

An analysis of how Internet Empowers Energy Conservation and Emission Reduction (ECER)

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Abstract. This article comprehensively explores the multiple impacts and application pathways of digital technology, particularly internet technology, in the domains of environment, energy, and enterprise development. On one hand, technologies such as 5G, the Internet of Things (IoT), artificial intelligence (AI), and machine learning (ML) are fundamentally transforming the domains of households, healthcare, business, and urban management. These technologies optimize electricity grids and enterprise energy management through big data and machine learning, reducing waste and enhancing supply chain transparency. For instance, the application of blockchain technology in energy trading could lead to the formation of decentralized energy markets. However, these technological advancements also bring a range of challenges and risks. The development of the internet may stimulate companies to expand their production scale, thereby increasing energy demand and environmental pollution. Particularly in China, despite having a clear advantage in hardware production, challenges remain in terms of original technological research and development, innovation, and intellectual property protection. New business models and transaction methods also bring complexity to environmental and energy conservation regulation. Excessive short-term funds may result in industry overexpansion, resource wastage, and even financial risks. The article ultimately emphasizes the need for a comprehensive application of various technologies and strategies to address these challenges and risks. This article provides a comprehensive exploration of the multiple impacts and application pathways of digital technology, particularly internet technology, in the domains of environment, energy, and enterprise development. It highlights the positive role of the internet in promoting green and sustainable development, including its key roles in information dissemination, IoT applications, and intelligent supply chain management. The article also discusses the importance of policies and regulations in guiding the internet towards green and low-carbon development. Governments need to establish comprehensive and explicit green policies and ensure their implementation through financial incentives and legal sanctions. Third-party green certifications and social supervision are also important means to ensure the environmental performance of enterprises. In conclusion, the article proposes a multidimensional and multilevel framework, emphasizing the importance of the comprehensive application of various technologies and strategies to address the challenges and risks in the domains of environment and energy. It also highlights the crucial role of governments in creating an environment conducive to the sustainable development of the internet industry.

Keywords: Internet; Energy Conservation and Emission Reduction (ECER), Challenges; Paths.

1. Introduction

We have entered a digital and intelligent era fueled by Internet technology. The advent of 5G technology, with its low latency and high-speed transmission, has revolutionized the internet and created an ideal environment for the Internet of Things (IoT). Today, household devices, urban management, and traffic monitoring all benefit from this technology, greatly advancing the process of automation. From voice assistants to predictive analytics, these tools handle big data to optimize decision-making and improve efficiency [1]. For instance, artificial intelligence (AI) and machine learning (ML) play indispensable roles in healthcare and business domains. From data storage to real-time collaboration, cloud technology eliminates the need for physical hardware for individuals and companies. Enterprises can save on upfront investment and maintenance costs. Blockchain, initially seen as a supporting technology for cryptocurrencies, now plays a core role in multiple fields. Virtual

reality (VR) and augmented reality (AR) provide us with new immersive experiences, transforming our interaction with the digital world, whether in gaming, medical simulations, or education.

Many processes involved in global energy consumption suffer from unnecessary waste or inefficiency. Contemporary big data technology, AI, and ML provide us with tools to identify, analyze, and address these issues. For example, through real-time data analysis, the power grid can better allocate electricity supply, reducing energy waste during peak loads. ML algorithms can also predict energy consumption patterns, enabling energy production to align more closely with actual demand and improve overall efficiency. In the long run, this technology-driven innovation will significantly reduce global carbon footprints and help countries achieve climate goals. Additionally, in the context of globalization, supply chains are becoming increasingly complex. Non-transparent and inefficient supply chain management leads to significant resource waste. Digital technology can help businesses track the flow of raw materials and products in real-time, identify bottlenecks and waste within the supply chain, enabling more precise management. For example, through IoT technology, companies can monitor the storage and transportation status of products, avoiding unnecessary losses. This greatly enhances operational efficiency, reduces resource waste and environmental pollution, and enables greener production models.

With the rapid development of digital technology, the application of a single technology is no longer sufficient to solve complex modern problems. This article explores how to combine multiple technologies to form technological integration and better address challenges in the fields of environment and energy. For example, AI technology can help us better predict energy demand, optimize energy distribution, and reduce energy waste. Deep learning techniques, for instance, can forecast future electricity demand, providing a more stable power supply to the grid. IoT technology can provide real-time data for environmental monitoring. The vast amount of data collected by sensors can be used to accurately monitor pollutant emissions, ensuring that companies and factories adhere to environmental standards. At the same time, IoT technology can monitor and manage energy devices in real-time, ensuring their efficient operation. The application of blockchain in energy trading: With the development of renewable energy technologies such as solar and wind power, blockchain technology can provide a platform for individuals to become energy producers and consumers. Through blockchain technology, individuals can directly sell the energy they produce to those in need, forming a decentralized energy trading market.

2. Challenges of Internet Empowering ECER

2.1. The rapid development of the internet may stimulate companies to expand their production scale and product demand, resulting in increased energy requirements and environmental pollution emissions.

With the widespread adoption of the global internet and the accelerating pace of digital transformation, numerous enterprises have begun to recognize the immense market potential of the digital economy. Many companies have expanded their production scale to seize market opportunities and meet the ever-growing consumer demand. The driving force behind this expansion is the Internet's low-cost and efficient marketing and distribution channels. In order to support larger-scale production, the demand for raw materials by enterprises has also increased. Whether it is metals, plastics, or other finite resources, excessive extraction can lead to resource depletion, posing a threat to future production activities in this unsustainable production and consumption model [2]. Large-scale production often accompanies significant water consumption. In areas with water scarcity, excessive use and pollution of water resources can lead to long-term water crises, affecting local communities and the stability of ecosystems. With the expansion of production scale, the energy demand also increases. This increases reliance on non-renewable energy resources such as coal and oil, results in more carbon emissions, and exacerbates the greenhouse effect. While the development of the internet facilitates the production of green products and the dissemination of green concepts,

the expansion of the internet stimulates the production scale of enterprises, increases their energy demand, and generates more carbon emissions and pollution.

Thus, the prosperity of the real estate sector brought about by the digital economy also leads to increased demand in the metallurgical industry. This involves the extraction of mineral resources and entails the extensive use of water resources and land, resulting in excessive resource consumption. High-speed production activities generate large amounts of solid waste, wastewater, and exhaust gases [3]. If not properly managed, these pollutants may enter our soil, water sources, and atmosphere, affecting human health and the balance of ecosystems.

2.2. Development Gaps may exist.

China's position in the global electronic hardware production sector is undisputed. When it comes to products like smartphones, computers, home appliances, or various sensors and components, China has a strong manufacturing and supply chain capability. This leading advantage has accumulated rich experience and global market share for China. However, despite the evident advantages in hardware production, China still faces some challenges in original technology research and development (R&D) and innovation:

2.2.1 R&D investment and commercialization

Compared to some developed countries, there is still a gap in R&D investment in basic and applied research by Chinese enterprises and the government. Moreover, translating research outcomes into commercial applications is sometimes inefficient.

2.2.2 Intellectual property culture

Protecting and respecting intellectual property is crucial in an innovation ecosystem. Although China has made significant progress in intellectual property protection in recent years, there is still a need for further cultivation of a culture that values and respects intellectual property, particularly in certain industries and sectors. While China has implemented a series of laws and policies related to data security and privacy, there are still gaps compared to the European General Data Protection Regulation (GDPR), especially in the definition of personal data, restrictions on data collection and usage, and regulations on cross-border data flow [4].

2.3. The empowerment of the internet for energy conservation, emission reduction, and green development may also pose certain risks.

As internet technology continues to develop and be applied, new business models and transaction methods are emerging. This presents significant challenges for regulatory agencies, making it more difficult to effectively implement green and energy-saving guidelines in the new internet environment [3].

With the rise of green industries and smart manufacturing, a large amount of capital is flowing into these sectors. In the short term, this may drive up the prices of related assets, inducing more investors to enter the market and potentially creating an asset bubble. Once these expectations fail to materialize or if other external factors lead to a loss of market confidence, this overheated investment environment may quickly cool down, resulting in a sharp decline in asset prices. Overcapacity and resource waste: In the frenzy of investment, companies may blindly expand production capacity without sufficient market research [5]. This significantly increases the survival pressure for small and medium-sized enterprises, especially those without obvious advantages in technology, brand, and channels. If they fail to adjust their strategies and business models in a timely manner, these companies may be rapidly eliminated from the market. Without proper planning and regulation, overinvestment may lead to overcapacity, causing resource waste and putting some companies under survival pressure.

Industries such as new energy and high-tech manufacturing require a certain amount of time for technology research and development, market implementation, and product maturity. These industries need long-term and stable funding support to ensure their healthy development. Excessive

short-term funds may cause these industries to expand excessively in a short period, but they may subsequently face difficulties due to a broken capital chain [6]. Short-term funds pursue quick returns, which can lead to rapid inflation of the valuation of certain assets or industries, far exceeding their actual value. Once market confidence is undermined, these bubbles may burst rapidly, leading to a rapid outflow of funds, causing financial market panic, and even triggering broader financial risks.

3. Pathways of Internet Empowering ECER

3.1. Make the powerful information dissemination function of the Internet has a key driving force for global dissemination of green technologies and sustainable development concepts.

3.1.1 Technological Applications and Dissemination

The powerful information dissemination function of the Internet has become a key driving force for global dissemination of green technologies and sustainable development concepts. Through various online platforms, including social media, online education platforms, blogs, professional forums, and news websites, green and sustainable ideas can quickly reach people around the world. This broad dissemination ensures that individuals, social organizations, and large corporations can understand and embrace these values and technologies in the shortest possible time. The Internet is not just a one-way information platform; it is also a diverse and interactive environment. Enterprises, research institutions, government departments, and ordinary citizens can exchange experiences, share resources, and form multi-party collaborations on social media, online conferences, webinars, online forums, and other platforms [7]. This multi-stakeholder participation helps find comprehensive solutions to environmental issues and promotes green development. Through the Internet, people can more easily access information and advice on green consumption. This includes recommendations for environmentally friendly products, lifestyle tips for energy conservation and emission reduction, and best practices for sustainable development. This not only allows businesses committed to sustainable development to gain more market attention but also makes it easier for ordinary consumers to implement environmentally friendly behaviors. Modern Internet technologies allow for highly personalized information delivery. Through data analysis and user behavior research, relevant green technologies and environmental information can be accurately delivered based on users' specific interests and needs. This not only improves the efficiency of information dissemination but also increases user engagement.

3.1.2 Internet of Things (IoT) in Intelligent Supply Chains

IoT devices have become an indispensable part of modern factories and production lines. From the initial processing of raw materials on the production line to assembly, quality inspection, and packaging and storage of the final products, IoT devices can play a role. These devices, such as sensors, smart cameras, RFID tags, etc., can monitor various key indicators related to production in real time. These include energy usage, waste and wastewater generation, temperature and humidity fluctuations, and even workers' activities.

The collected data is transmitted to a central database or cloud platform, where complex data analysis algorithms and artificial intelligence models are running. These tools can help companies not only quickly identify any inefficient or wasteful processes but also predict future maintenance needs or system failures through data mining and pattern recognition. With this information, companies can take proactive measures for maintenance and optimization rather than just reacting. Thanks to the real-time data flow and high degree of automation provided by IoT, production processes can be adjusted immediately when needed. For example, if the system detects that a machine has been idle for a long time or if the energy efficiency of a production process suddenly decreases, it will automatically make corresponding adjustments. This may include shutting down unused equipment, reducing machine speeds, or changing operational modes to optimize energy use and reduce unnecessary waste or emissions. This high level of automation and intelligent optimization

not only greatly improves production efficiency but also significantly reduces a company's negative impact on the environment. For example, through better energy management, companies can greatly reduce their carbon emissions. At the same time, by reducing waste and wastewater generation, companies are also reducing their overall environmental footprint.

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3.1.3 Data-Driven Decision Support

Through the integration of IoT and intelligent supply chain technologies, the management of companies can have an advanced, data-driven decision support system. This system not only collects various data from the production line to the supply chain but also integrates them into a visualized dashboard. This dashboard can display real-time data on energy usage, waste generation, carbon footprint, logistics status, and other key indicators, enabling management to make more timely and accurate adjustments to production and operational strategies. In traditional decision-making models, once a strategy is formulated, it is difficult to change. However, in a data-driven environment, companies can respond more flexibly to unforeseen events or market changes. For example, if data shows an abnormal increase in the carbon footprint of a product, management can quickly intervene and adjust the production process or supply chain strategy to reduce environmental impact.

In addition to real-time monitoring of operational data, this integrated system also supports the analysis of the entire product lifecycle. This includes everything from raw material procurement and supplier selection to product production, distribution, use, and eventual recycling and disposal. In this way, companies can not only understand the environmental impact of the production stage but also comprehensively assess their environmental responsibilities throughout the entire lifecycle. This comprehensive view enables companies to better plan and implement their sustainability strategies [8]. This data-driven decision-making model has an additional benefit: it serves as a powerful communication tool for demonstrating a company's environmental responsibility to the outside world. When a company can accurately quantify and showcase its sustainability efforts, it not only increases consumer trust and participation but also attracts more investors who prioritize environmental, social, and governance (ESG) factors.

Furthermore, data-driven decision support can be considered from real-time operations to lifecycle environmental responsibility. The deep integration of Internet of Things (IoT) and intelligent supply chain technologies has provided enterprise management with a comprehensive and efficient data-driven decision support system. This system not only integrates and analyzes information from multiple data sources on a unified platform but also offers a holistic visual interface. These interfaces display key performance indicators such as real-time energy usage, waste generation, carbon footprint, and other relevant metrics. With the input of real-time data, companies can quickly identify areas in production or operations that require improvement. If the data indicates low energy efficiency or excessive waste generation in a particular production process, management can immediately adjust the related processes or even suspend certain operations to reduce their negative environmental impact. This real-time adjustment mechanism not only increases production efficiency but also enhances the company's ability to respond promptly to environmental responsibilities. The integrated system also provides companies with the opportunity to evaluate the environmental impact of their production and operational activities from a more comprehensive and multidimensional perspective. For example, by tracking the entire lifecycle of a product, from raw material procurement, production, distribution, use, to eventual recycling and disposal, companies can not only have a clear quantitative understanding of the environmental impact at each stage but also identify areas for further improvement. This data-driven decision-making approach extends to the analysis of the complete lifecycle of products. It encompasses the environmental impact of raw materials, energy efficiency in the production process, the carbon footprint during product use, as well as product recycling and

disposal [9]. Each stage can be thoroughly quantified and analyzed. As a result, companies can gain a more comprehensive understanding of their environmental responsibilities throughout the entire lifecycle of their products.

3.2. Creating a favorable environment for the development of the Internet and guiding its transition to the green and low-carbon field.

To ensure the sustainable development of the Internet industry, the government needs to first establish comprehensive and clear green policies. This includes promoting various aspects such as green data centers, low-carbon operations, and the use of renewable energy. The policy content needs to be specific, actionable, and coordinated with policies in other industries to form a holistic framework for sustainable development. In addition to policy guidance, financial incentives are also an effective means to encourage companies to adopt green technologies and sustainable development models. The government can reward companies that make efforts in environmental protection through tax incentives, subsidies, or low-interest loans. For example, specific tax exemptions can be provided to green data centers or companies that use clean energy. Alongside incentive mechanisms, a set of strict legal sanctions is also necessary [10]. For companies that excessively consume resources, pollute the environment, or fail to comply with environmental protection laws and regulations, the government needs to impose severe penalties such as fines, revocation of business licenses, or other legal measures. To objectively and comprehensively assess a company's environmental performance, the government can also promote or introduce third-party green certification systems. This will not only provide companies with a clearer understanding of their environmental performance but also allow consumers and investors to identify truly responsible green companies more accurately.

Open and transparent information disclosure and social supervision are also indispensable in policy implementation. The government needs to regularly publish public reports on corporate environmental performance and accept public and media supervision to ensure effective policy implementation and continuous optimization. In summary, an effective system of policies and regulations requires comprehensive strategic planning, clear implementation guidelines, and coordination with multiple aspects such as financial incentives, legal sanctions, third-party certification, and social supervision. This will create an environment conducive to the sustainable development of the Internet industry. Such comprehensive policies will provide clear direction and strong incentives for Internet companies, ensuring that they recognize the importance of environmental responsibility and sustainable development while experiencing rapid growth.

3.2.1 Improving Public Awareness and Education

The education system is one fundamental avenue for cultivating public environmental awareness. From primary schools to universities, environmental education should be a consistent component of the curriculum. Through instruction, students can not only comprehend the severity of issues like climate change and resource scarcity but also acquire the knowledge and skills to practice sustainability in their daily lives [11]. In the era of information, social media and news platforms wield significant influence. Governments, non-governmental organizations, and businesses should leverage these platforms to disseminate information pertaining to environmental protection, green technologies, and sustainable development. By employing storytelling, data visualization, or interactive content, it is possible to effectively capture public attention and motivate individuals to take tangible actions. In addition to conventional information dissemination, organizing various online and offline activities is also an effective educational approach. These activities can include webinars, question-and-answer sessions conducted online, or on-site events such as clean-up campaigns and tree-planting festivals. Such initiatives not only enhance public environmental awareness but also engage more individuals in environmental efforts.

For businesses, apart from complying with relevant laws and regulations for green development, they can promote environmental consciousness through Corporate Social Responsibility (CSR) programs [12]. For instance, companies can sponsor environmental projects or collaborate with schools to provide students with opportunities to engage in sustainable development practices.

Successful green projects or practices often have strong demonstration effects. Governments and major institutions should compile and showcase these success stories, making them powerful tools to encourage greater participation in green actions.

In an academic context, it is important to note that the statements above are based on existing research and best practices in the field of environmental education and public awareness. The references mentioned [11] can provide further details and in-depth analysis on the topic.

3.2.2 Technological Innovation and Application

Cloud computing technology can greatly enhance the efficiency of data storage and processing, reducing the need for enterprises to build and maintain data centers. This not only reduces physical space and hardware consumption but also decreases energy consumption related to power supply and cooling. Multiple companies or organizations can share cloud computing resources, further improving energy efficiency.

Furthermore, through big data analytics, businesses can accurately predict user needs and behavior patterns, enabling more precise resource planning [12]. For example, e-commerce platforms can use user data analysis to accurately forecast inventory demands, avoiding excessive stockpiling and thus reducing the carbon footprint generated by logistics and storage. Additionally, artificial intelligence and machine learning technologies can automatically adjust server operations to reduce energy consumption during periods of low demand. Moreover, these technologies can also predict faults or unnecessary energy waste through real-time monitoring of user behavior and device status, allowing timely adjustments to be made.

3.2.3 Sustainable Business Models

Circular economy models not only focus on reducing resource waste but also emphasize integrating sustainability at the product design stage. This includes using biodegradable or recyclable materials, designing products with easy disassembly and repair structures, and planning for post-use regeneration pathways. By collaborating with designers, engineers, and sustainability experts, businesses can develop more environmentally friendly products. Additionally, equipment recycling and remanufacturing programs not only enable products and materials to be reused after their lifecycle but also create new business opportunities and employment positions. Sharing economy and leasing models can be diversified and localized based on different regions and consumer groups. For example, agricultural machinery sharing may be more suitable for rural areas, while vehicle and housing sharing may be more suitable for urban areas [12]. Furthermore, these models can achieve higher efficiency, transparency, and security through the use of advanced information technologies such as blockchain and Internet of Things (IoT) devices. Offering green choices and ensuring information transparency can not only meet consumer demands but also influence the entire market. Businesses should actively participate in or initiate various environmental activities and campaigns to raise public awareness of sustainable consumption [13]. Additionally, businesses can incentivize consumers and other companies to follow their environmental footsteps through environmental reward programs or preferential policies.

Supply chain sustainability requires not only collaboration with direct suppliers but also consideration of the entire supply network, including the sourcing of raw materials, energy efficiency and waste management in the production process, and product distribution and recycling. This may require businesses to establish collaborative relationships with multiple stakeholders, including government agencies, non-governmental organizations, research institutions, and other companies. Through comprehensive collaboration, businesses can not only enhance the sustainability of their own supply chains but also promote the sustainable development of entire industries or regions.

3.3. Strengthen Internet Regulation to Promote Low-Carbon Transformation in Traditional Industries

3.3.1 Refined Internet Regulation

The purpose of strengthening Internet regulation is not only to ensure the security of networks and information but also to drive the entire industry towards environmental protection and low-carbon practices. This goal should encompass multiple aspects, including but not limited to data center energy efficiency, energy consumption of online platforms, and proper management of electronic waste.

Government agencies should first establish clear baseline standards for data center energy efficiency and continuously update and improve these standards to accommodate technological advancements and environmental needs. After the standards are set, an authoritative certification system should be established to enable continuous assessment and regulation of the performance of each data center. This assessment should include not only energy consumption but also factors such as the proportion of renewable energy used and cooling efficiency. The government can provide incentives such as tax benefits or subsidies to encourage data centers to improve their energy efficiency [12]. Conversely, data centers that fail to meet the standards should face fines or other penalties.

3.3.2 Energy Consumption of Online Platforms

For online services with high bandwidth and computing demands, such as streaming media and online gaming, the government should establish clear limits on their energy consumption and regulate compliance. Enterprises should be encouraged to reduce the energy consumption of online platforms through algorithm optimization and hardware upgrades. By raising user awareness through user interfaces or push notifications, individuals can realize the potential environmental impact of their online behavior and make more environmentally friendly choices.

The government should mandate enterprises to recycle electronic products that are no longer in use or have been discarded. Dedicated collection points should be established, and the recycling process should be regulated [13]. Enterprises should be incentivized to reuse or remanufacture the collected electronic waste to extend the product lifecycle. Public awareness campaigns should be conducted to highlight the importance of electronic waste recycling and encourage consumer participation.

3.4. Promote Low-Carbon Transformation in Traditional Industries: Integrated Strategies and Execution Paths

3.4.1 Energy Efficiency Improvement

Comprehensive review and analysis of existing production processes should be conducted to identify energy efficiency gaps and areas of waste. Once these problem areas are identified, targeted optimizations can be implemented, such as introducing advanced production technologies or improving raw material usage. Companies can encourage or require the replacement of old, energy-consuming equipment with more energy-efficient machines and tools. This may require financial support from the government, such as subsidies or tax incentives [14]. Companies can provide professional training on energy efficiency management and energy-saving practices to ensure that employees understand how to implement energy-saving measures in their daily work.

Enterprises should be encouraged or mandated to use more renewable energy in their production processes. This can involve installing solar panels directly on production sites or purchasing green energy. The government can promote broader adoption of clean energy by implementing a range of incentives, such as renewable energy subsidies or carbon trading mechanisms [15]. Consideration of recyclability in product design and the ease of disassembly should be incorporated from the outset to minimize waste generation at the source. Lean production methods should be adopted to reduce unnecessary raw material and energy consumption, thereby reducing waste generation. In addition to waste reduction, an effective waste recycling and disposal system needs to be established. This may

include internal recycling programs, collaboration with third-party recycling organizations, or participation in government-led recycling initiatives [16].

Through these comprehensive strategies and specific measures, it is possible to achieve low-carbon transformation in traditional industries while enhancing the competitiveness and sustainability of businesses. Such a transformation requires collective efforts from all sectors of society, as only with sufficient resources and attention from various stakeholders can success be ensured.

4. Summary and Reflections

With the development of the internet and the digital economy, businesses have expanded their production scale to meet market demands. This increased demand for raw materials may lead to resource depletion. Excessive water consumption is particularly concerning in regions with water scarcity. The increased energy demand contributes to carbon emissions and environmental pollution. Industries such as metallurgy and real estate have also experienced rapid growth due to the digital economy, but this has brought about issues of resource overconsumption and environmental problems. While China has advantages in hardware production, it still faces challenges in original technology research and development and innovation. Although progress has been made in intellectual property rights and data protection, there are still some gaps.

New business models and transaction methods present challenges to the implementation of green and energy-efficient guidelines. The influx of large amounts of capital may lead to asset bubbles and resource waste. Industries such as new energy and high-tech manufacturing require long-term financial support, and short-term funding may result in industry overexpansion and subsequent financial risks.

Overall, while the internet and digital economy provide immense potential and convenience for business and economic development, they also bring about a range of environmental, social, and economic challenges and risks. Therefore, comprehensive and holistic strategies are needed to balance the impacts from these different aspects. This article proposes three approaches to reduce related risks. Firstly, as the platform for information dissemination, the internet strengthens the global dissemination of green and sustainable development concepts. Various platforms such as social media, online education, and blogs enable information to reach individuals, organizations, and businesses more quickly. Through data analysis and personalized recommendations, the efficiency of information dissemination and user engagement is improved. Secondly, IoT devices such as sensors and smart cameras play a crucial role throughout the production process, enabling real-time monitoring of energy usage, waste generation, etc. Data is centralized on cloud platforms for advanced data analysis and AI model computation. Through real-time data streams and automation, production processes can be adjusted instantly, improving energy efficiency and reducing waste. Thirdly, management can monitor and adjust production and operational strategies in real-time, allowing for more flexible responses to market and environmental changes. Support for lifecycle analysis quantifies and evaluates environmental impacts comprehensively, from raw material procurement to product recycling. By adopting these approaches, businesses can mitigate risks and promote sustainable development in the context of the internet and the digital economy.

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