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Analysis of Digital Transformation in the Iron and Steel Industry: A Case Study of B Steel Zhanjiang

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Abstract

In the context of rapid technological advancement, digital transformation has become central to industrial upgrading. This study examines the practices and challenges of digital transformation in the iron and steel industry, using B Steel Zhanjiang Iron & Steel (B Steel) as a case study. By leveraging technologies such as big data and artificial intelligence, B Steel has reshaped its business processes, achieving bidirectional integration between operations and data. Since 2016, B Steel has launched the "Baocloud" platform and established the "Smart Engineering" system to drive comprehensive digital transformation, though the process has encountered significant challenges. Utilizing analytical tools such as fishbone diagrams, this paper conducts an in-depth analysis of mid-to-late-stage issues in B Steel's digital transformation and proposes targeted solutions. The findings aim to provide empirical and theoretical support for digital transformation in the steel industry, promoting its sustainable development.

Keywords: Baosteel Zhanjiang (B Steel), Case study, Digital transformation, Solutions.

1. Introduction

Since 2024, the iron and steel industry has faced a dual weakening of supply and demand, leading to intensified operational pressures for steel enterprises. Against this backdrop, the sector's overall financial performance further deteriorated in the first half of 2024 (see Figure 1), with most companies experiencing expanded net losses and declining operating cash flow. In response, firms must pursue continuous innovation and transformation to adapt to market fluctuations. (China Industrial Economic Information Network, 2025).

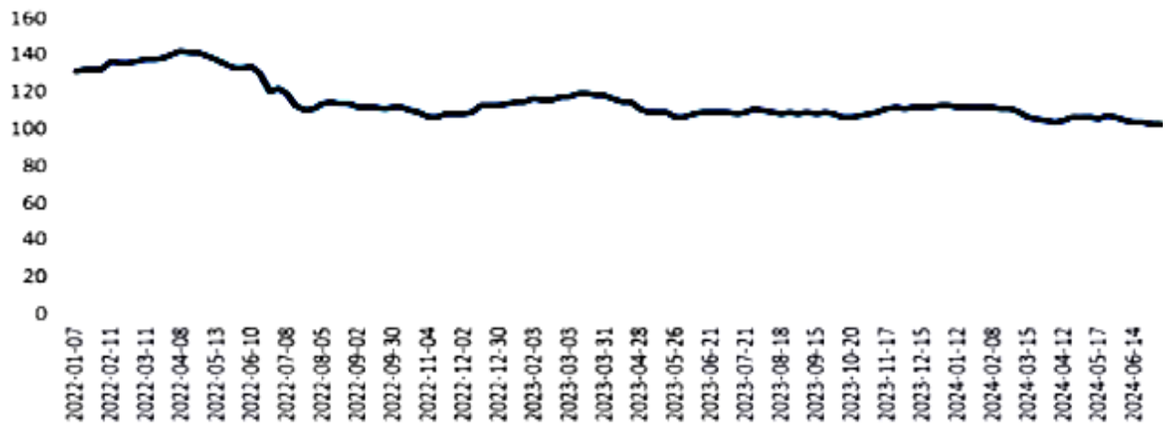

Figure 1. Trends in China's Composite Steel Price Index (2022–2024) (Unit: Points)
Source: Prospect Industry Research Institute(China Industrial Economic Information Network, 2025).

This study takes B Steel Zhanjiang Iron and Steel Co., Ltd. as a case study to deeply explore the internal management issues and external environmental challenges faced by the steel industry during the process of digital transformation. It aims to propose targeted improvement measures to promote internal structural optimization and capacity enhancement within enterprises. The specific research objectives are as follows:

(1)To analyze internal management problems: Systematically identify and examine the internal management issues that emerged during the middle and late stages of B Steel's digital transformation, including insufficient employee skills, poor system compatibility, inadequate optimization of local processes, high technical maintenance costs, and

mismatches in employee skill sets. Additionally, this study seeks to explore the underlying causes and impact mechanisms of these issues.

(2) To investigate external risk factors: From the dimensions of intensified market competition, rapid technological updates, fluctuations in raw material prices, and changes in regulatory policies, this research analyzes the influence of the external environment on B Steel's digital transformation, and evaluates the operational risks and uncertainties introduced by these factors.

(3) To propose improvement measures and suggestions: Based on the case analysis, this study puts forward a series of recommendations, including but not limited to: adjusting production capacity structure, integrating and upgrading systems, strengthening local lean management, optimizing technical costs, enhancing employees' digital skills, improving supply chain management, utilizing financial instruments for risk hedging, and promoting the development of a green circular economy. These suggestions are intended to support enterprises in achieving successful digital transformation and sustainable development.

Through this research, it is hoped to provide practical references and theoretical support for steel industry enterprises undergoing digital transformation, helping them effectively respond to internal and external challenges, enhance core competitiveness, and achieve high-quality development.

2. Case Study

Baosteel Zhanjiang Iron & Steel (B Steel) has achieved remarkable success in its transition to a digitalized enterprise, establishing itself as an industry benchmark. However, during the mid-to-late stages of this transformation, the company encountered significant challenges. By employing a fishbone diagram analysis (see Figure 2), B Steel can identify targeted solutions to these issues, thereby facilitating deeper advancement of its digital transformation.

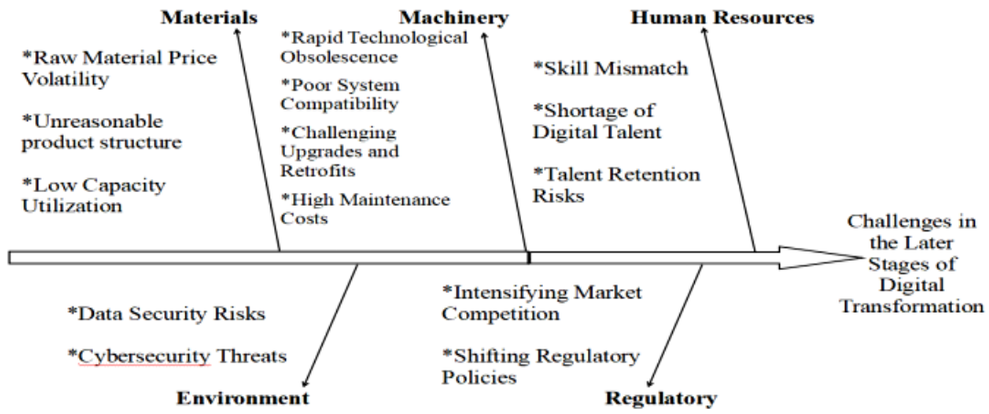

Figure 2. Fishbone Diagram Analysis.

2.1. Staff Aspects

In the Mid-to-Late Stages of B Steel's Digital Transformation, Staff Challenges have Emerged: some employees are accustomed to traditional production models and lack proficiency in new digital technologies, which affects efficiency and quality. There is a shortage of interdisciplinary talent with both information technology and business expertise. Intense talent competition and changes in work patterns increase the risk of talent attrition. B Steel needs to strengthen employee training, recruit digital talent, establish incentive mechanisms, and optimize the work environment to drive the success of the transformation.

2.2. Machinery Aspects

In the Mid-to-Late Stages of B Steel's Digital Transformation, Machinery-Related Challenges Include: the rapid development of new technologies means that failure to keep pace will result in a loss of competitive advantage, leading to reduced market share and damage to brand image. Outdated systems exhibit poor compatibility with new modules, necessitating upgrades and renovations, which involve substantial financial, time, and human resource investments. The integration of cutting-edge technologies increases maintenance costs. Technologies such as smart manufacturing, industrial robotics, 5G, and AI require specialized teams for support, elevating management complexity. Technical failures may cause production halts and financial losses.

2.3. Material Aspects

In the Mid-to-Late Stages of B Steel's Digital Transformation, Material-Related Challenges Include: fluctuations in raw material prices increase production costs and compress profit margins. An irrational product structure, with a high proportion of mid-to-low-end products, undermines competitiveness and leads to idle production capacity. Fluctuations in market demand affect capacity utilization. During periods of macroeconomic downturn or industry stagnation, demand declines, resulting in insufficient orders.

2.4. Regulatory Aspects

In the Mid-to-Late Stages of B Steel's Digital Transformation, Regulatory Challenges Include: intensified industry competition, with new entrants and innovative technologies capturing market share, requiring B Steel to continuously innovate to maintain its leading position. Strict environmental and safety regulations necessitate adjustments to digital management and production models to meet compliance requirements, avoid penalties, and increase compliance costs. Enterprises must monitor regulatory changes and adjust strategies promptly to ensure compliance.

2.5. Environmental Aspects

In the Mid-to-Late Stages of B Steel's Digital Transformation, Environmental Challenges Include: an increased risk of data security, with threats such as data breaches and tampering endangering corporate assets. Cybersecurity risks are on the rise, requiring sustained investment in strengthening defenses against unknown vulnerabilities and threats. New technologies or partners may introduce security vulnerabilities, making it a long-term task to enhance employees' security awareness.

3. The Main Subject of the case Problem

The research subject of this case study is B Steel, established in 2011, with businesses encompassing steel smelting, rolling, processing, and related technical services. Zhanjiang Iron and Steel has become the largest carbon steel plate base in South China, a model of green and efficient steel production, contributing to the development of Guangdong Province. B Steel has built a big data center, driving digital business in four major professional fields, achieving significant preliminary transformation results. However, mid-to-late-stage problems have gradually emerged.

3.1. Macro Analysis (PEST)

Through PEST analysis (Table 1), B Steel can examine the political, economic, social, and technological factors in the external environment from a macro perspective to better understand market trends and potential impacts, thus formulating corresponding strategic plans.

Table 1. PEST Analysis of B Steel.

Dimension	Content Description
P	Strict regulatory environment: The government may issue more detailed policies and regulations, requiring attention to changes. New regulations may lead to compliance uncertainties and even penalties. Data security requirements are increasing: The government is strengthening data security and privacy protection regulations, and establishing protection systems requires funds and human resources, posing technical and management challenges.
E	Cost pressure: Digital transformation requires continuous financial investment, with costs rising in research and development, equipment upgrades, and talent training. Market competition: Other enterprises are advancing digital transformation, intensifying market competition. B Steel needs to continuously innovate to maintain a leading position and avoid market share losses.
S	Talent supply and demandcontradiction: Digital transformation requires composite talents, with insufficient quantity, quality, and structure of talents. Training consumes resources, and talentloss risks increase. Consumer demand changes: Social consumption concepts evolve, with increasing requirements for steel product quality, personalization, and environmental protection, necessitating rapid response to market demand.
T	Cost of technology catch-up: Technology updates rapidly, and research and development and introduction investments may not be directly proportional, posing risks of resource waste. Technology integration challenges: Technology collaboration and integration require cross-domain knowledge to solve compatibility issues and prevent data silos and system incompatibilities. Cybersecurity challenges: Network attack methods are upgrading, requiring strengthened cybersecurity construction to prevent unknown vulnerabilities and risks.

3.1.1. Policy, P

Strict Regulatory Environment: The government may issue more detailed policies and regulations, requiring attention to changes. New regulations may lead to compliance uncertainties and even penalties. P5

Data Security requirements are increasing: The government is strengthening data security and privacy protection regulations, and establishing protection systems requires funds and human resources, posing technical and management challenges. P4P5

3.1.2. Economy, E

Cost Pressure: Digital transformation requires continuous financial investment, with costs rising in research and development, equipment upgrades, and talent training.P4

Market Competition: Other enterprises are advancing digital transformation, intensifying market competition. B Steel needs to continuously innovate to maintain a leading position and avoid market share losses. P4

3.1.3. Society, S

Talent Supply And Demand Contradiction: Digital transformation requires composite talents, with insufficient quantity, quality, and structure of talents. Training consumes resources, and talentloss risks increase. P5

Consumer Demand Changes: Social consumption concepts evolve, with increasing requirements for steel product quality, personalization, and environmental protection, necessitating rapid response to market demand. P5

3.1.4. Technology, T

Cost of Technology Catch-up: Technology updates rapidly, and research and development and introduction investments may not be directly proportional, posing risks of resource waste.P5

Technology integration challenges: Technology collaboration and integration require cross-domain knowledge to solve compatibility issues and prevent data silos and system incompatibilities.P5

Cybersecurity Challenges: Network attack methods are upgrading, requiring strengthened cybersecurity construction to prevent unknown vulnerabilities and risks. P5.

3.2. Industry Five Forces Analysis

The steel industry's digitalization is insufficient, and collaboration with internet companies brings new opportunities. In 2020, the digitalization rate of China's steel industry was only 30%. By 2025, the target is to achieve a research and development investment intensity of 1.5%, a numerical control rate of 80%, an equipment digitalization rate of 55%, and over 30 smart factories (Dengfeng Zhixin Technology, 2024). Through the five forces analysis of B Steel (Figure 3).

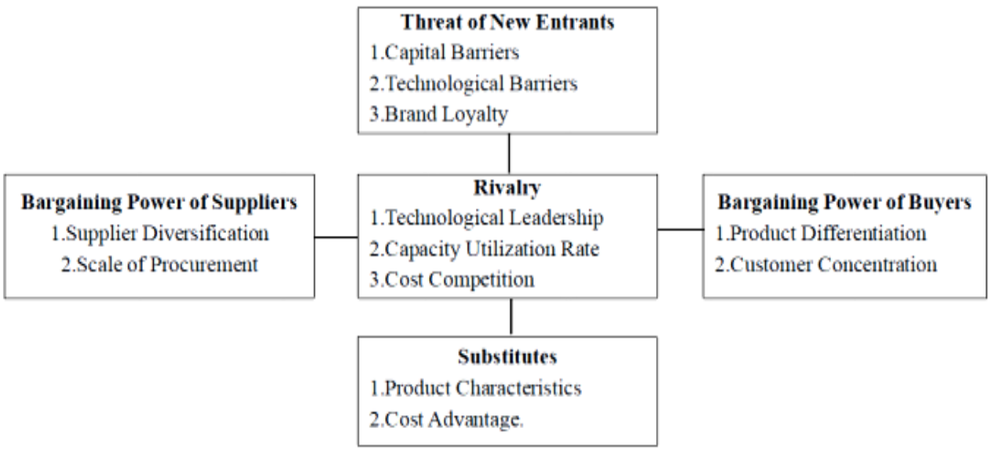

Figure 3. Five Forces Analysis of B Steel.

The competitive situation of the steel industry is visualized, helping B Steel's management identify key competitive forces in the industry and formulate corresponding strategies.

3.2.1. Threat of New Entrants

Capital Barriers: Smart manufacturing systems, industrial robots, 5G deployment, and other technologies require substantial funds, forming capital barriers.P6

Technical Barriers: AI technology integration and professional talent support form technical barriers.P6

Brand Loyalty: B Steel's brand influence and customer trust pose challenges for new entrants.P6

3.2.2. Substitutes

Product Characteristics: The uniqueness and customization capabilities of B Steel's products reduce the threat of substitutes.P6

Cost Advantage: Digital transformation reduces costs and enhances price competitiveness. P6

3.2.3. Bargaining Power of Buyers

Product Differentiation: High-quality and special-performance products limit buyer choices. P6

Customer Concentration: Extensive market coverage and diversified customer groups weaken buyer bargaining power. P6

3.2.4. Bargaining Power of Suppliers

Supplier Diversification: Global supplier resources reduce dependence. P6

Procurement Scale: Large-scale procurement gives B Steel negotiating advantages. P6

3.2.5. Rivalry

Technical Leadership: B Steel's technological advantages affect the competitive landscape.P6

Capacity Utilization: High capacity utilization enhances market response speed.P6

Cost Competition: Cost advantages intensify industry cost competition.

3.3. Micro Analysis (SWOT)

Through SWOT analysis (Table 1), B Steel can more clearly understand its Strengths, Weaknesses, Opportunities, and Threats, thereby formulating corresponding strategic measures, optimizing resource allocation, and improving market competitiveness.

Table 1. SWOT Analysis of B Steel

Strengths, S		**Weaknesses, W**	
Dimension	**Content Description**	**Dimension**	**Content Description**
S1	Geographical and logistics advantages: Located in Zhanjiang, Guangdong, near the port, reducing raw material transportation costs.	W1	Capacity utilization and structure issues: Capacity utilization needs to be improved, and the product structure needs to be optimized.
S2	Capacity and product advantages: Large annual capacity, diversified products, meeting market demand.	W2	System compatibility and upgrade challenges: Poor compatibility between old systems and new modules.
S3	Technical integration and collaboration advantages: Integrating smart manufacturing, industrial robots, 5G, and AI technologies.	W3	Local process optimization is insufficient: Some digital processes are not fully optimized.
S4	Data-driven decision-making advantages: Using production data to optimize production and improve efficiency.	W4	High technology maintenance costs: The integration of cutting-edge technologies increases maintenance costs.
S5	Demonstration effect advantages: Digital transformation achievements attract government attention and enhance brand influence.	W5	Employee skills mismatch: Employees lack proficiency in new digital technologies.
Opportunities, O		**Threats, T**	
O1	Industry standard-setting opportunities: Participating in the formulation of intelligent manufacturing standards to enhance industry discourse power.	T1	Fast technology updates: Need to keep up with new technologies to avoid losing advantages.
O2	Expansion of business cooperation space: Exporting transformation experience and deep cooperation with upstream and downstream enterprises.	T2	Intensified market competition: Competitors accelerate digital transformation, and new entrants bring competition.
O3	Market demand growth potential: Southeast Asian market demand growth, domestic high-end steel demand increase.	T3	Raw material price fluctuations: Iron ore and coal price fluctuations affect cost control.
O4	Technology upgrade and innovation prospects: New production lines to meet the needs of emerging fields.	T4	Regulatory policy changes: Strict environmental and safety regulations increase compliance costs.
O5	Policy support and guidance: Circular economy and technological innovation receive policy support and guidance.		

3.3.1. Strengths, S

Geographical and Logistics Advantages: Located in Zhanjiang, Guangdong, near the port, reducing raw material transportation costs and enhancing market competitiveness.P7

Capacity and product advantages: Annual capacity of 8.23 million tons of hot metal, 8.92 million tons of steel water, and 6.89 million tons of steel products, diversified products meeting market demand (Eastmoney, 2025).P7

Technical Integration and Collaboration Advantages: Integrating smart manufacturing, industrial robots, 5G, and AI technologies to achieve efficient production.P7

Data-driven Decision-Making Advantages: Using production data to optimize production and improve efficiency.P7

Demonstration Effect Advantages: Digital transformation achievements attract government attention and enhance brand influence.P7

3.3.2. Weaknesses,W

Capacity Utilization and Structure Issues: Capacity utilization needs to be improved, and the product structure needs to be optimized.P7

System Compatibility and Upgrade Challenges: Poor compatibility between old systems and new modules.P7

Local Process Optimization is Insufficient: Some digital processes are not fully optimized, affecting efficiency.P7

High Technology Maintenance Costs: The integration of cutting-edge technologies increases maintenance costs.P7

Employee Skills Mismatch: Employees lack proficiency in new digital technologies.

3.3.3. Opportunities,O

Opportunities for Industry Standard Setting: Participate in the formulation of smart manufacturing standards to enhance industry influence.

Expand Business Cooperation Opportunities: Share transformation experience and engage in deep cooperation with upstream and downstream enterprises.

Market Demand Growth Potential: Growing demand in the Southeast Asian market and rising demand for high-end steel products domestically.

Technology Upgrade and Innovation Prospects: Build new production lines to meet emerging market demands.

Policy Support and Guidance: Circular economy and technological innovation initiatives receive policy support.

3.3.4. Threats,T

Rapid Technological Updates: Need to keep up with new technologies to avoid losing competitive advantages.

Intensified Market Competition: Peers accelerating digital transformation, new entrants bringing competition.

Raw Material Price Fluctuations: Fluctuations in iron ore and coal prices affecting cost control (Figure 4, Data source: Wind, State Investment Securities Research Center).

Changes in Regulations and Policies: Strict environmental and safety regulations increasing compliance costs.

Figure 4. Raw Material Price Fluctuations Cause Steel Price Volatility.

4. Existing Issues and Causal Analysis

4.1. Internal Management Issues and Causal Analysis

(1) Capacity Utilization and Structural Issues: Changes in the macroeconomic environment and the downturn in related industries can lead to a decline in market demand for cold-rolled products, resulting in idle capacity on B Steel's cold-rolled production lines and making it difficult to improve capacity utilization rates. B Steel has failed to adjust its product structure in a timely manner according to changes in market demand, resulting in an overly high proportion of mid-to-low-end products, which has impacted market competitiveness. This has prevented the full utilization of high-end product capacity, constraining overall capacity utilization rates. Unstable raw material supply or sales obstacles have led to waste of equipment resources, increased unit product costs, and impaired economic benefits, further limiting the effective utilization of capacity. The process flow of capacity utilization and structural issues is illustrated in Figure 5:

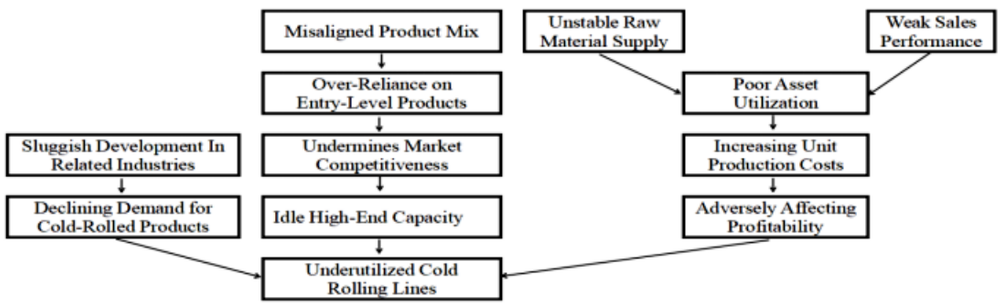

Figure 5. Process Flow Diagram of Capacity Utilization and Structural Issues.

(2) System Compatibility and Upgrade Challenges: As businesses expand and technology evolves, compatibility between legacy systems and new modules deteriorates, necessitating upgrades and renovations. Upgrades require significant investments in equipment and software maintenance, as well as substantial time and human resources, imposing economic burdens on businesses. Inadequate data interaction and integration between legacy systems and new modules may cause production delays, increasing technical risks and economic losses.

(3) Insufficient Optimization of Local Processes: Although some production processes have been digitized, the processes have not been fully optimized, resulting in issues such as poor information transmission and duplicate data entry, which affect overall efficiency and prevent the full potential of digitization from being realized. Some production processes involve excessive approval procedures and lengthy decision-making chains, leading to slow response times, missed market opportunities, and constraints on the improvement of overall operational efficiency.

(4) High Technical Maintenance Costs: The integration of cutting-edge technologies such as smart manufacturing systems, industrial robots, 5G, and AI requires specialized teams to ensure stable operation, increasing labor costs. B Steel must continuously invest funds in technological optimization, upgrades, and maintenance, thereby increasing operational costs. The complexity of these technologies elevates management challenges, and any technical failures could lead to production halts and significant losses.

(5) Mismatched Employee Skills: Some employees are accustomed to traditional production models and lack proficiency in new digital technologies, making it difficult for them to adapt to the requirements of work after digital transformation. In the new production model, there is increased demand for new skills such as data analysis and intelligent system management, but employee training outcomes may be inadequate, leading to low work efficiency and unstable product quality.

4.2. External Competition and Risk Issues and Analysis of Causes

(1) Intensified Market Competition: Other companies in the industry have recognized the importance of digital transformation and may accelerate their transformation efforts, emulating B Steel's model. Leveraging their own resources and cost advantages, they may quickly catch up during the transformation process, intensifying market competition. New entrants may introduce innovative business models and technologies, capturing market share and posing a threat to B Steel's traditional sales channels and market position.

(2) Rapid Technological Updates: Digital technology is evolving at an unprecedented pace, requiring B Steel to continuously invest resources in R&D and technology acquisition. However, this may result in situations where input does not yield proportional output, leading to resource wastage and the risk of technological obsolescence. New technologies may be difficult to effectively integrate into existing production systems, impacting the company's production efficiency and product quality.

(3) Fluctuations in Raw Material Prices: The steel industry is highly dependent on raw materials such as iron ore and coal, whose prices are subject to frequent fluctuations influenced by global supply and demand dynamics, geopolitical factors, and other variables. Rising raw material prices directly increase production costs, compress profit margins, and pose challenges to the company's cost control and profitability. If costs cannot be passed on to downstream customers, this will further impact the company's profit levels and increase operational risks.

(4) Changes in Regulations and Policies: Environmental and safety regulations are becoming increasingly stringent, requiring companies to invest more resources in upgrading digital environmental monitoring and treatment systems to meet regulatory requirements. This not only increases capital investment but also imposes higher demands on management capabilities. The frequent introduction of new policies and regulations may make it difficult for B Steel to fully understand and swiftly adjust business processes and technological applications to comply within a short timeframe, leading to uncertainties in compliance risks.

5. Improvement Measures and Recommendations

5.1. Internal Management Improvement Recommendations

(1) Adjustment of Capacity Utilization and Structure: Implement the four-factor correlation as shown in Figure 6:

Optimizing Resource Allocation: Addressing the issue of idle capacity and low utilization rates in B Steel's cold-rolled production lines, the company should promptly implement flexible product structure adjustment strategies. Leveraging local resources in the Guangdong-Hong Kong-Macao Greater Bay Area, the company should closely monitor real-time market dynamics in Zhanjiang and adjust product lines accordingly. The focus should be on developing high-value-added, high-tech products such as specialty stainless steel, electrical steel, and steel for new energy vehicles to enhance product competitiveness. Simultaneously, gradually reduce production of mid-to-low-end products that are market-saturated and low-profit to ensure more rational resource allocation.

Enhance Market Forecasting and Production Plan Adjustments: Utilize advanced data analysis tools and models internally to improve the accuracy of market demand forecasts and flexibly adjust production schedules. B Steel should optimize production scheduling to reduce idle time on production lines, increase equipment utilization rates, and ensure that production capacity aligns with market demand.

Establish Long-Term Stable Supplier Relationships: Through strategic procurement, establish solid partnerships with key raw material suppliers in Zhanjiang to achieve supply chain synergy. Signing long-term supply agreements not only ensures the continuity of raw material supply but also reduces costs through bulk purchasing and enhances bargaining power in raw material procurement.

Regularly Upgrade and Modernize Production Lines: B Steel should focus on improving production efficiency and product quality, as well as conducting regular internal training to enhance employees' sensitivity to market changes and their ability to respond, thereby better adapting to market changes and improving overall capacity utilization rates.

Figure 6. Four-element Correlation Diagram.

(2) System Integration and Upgrading: The influencing factors of each system are intertwined (Figure 7). For example, technological advancements may reduce production costs and minimize environmental impacts, while changes in environmental regulations may drive companies to invest in more energy-efficient technologies. Similarly, economic factors such as fluctuations in energy prices may influence cost control strategies in production management, while social factors such as public concern for environmental protection may prompt companies to improve water system management. Therefore, B Steel must comprehensively consider factors across these three dimensions when conducting production management, energy management, and water system management to achieve sustainable development. B Steel should implement a system integration and upgrade strategy by utilizing

a unified operating platform, standardized data interfaces, and modular design to enhance compatibility between different systems, ensure a smooth transition between new and existing systems, and lay a solid foundation for future technological iterations and functional expansions.

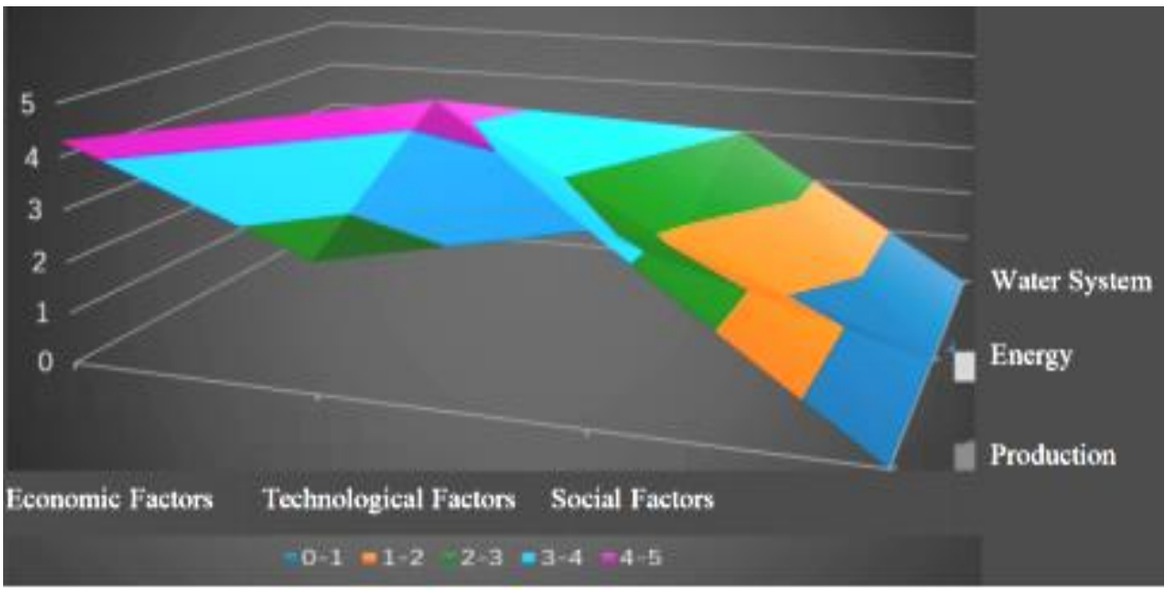

Figure 7. Rendering of the Upgraded 3D Analysis System.

(3) Localized Lean Management: To address the issue of insufficient optimization of local processes at B Steel, a range of optimization measures and solutions can be implemented. In production processes, advanced technologies and equipment can be introduced, standardized operational procedures implemented, and lean production management promoted to enhance efficiency and quality; in energy management, energy systems can be upgraded, an energy control platform established, and waste heat recovery and utilization strengthened to improve energy efficiency; in environmental protection and safety management, upgrading environmental protection technologies, improving safety management systems, and strengthening information technology infrastructure to enhance regulatory oversight and emergency response capabilities; simultaneously, strengthening enterprise information technology infrastructure, introducing intelligent technologies, and achieving intelligent upgrades of production processes and data-driven management optimization.

(4) Technical Cost Optimization Through Process, Staff, and Transformation Management Cycles, as Detailed in Figure 8:

Process	Personnel	Management	Transformation
Maintenance Strategy & Workflow Refinement	Competency Development & Cross-functional Collaboration	Asset Lifecycle Management & Supply Chain Localization	Digital Transformation & Intelligent Applications

Figure 8. Process Management Cycle Diagram.

Maintenance Planning and Process Optimization: B Steel should establish a more scientific and systematic maintenance plan. First, based on equipment usage frequency, wear and tear, and historical maintenance records, develop a regular preventive maintenance plan to ensure equipment operates in optimal condition. Second, introduce predictive maintenance technology to monitor equipment data in real time, identify potential faults in advance, and implement corresponding maintenance measures. Additionally, optimize maintenance processes by streamlining unnecessary steps to ensure maintenance tasks are executed quickly and efficiently.

Skill Enhancement and Team Collaboration for Maintenance staff: Strengthening the skill training of maintenance staff is key to reducing maintenance costs. B Steel should regularly organize technical training to ensure maintenance staff master the latest maintenance techniques and knowledge. Additionally, encourage communication and collaboration among maintenance staff to establish a teamwork mechanism for jointly addressing complex equipment issues. Furthermore, establish an incentive mechanism for maintenance staff to stimulate their work enthusiasm and innovative capabilities.

Spare Parts Management and Domestic Substitution: Spare parts management is a significant component of maintenance costs. B Steel should establish a scientific spare parts inventory management system, reasonably control spare parts inventory levels based on equipment maintenance needs and spare parts consumption patterns, and avoid inventory buildup and capital tied up in inventory. Additionally, actively seek domestic substitution solutions for spare parts to reduce procurement costs. Establish long-term partnerships with high-quality local suppliers in the Guangxi region to ensure the quality and supply stability of spare parts.

Digital Transformation and Intelligent Applications: Digital transformation is an important means of reducing maintenance costs and improving production efficiency. B Steel should increase investment in digitalization and intelligent applications, establish a maintenance management information platform for equipment, and achieve real-time data collection, analysis, and processing. Through data analysis, predict equipment failure trends and optimize maintenance plans. Additionally, introduce intelligent maintenance tools and technologies, such as intelligent diagnostic systems and remote maintenance platforms, to enhance the intelligence level of maintenance work and reduce labor intervention costs.

(5) Employee Digital Skills Training: In response to the issue of skill mismatches among B Steel employees and the fact that some employees are accustomed to traditional production models and lack proficiency in digital technologies, the company should strengthen employee training, particularly in digital skills, to enhance employees' ability to master new technologies. Concurrently, promote cultural transformation within the company to encourage employees to embrace and adapt to digital production models. Utilize methods such as sharing real-world case studies and demonstrating digital applications to enhance employees' understanding and confidence in digital technologies, thereby gradually addressing skill mismatches and resistance to traditional production methods.

5.2. External Risk Prevention Measures

(1) Integrate Production, Sales, and Research to Strengthen Cost Control and Improve Production Efficiency (see Figure 9): B Steel should continue to consolidate and expand its advantages in cost control through refined management and technological innovation to reduce production costs and improve production efficiency. For example, it can draw on the successful experience of the Energy and Environmental Protection Department of Zhanjiang Steel in controlling power generation costs, utilize peak-off-peak electricity price differentials to optimize power costs, and introduce market competition mechanisms to stimulate team innovation and efficiency.

Deepening Production-Sales-Research Integration and Intensifying Market Expansion Efforts: B Steel needs to deepen the substantive transformation of production-sales-research integration, promote deep integration among production, sales, and research, and unleash the wisdom and strength of efficient collaboration. Meanwhile, it should adopt a market-oriented, customer-centric approach, continuously intensify market expansion efforts, and continuously enhance the quality of service provided to users, thereby swiftly adapting to market changes and capturing market share.

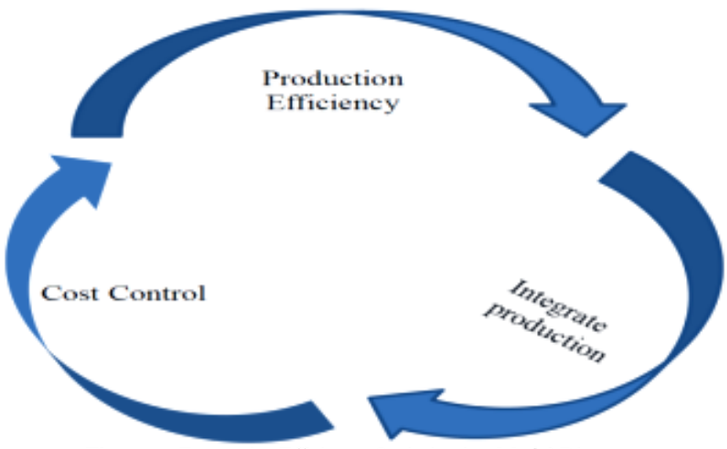

Figure 9. Enterprise Efficiency Optimization Model Diagram.

(2) Enhancing the Efficiency of Technology Conversion: In response to the severe challenge faced by B Steel enterprises, where rapid technological updates are not matched by proportional returns on investment, leading to resource waste, B Steel should increase its investment in technological research and development. This should involve not only actively introducing advanced production technologies from home and abroad, but also focusing on independent research and development to enhance technological innovation capabilities, ensuring that technological updates can be swiftly and effectively converted into actual productive capacity. Additionally, the company should optimize production processes, strengthen delicacy management, and adopt measures such as precise cost control and improved resource utilization efficiency to minimize resource waste during production. Furthermore, establishing a robust technical assessment and feedback mechanism is crucial to accurately evaluate the effectiveness of technical investments, adjust investment directions flexibly based on market and technological trends, and ensure that every dollar invested in technology yields maximum economic benefits, thereby achieving efficient resource utilization and sustainable corporate development.*(3) Supply Chain Management and Optimization:* Diversified Procurement Strategies and Supply Chain Optimization: B Steel should implement diversified procurement strategies to expand raw material supply channels and reduce reliance on single suppliers, thereby mitigating risks associated with raw material price fluctuations. Leveraging the geographical advantages of the Guangdong-Hong Kong-Macao Greater Bay Area, the company can establish long-term stable partnerships with multiple domestic and international suppliers. Through measures such as signing long-term contracts, flexibly adjusting procurement volumes and timings, the company can lock in raw material prices and minimize the impact of market price fluctuations on production costs. Additionally, optimizing supply chain management to enhance flexibility and responsiveness ensures stable raw material supply and reduces production risks caused by supply chain disruptions.

(4) Utilizing Financial Instruments for Risk Management: Actively employing financial instruments such as futures and options to hedge against raw material price volatility risks. Through futures markets, the company can lock in future raw material prices to mitigate uncertainties arising from market price fluctuations. Additionally, companies can establish risk management systems to monitor and issue early warnings for raw material price fluctuations in real time, enabling timely implementation of response measures. By reasonably utilizing financial instruments for risk prediction and management, B Steel can better control raw material costs and enhance the company's competitiveness and profitability.

(5) Promoting Green Circular Economic Development: In response to changes in environmental protection regulations and policies, B Steel should first establish a dedicated environmental protection management department responsible for tracking and researching the latest developments in environmental protection regulations to ensure the company stays informed and compliant with relevant policies; Second, increase

investment in the research and application of environmental protection technologies, and invest in advanced pollution control facilities, such as efficient dust removal, desulfurization, and denitrification systems, as well as wastewater treatment and recycling technologies, to reduce pollutant emissions; Third, optimize production processes, implement clean production practices, reduce waste generation during production, and improve resource utilization efficiency; Additionally, establish and improve an environmental monitoring system to conduct real-time monitoring of environmental indicators during production processes, ensuring that all environmental protection measures are effectively implemented; Concurrently, conduct environmental education and training to enhance employees' environmental awareness and participation, fostering a corporate culture of environmental responsibility; finally, actively participate in the formulation of environmental policies and industry standards, establish effective communication mechanisms with government agencies and industry organizations, and secure greater policy support and market opportunities for the company(see Figure 10). Thereby achieving green transformation and long-term development while adhering to environmental regulations.

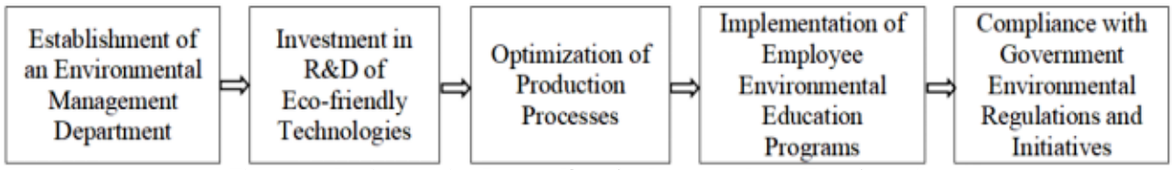

Figure 10. Implementation Process Chart for Corporate Green Transformation.

6. Conclusion

B Steel is a large steel production enterprise in Zhanjiang with stable production capacity and strong industry authority. Since 2014, domestic enterprises have begun to transition toward digital enterprises, and B Steel Co., Ltd. is also focusing on this transformation. Of course, in the current era of rapid economic and technological development, B Steel Co., Ltd. is inevitably facing numerous challenges. Following the above analysis and discussion, our team offers the following recommendations. Addressing issues such as internal management within the corporate structure and external objective influences encountered by B Steel Co., Ltd. during its digital transformation, we propose improvement measures for internal structural optimization and production capacity enhancement. We hope these suggestions will contribute to the company's future development.

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