S.Y.; Li, M.W.; Lee, Y.S. Why do medium-sized technology farms adopt environmental innovation? The mediating role of pro-environmental behaviors. Horticulturae 2021, 7, 318.
44. Kuckertz, A.; Wagner, M. The influence of sustainability orientation on entrepreneurial intentions—Investigating the role of business experience. J. Bus. Ventur. 2010, 25, 524–539.
45. Tjahjadi, B.; Soewarno, N.; Hariyati, H.; Nafidah, L.N.; Kustiningsih, N.; Nadyaningrum, V. The role of green innovation between green market orientation and business performance: Its implication for open innovation. J. Open Innov. Technol. Mark. Complex. 2020, 6, 173.
46. Abdullah, M.; Zailani, S.; Iranmanesh, M.; Jayaraman, K. Barriers to green innovation initiatives among manufacturers: The Malaysian case. Rev. Manag. Sci. 2016, 10, 683–709.
47. Flores, P.J.; Jansson, J. The role of consumer innovativeness and green perceptions on green innovation use: The case of shared e-bikes and e-scooters. J. Consum. Behav. 2021, 20, 1466–1479.
48. Pan, Z.; Liu, L.; Bai, S.; Ma, Q. Can the social trust promote corporate green innovation? Evidence from China. Environ. Sci. Pollut. Res. 2021, 28, 52157–52173.
49. Tölkes, C. The role of sustainability communication in the attitude–behaviour gap of sustainable tourism. Tour. Hosp. Res. 2020, 20, 117–128.
50. Tih, S.; Zainol, Z. Minimizing waste and encouraging green practices. J. Ekon. Malays. 2012, 46, 157–164.
51. Guo, Y.; Wang, L.; Chen, Y. Green entrepreneurial orientation and green innovation: The mediating effect of supply chain learning. SAGE Open 2020, 10, 2158244019898798.
52. Weng, H.H.R.; Chen, J.S.; Chen, P.C. Effects of green innovation on environmental and corporate performance: A stakeholder perspective. Sustainability 2015, 7, 4997–5026.
53. Yousaf, Z. Go for green: Green innovation through green dynamic capabilities: Accessing the mediating role of green practices and green value co-creation. Environ. Sci. Pollut. Res. 2021, 28,

54863–54875.

54. Guo, Y.; Wang, L.; Yang, Q. Do corporate environmental ethics influence firms' green practice? The mediating role of green innovation and the moderating role of personalities. J. Clean. Prod. 2020, 266, 122054.
55. Qiu, L.; Hu, D.; Wang, Y. How do firms achieve sustainability through green innovation under external pressures of environmental regulation and market turbulence? Bus. Strategy Environ. 2020, 29, 2695–2714.
56. Wang, X.; Zhao, Y.; Hou, L. How does green innovation affect supplier-customer relationships? A study on customer and relationship contingencies. Ind. Mark. Manag. 2020, 90, 170–180.
57. Zhang, H.; He, J.; Shi, X.; Hong, Q.; Bao, J.; Xue, S. Technology characteristics, stakeholder pressure, social influence, and green innovation: Empirical evidence from Chinese express companies. Sustainability 2020, 12, 2891.
58. Sharma, P.K.; Kumar, N.; Park, J.H. Blockchain technology toward green IoT: Opportunities and challenges. IEEE Netw. 2020, 34, 263–269.
59. Thukral, M.K. Emergence of blockchain-technology application in peer-to-peer electrical-energy trading: A review. Clean Energy 2021, 5, 104–123.
60. El-Kassar, A.N.; Singh, S.K. Green innovation and organizational performance: The influence of big data and the moderating role of management commitment and HR practices. Technol. Forecast. Soc. Change 2019, 144, 483–498.
61. Feng, H.; Wang, X.; Duan, Y.; Zhang, J.; Zhang, X. Applying blockchain technology to improve agri-food traceability: A review of development methods, benefits and challenges. J. Clean. Prod. 2020, 260, 121031.
62. Alshurideh, M.; Kurdi, B.A.; Shaltoni, A.M.; Ghuff, S.S. Determinants of pro-environmental behaviour in the context of emerging economies. Int. J. Sustain. Soc. 2019, 11, 257–277.
63. Ru, X.; Wang, S.; Chen, Q.; Yan, S. Exploring the interaction effects of norms and attitudes on green travel intention: An empirical study in eastern China. J. Clean. Prod. 2018, 197, 1317–1327.
64. Alsharari, N. Integrating blockchain technology with internet of things to efficiency. Int. J. Technol. Innov. Manag. 2021, 1, 1–13.
65. Ahmad, A.; Madi, Y.; Abuhashesh, M.; Nusairat, M.N.; Masa'deh, R.E. The knowledge, attitude, and practice of the adoption of green fashion innovation. J. Open Innov. Technol. Mark. Complex. 2020, 6, 107.
66. Adolphs, R.; Nummenmaa, L.; Todorov, A.; Haxby, J.V. Data-driven approaches in the investigation of social perception. Philos. Trans. R. Soc. B Biol. Sci. 2016, 371, 20150367.

67. Li, R.; Crowe, J.; Leifer, D.; Zou, L.; Schoof, J. Beyond big data: Social media challenges and opportunities for understanding social perception of energy. Energy Res. Soc. Sci. 2019, 56, 101217.
68. Montero, O.P.; Batista, C.M. Social perception of coastal risk in the face of hurricanes in the southeastern region of Cuba. Ocean Coast. Manag. 2020, 184, 105010.
69. Singh, H.; Jain, G.; Munjal, A.; Rakesh, S. Blockchain technology in corporate governance: Disrupting chain reaction or not? Corp. Gov. Int. J. Bus. Soc. 2019, 20, 67–86.
70. Anggadwita, G.; Dhewanto, W. The influence of personal attitude and social perception on women entrepreneurial intentions in micro and small enterprises in Indonesia. Int. J. Entrep. Small Bus. 2016, 27, 131–148.
71. Ye, C.; Hofacker, C.F.; Peloza, J.; Allen, A. How online trust evolves over time: The role of social perception. Psychol. Mark. 2020, 37, 1539–1553.