

The Impact of Huawei's Business Model on Developing Intelligent Railway

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Abstract: With the development of technology, the Internet, and big data, all industries have gradually undergone digital transformation. Simultaneously, as transportation demand grows, digital and intelligent solutions have created new development potential for the railroad business. Huawei, a Chinese technology company, grasped the chance to enter the railroad sector and pioneered the development of the intelligent railway by combining digital and railroad technologies. This study uses ten pieces of literature and Huawei Intelligent Railway objects to look at how digitalization of the railway affects the environment, society, and government, as well as the effects of ESG theory and the SWOT approach. Finally, the examination of this research leads to the conclusion that Huawei's business model of digital technology-enabled railway helps the improvement of the environment, society, and government. As a result, it is possible to infer that successful digital technology empowerment benefits global development by promoting the betterment of the environment, society, and government.

Keywords: Huawei Intelligent Railway, Digitalization, ESG, SWOT

1. Introduction

1.1. Research Background

As big data, the internet, and technology have advanced, the digital transformation has begun to expand across numerous industries. Because of the rising need for transportation, the old railway operating model is no longer able to match the public's demands; instead, digital and intelligent solutions show new possibilities for the railway sector to expand. This can help operators realize real-time monitoring and optimization of rail transit systems, assess railroad operating conditions and potential problems, provide a foundation for infrastructure maintenance and upgrading, reduce operating costs, and provide passengers with a new travel experience. Huawei, a worldwide leader in ICT infrastructure and smart terminals, adheres to good management, continual innovation, and terminals in order to deliver competitive ICT solutions, products, and services to operator customers, corporate customers, and consumers. It is also committed to making the world a better, more connected place and achieving the possibilities of the information society. Huawei sees digital transformation as both a potential and a requirement in the railroad sector; therefore, it has begun to investigate smart railroads as a new business model to encourage the evolution of railroad

construction in the direction of information, modernization, and intelligence. At the same time, the smart railroad has broad market demand and technology needs; current railroad transportation is increasing; science and technology development is progressing; and, with the help of Internet of Things technology, the realization of intelligent and efficient railroad transportation is an unavoidable trend of the railroad's current development. The use of smart railroads offers significant support for scientific and technological innovation, allowing it to be as simple as completing the train's automatic station announcement, passenger safety inspection, station equipment management, and so on.

Researchers have also begun to increase research related to smart railroads in recent years, such as railroad construction, railroad communication technology, railroad transportation, and other aspects. Lu Wei has studied railroad intelligence on railroad transportation, macroeconomic management, and sustainable development with the design of railway buildings in Dabao Dang Park [1]. Mao et al. used engineering science and technology as the focus of their research in the Yuma Railway research and station construction process. They looked at how the progress of the station roadbed construction affected the key scientific and technological attack processes. They also looked at how intelligent engineering key technologies were used in the fast construction of railroad roadbeds [2]. Yang Gang studied the research and application of vehicle networking based on 5G NR in the vehicle management of railroad intelligent sites with railroad transportation as the research object [3]. Wang Fei took the existing high-speed railroad as the basis for the study and designed an expandable intelligent energy management system for the high-speed railroad by utilizing the Internet of Things, network communication, multimedia monitoring, databases, and other technologies [4].

1.2. Research Gap

In terms of academic research, there are many scholars who take Huawei's chip, technology, and management mode as the research object, but only a few scholars take Huawei's Intelligent Railway for research and exploration, thus, there is also a research gap in this area. How does Huawei's business model for developing smart railroads impact the world? There are still large gaps in research on smart railroads. This paper will delve into the impact of Huawei's Intelligent Railway business model on the world because the railroad is a national strategic, pioneering, critical major infrastructure, the national economic artery, major livelihood projects, and the backbone of the comprehensive transportation system. The current railroad information technology construction is evolving in the direction of modernization and intelligence to enhance the level of intelligence in the railroad industry and to realize the railroad safety, efficiency, and experience of the comprehensive mention in the status and role in economic and social development is crucial.

1.3. Fill The Gap

This paper will exploit the theories of ESG, qualitative analysis methods, and SWOT analysis methods to study the impact of the Huawei digital empowerment smart railroad business model on the world. This paper will analyze Huawei's Intelligent Railway from the perspectives of environment, society, and governance and analyze the impact of Smart Railway from the perspective of enterprises and countries. The final conclusion will be based on the characteristics of Huawei's Intelligent Railway, and the digital recommendations will be made for other enterprises and industries.

2. Literature Review

2.1. Definition

In 2004, the United Nations Global Compact (UNGC) came up with the idea of ESG as a way to deal with the problem of how to make economic, social, and environmental factors work together. They

did this from the point of view of corporate social responsibility and sustainable development, focusing on the capital market to make sure that the three factors of environment, society, and governance are taken into account in investment decisions and business operations [5]. ESG shows that companies need to look at their value from more than just a financial point of view. They need to also look at the company's social, environmental, and governance performance. This way, policies and actions related to social responsibility can be measured and compared. Furthermore, ESG indicators are used to predict a company's future financial success and social impact. As a result, ESG, as an investing principle that combines social, environmental, and governance factors, serves as a stimulus for firms' long-term success. Promoting the development of ESG principles across the world is critical to the country's further opening up to the outside world, improving enterprise worldwide competitiveness, and realizing the "dual-carbon" aim. Meanwhile, as a complete framework and concept of environmental, social, and governance considerations, ESG reveals an interaction link between its aspects.

The ESG framework consists of three key components: environmental, social, and governance. Table 1 illustrates that environmental challenges have the potential to significantly impact the financial performance or solvency of a business, country, or individual. Social concerns refer to matters that have the potential to positively or negatively impact the financial performance or stability of an organization, government, or person. Governance matters refer to issues that have the potential to either positively or negatively impact the financial performance or Governance refers to the way in which decisions and actions are made and implemented, and it may have either a positive or negative effect on the financial performance or ability to pay debts of an organization, government, or person [6].

Table 1: Definition and Influencing Factors of the Three ESG Elements [6]

Name	Impact factor	Definition/Explanation
E(environment)	greenhouse gases, energy consumption, air pollution, water recycling, waste production and management, biodiversity	ecological and environmental problems that could effectively or adversely impact a sovereign or independent entity's financial performance or solvency
S(social)	workplace health and safety, opportunity, equality, supply chain management, training and education opportunities, employee freedom, child labor, force labor, privacy	social issues that may have an impact on the financial performance or solvency of businesses, sovereigns, or individuals, either effectively or adversely.
G(governance)	Transparency and disclosure, CEO salary, board diversity and structure, bribery and corruption, stakeholder engagement, and shareholders' rights	governance issues that may have a favorable or adverse impact on an entity's, sovereign's, or individual's financial performance or solvency

2.2. Important Results

ESG is currently widely investigated, practiced, and encouraged in clinical settings.

The integration of digital technology with enterprise products has the potential to have an impact on the environment. The first big geographic information model developed by Generative Artificial Intelligence successfully evaluated a vast amount of satellite data and eventually realized flood prediction, forest fire early warning, and the impact of extreme weather on crops and food [7]. Lenovo innovates through its own digital transformation and active collaboration with global technology

giants. As a result of their close relationship, LEGREEN's modules for product carbon footprint, environmental compliance, and organizational carbon management get technical support from Microsoft Cloud. This support includes a performance guarantee, more intelligent analysis scenarios, and customer coverage to make sure that accurate carbon footprint calculations and climate change impact analyses are offered. The carbon footprint is estimated precisely, and statistics on the effects of climate change and ecological damage are examined [8].

Enterprise digital technical innovation can have an impact on society. IBM builds a smart new world through digital technology to assist hearing-impaired persons in realizing information accessibility by bridging the digital gap and in controlling human rights [7]. Control of human rights by deaf persons [7]. Lenovo launched LEGREEN using digital technology to create "8+1" intelligent goods and services solutions that address the fundamental concerns confronting enterprise management. Breaking down organizational barriers, implementing data-driven decision-making, closed-loop process management, and effectively empowering the sustainable growth of all sectors of society are all examples of digital intelligence [8].

Enterprises that use digital visualization can have an impact on governance. IBM, in collaboration with Interpol, human rights organizations, and universities, has used artificial intelligence (AI) to assist the government in a collaborative manner, integrating financial data through digital technology and financial transactions between the traces to determine criminal behavior, from which many abnormal transactions can be found. Based on this data, society can detect high-risk transactions in order to reduce the danger of crime and, hence, the cost of governance [7]. Lenovo assists enterprises in meeting the challenges of mandatory regulations and voluntary certification for going abroad by transforming complex regulatory requirements into a systematic data package, significantly reducing compliance costs, which is critical for Chinese manufacturing to maintain global competitiveness and promote opening up to the outside world [8].

2.3. Summary

Based on the theory of ESG, the future of Huawei's Intelligent Railway is promising, and it will continue to promote technological and management innovation in intelligent construction, intelligent equipment, intelligent operation, intelligent operation and maintenance, and intelligent service, so that the railroad's innovation ability, technological strength, and technical equipment are more advanced and applicable, and the overall technological level of China's railroads is in the world's leading position [9]. In addition, the smart railroad is also important for the three elements in ESG. For the environment, smart railroads can largely solve environmental problems, effectively reduce energy consumption and emissions, realize green transportation, continue to promote the concept of green development, and better serve the public's green travel needs. For the society, smart railroad is an important driving force to realize high-quality development, an important infrastructure that can promote the coordinated development of regional urban and rural areas, and significantly enhance the attractiveness and radiance of the economic development of the areas along the route. For governance, the smart railroad can identify vehicle fault hidden danger and early warning disposal, help to significantly improve operational efficiency, improve the railroad emergency response and rescue capabilities, to provide safe travel for the people.

3. Method

3.1. Research Design

The experiment will be designed using qualitative analytical methodologies and a SWOT analysis in this article. The qualitative analysis method's goal is to define the specific nature and qualities of the study object through literature research, data research, case studies, and so on. This method facilitates

the processing of thoughts on the various materials obtained, allowing one to remove the rough and extract the essence, remove the false and keep the true, and from the other side, from the surface to the inside, allowing one to implement an understanding of the essence of things and reveal the inner law. This paper's research focus is the global impact of Huawei's Intelligent Railway business model, which is a descriptive study that does not use formal statistical computations. At the same time, because the theme focuses on the use of words to summarize and explain the information analysis, the qualitative analysis approach is used.

SWOT analysis is based on the internal and external competitive environments as well as the competitive situations. The research object is closely tied to the primary internal strengths and weaknesses, as well as the external opportunities and threats identified, with systematic analysis to match the various elements to each other. Much literature reflects SWOT; for example, Zhao used FH Company as an example and used SWOT analysis methods to strategically assess FH Company to identify its advantages, disadvantages, opportunities, and threats [10]. In this paper, SWOT analysis will show how HUAWEI Intelligent Railway can use its own strengths to compensate for its own weaknesses, capitalize on external opportunities, expand product fields and industry applications, effectively respond to external threats, strengthen its competitiveness and innovation, and keep up with the times as the situation evolves.

3.2. Huawei

Huawei, a global leader in ICT (information and communications technology) infrastructure and smart terminals, was founded in 1987. HUAWEI has developed an end-to-end solution advantage in telecom carriers, enterprises, terminals, and cloud computing, and it offers competitive ICT solutions, products, and services to carrier, corporate, and consumer clients. The purpose of HUAWEI is to dedicate itself to delivering the digital world to every person, family, and organization, as well as to develop an intelligent environment in which everything is connected to the globe. Huawei Intelligent Railway originates in the backdrop of today's expanding transportation demand, where the traditional train operation model can no longer match people's needs and digital and intelligent solutions have offered new development opportunities to the railroad industry. Huawei Intelligent Railway promotes technological and management innovation in the areas of intelligent construction, intelligent equipment, intelligent operation, intelligent operation and maintenance, and intelligent services, gradually realizing intelligent operation management and decision-making for railroads based on comprehensive data collection and analysis. Huawei Intelligent Railway has grown rapidly over the last decade, and it has made significant achievements both at home and abroad. For example, in 2015, HUAWEI won the bid for the German Railway (DB) GSM-R North project with Siemens CVC, HUAWEI collaborated with China TONGZHOU and China Telecom to help the WANZHOU high-speed railroad formally open for operation in 2023, and HUAWEI signed a memorandum of cooperation with the Southern African

3.3. SWOT

3.3.1. Strength

The overall benefits of Huawei's Intelligent Railway include increased operational efficiency, safety, and intelligence. Operational efficiency can be increased by optimizing the operational schedule and reducing travel time. It can help the environment by reducing energy usage and promoting environmental protection. It makes travel easier for people in society. It can help with governance by promoting green travel. More safety can be achieved by the intelligent railroad's thorough and complete information perception of moving parts like rolling stock, fixed facilities like tracks, bridges, and tunnels, and natural environments like wind, rain, and snow, as well as the corresponding safety

risks in the transportation system. This can be done by real-time monitoring of railroad facilities and operating conditions to spot problems early and stop railroad accidents. For the environment, increased safety can increase the use of railroads and automobiles while decreasing track and vehicle recycling. It benefits society by increasing public trust. It can assist the government in harvesting the hearts of the people.

3.3.2. Weakness

The main disadvantage of the Huawei Intelligent Railway technology is its excessively high construction costs. The Huawei Intelligent Railway project requires a larger initial investment and a longer time frame to be completed.

The construction and operation of the railroad have a noticeable influence on the quality of surface water, groundwater, and soil, with the magnitude of this influence growing as the period of construction increases. The increased costs related to railroad development could potentially raise the tax burden on the general population, affecting society. The government's allocation of funds towards engineering projects, such as the construction of road bases and station yards, will result in the growth of societal infrastructure. Nevertheless, this will also present difficulties in terms of administration.

3.3.3. Opportunity

The primary advantage of Huawei's Intelligent Railway in the market is its ability to integrate railroads with big data and artificial intelligence for the purpose of enhancement. The railroad sector may now leverage the advancements in technology to capitalize on the potential of big data and artificial intelligence. Huawei has the capability to integrate big data and AI technologies in order to enhance the information processing capability of the smart train system. This integration leads to improved efficiency in several areas, such as intelligent ticket checking and on-board AI services. Utilizing big data and AI minimizes environmental impact and fosters sustainable development by decreasing human and material expenditures. For society, it can more effectively fulfill the requirements of the general population. In terms of governance, it efficiently advances government policies and enhances technical innovation.

3.3.4. Threats

The fierce competition that other transportation sectors pose to Huawei Intelligent Railway is its main obstacle in the market. With the growth and improvement of the highway and civil aviation industries, railroads are no longer the sole choice for transportation and travel. As a result, Huawei Intelligent Railway now faces more competition. From an ESG standpoint, this situation has both positive and negative aspects. This is advantageous for the environment as it enables the choice of the most energy-efficient method of transportation, thereby minimizing environmental pollution. This phenomenon enhances the range of transportation and travel options available to both enterprises and individuals, thereby benefiting society as a whole. This might potentially pose challenges for the government in terms of governance.

4. Results & Discussion

The analysis of this research leads to the conclusion that empowering digital technology is advantageous to the development of businesses.

Intelligent railroads and traditional railroads certainly have opposing viewpoints, but both are unquestionably intelligent. Intelligent railroad is the solution to satisfy the needs of railroad modernization, and its development not only supports railroad construction upgrades but also seizes

the high ground in future railroad competitiveness. The advancement and deployment of digital technology provides an effective technological way for organizations to increase their operational capabilities. For the environment, the use of digital technology increases firms' ability to develop sustainably and can encourage green development of the environment. For society, digital technology may assist firms in monitoring social data in real time, reacting and processing swiftly, ensuring prompt and effective remedies, and reducing the impact of potential threats on enterprises. In terms of governance, the use of digital technology can help organizations respond and adapt to market changes more quickly, as well as increase their regulatory efficacy, resilience, and competitiveness.

Intelligent railroads can be created by combining BEIDOU navigation, 5G technology, and automated driving. BEIDOU navigation can provide accurate positioning for intelligent railroads and serve as the foundation for autonomous navigation, while 5G technology helps intelligent railroads with railroad networking and vehicle-road cooperation, and automatic driving accelerates railroad intelligence in a more intuitive manner.

In this article, the impact of Huawei Intelligent Railway is comparable to that of other firms and goods, but the impact of Huawei Intelligent Railway on the environment, society, and governance is more noticeable.

5. Conclusion

In the context of the development of science and technology, the Internet and big data, and the gradual digital transformation of all industries, this paper conducts a qualitative study of Huawei's business model of using digital technology to empower smart railroads and explores the impact of Huawei's Intelligent Railway digital empowerment on the world. This paper combines the research of other scholars, cites 10 pieces of literature, and utilizes the SWOT analysis method to conduct a theoretical analysis of the ESG of Huawei Intelligent Railway. It finally concludes that Huawei's business model of digital technology-enabled railroads promotes the improvement of the environment, society, and governance and promotes the process of digitalization and intelligence in the world. Thus, it can be concluded that effective digital technology empowerment is favorable to the development of the world and can promote the improvement of the environment, society, and governance. Through the research and analysis in this paper, it can be proposed that the development of Huawei's Intelligent Railway can combine BEIDOU navigation, 5G technology, and automatic driving, thus accelerating the intelligence of the railroad. This paper fills the gap in academic research where a few scholars have studied Huawei's Intelligent Railway, provides a reference to the impact of Huawei's business model of developing a smart railway on the world, and is conducive to the use of digitalization in combination with the importance of enterprises and governments. The shortcoming of this paper is the lack of a large number of rigid data points. Because the data collected in this paper has a strong subjectivity, it is difficult to prove the rigidity and objectivity of the collected information. Therefore, more objective and reliable data should be collected in the future, and a detailed data analysis of Huawei Intelligent Railway should be carried out from the perspective of quantitative analysis methods.

References

- [1] Lu, W. (2023). *Convergence Program of Railway Intelligent Logistics Park under Data Perspective--Taking Dabao Dang Park as an Example*. *Railway construction technology*: 1-6.
- [2] Mao, C. X., Yao, X. W., Chen, B., Guo, L., He Y. F. (2023). *Analysis of key technology for intelligent and rapid construction of railroad roadbed project*. *Sichuan Cement*,2023(11):222-223+256.
- [3] Yang, G., (2023), *Research and application of vehicle networking based on 5G NR in railroad intelligent site vehicle management*. *Railroad communication signal engineering technology*, 20(10):37-42.
- [4] Wang, F. (2023). *Research on the design of intelligent energy management system for high-speed railroad*. *Computer Knowledge and Technology*,. 19(23):50-52+56.

- [5] Li, T. T., Wang, K., Sueyoshi, T., & Wang, D. D. (2021). *ESG: Research progress and future prospects. Sustainability, 13(21), 11663.*
- [6] Abhayawansa, S., & Tyagi, S. (2021). *Sustainable investing: The black box of environmental, social, and governance (ESG) ratings. The Journal of Wealth Management.*
- [7] *Fortunechina.com. (2023). Responsible AI: Artificial Intelligence in ESG Perspective. Retrieved from <https://www.fortunechina.com>*
- [8] *Oriental.com. (2023). Accelerating Zero-Carbon Transition: Lenovo Group Releases Enterprise-Level ESG Solutions. Retrieved from <https://caijing.chinadaily.com.cn>*
- [9] *Huawei. (2016). Intelligent Railway. Retrieved from: <https://e.huawei.com/cn/industries/railway>*
- [10] Zhao Y.H. (2023). *Research on Development Strategy of FH Company. Science and Technology Economic Market, 2023(07):95-97.*