Chapter 7
Quality Focus

Quality focused development, which means attaching importance to brand building and product quality improvement, is an important guarantee for an enterprise to achieve sustainable development. Quality is the cornerstone of brand building, service is the guarantee of brand promotion, innovation is the source of brand continuation, and culture is the essence of brand promotion. Through technological innovation and cultural construction, a "four-in-one" quality system of standardization, inspection, traceability, and informatization will be established so as to comprehensively improve product quality and service quality and fully build a brand system integrating quality, service, innovation, and culture, thus creating a brand enterprise with strong comprehensive competitiveness. From the development experience of the domestic and international steel industry, quality focused development is an inevitable choice for China's iron and steel enterprises to overcome the current obstacles and achieve sustainable development in the future.

7.1 History Review and Status Analysis

7.1.1 History Review

1. Development History of Brand Building of Domestic Iron and Steel Enterprises

A brand is a comprehensive logo of an enterprise and the goods or services it provides. Its purpose is to identify the product or service of a seller or a group of sellers and distinguish it from products and services of their competitors. As the core embodiment of the enterprise's excellent quality, a brand contains many factors such as trademark, attribute, name, packaging, price, history, reputation, and advertising method, which imply the quality and reputation of the enterprise and its goods or services. A brand is not only the quality commitment of an enterprise to consumers, but also an enterprise's trust level obtained from consumers. Although it is an intangible asset, the social awareness created by a brand can enable an enterprise

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to own strong cohesiveness and diffusive power, which will finally transform into the strong support and momentum for an enterprise's development. For consumers, a strong brand can enhance consumers' desire to buy; for producers, the brand is a sign of success. Therefore, brand building together with product quality, technology, management, service, etc., constitutes the core competitiveness of an enterprise. As for the understanding of brand building, iron and steel enterprises, like most manufacturing enterprises, have experienced the process from a unitary perspective to diversified ones, from tangible recognition to intangible one, from a company's own action to the requirements of the national strategy. As the iron and steel enterprises have increased their awareness in this regard, brand building has entered a stage of growth after the stage of formation.

Since steel products are mostly circulated in the form of intermediate products and unlike automobiles and home appliances, which are consumer-oriented, many iron and steel enterprises believe that the relevancy between a brand and an enterprise is relatively low. Therefore, for a long time, most iron and steel enterprises in China have neglected brand building, neglected the law of brand generation, and did not pay attention to science and technology investment, talent cultivation, and management innovation. The brand exists only as a product name and logo. At this time, the trademark of the product is equivalent to the brand, and the narrow brand has been formed. We define it as the period of brand building.

Since China's accession to the WTO, iron and steel enterprises have found that brands are so important to enterprises after getting more involved in the international market. Especially, in recent years, against the backdrop of the overcapacity, rising production cost, fierce market competition, weak domestic demand in the iron and steel industry, iron and steel enterprises have increasingly recognized that, in order to change the passive situation and achieve steady management and sustainable development, they must focus on enterprise brand building and meet the needs of customers to the greatest extent and win market recognition. In fact, from a certain perspective, brand value has become the lifeline for the survival of iron and steel enterprises. A dozen years after this, iron and steel enterprises have been continually exploring the road of brand building that adapts to their own development. Enterprise brands have been endowed with more value, cultural content, and individuality. Enterprises are experiencing their changes from simply establishing product names and symbols to creating high-end featured products and brand services, achieving integrity management and standardized management, fulfilling social responsibilities, and other comprehensive brand building endeavors. In the past two years, General Secretary Xi Jinping's important guidance of "promoting the transformation from made in China to created by China, from China's speed to China's quality, and from Chinese products to Chinese brands" has pointed out the specific development orientation of Chinese brands in the new context. Along this path, Chinese iron and steel enterprises have been constantly discovering new highlights for brand building and actively exploring a distinguished road of brand building so as to realize the rapid growth of their enterprise brands.

2. Development History of the Products and Service Quality of Domestic Iron and Steel Enterprises

From the nineteenth to the twentieth century, the global iron and steel industry developed rapidly and once became one of the industries with the greatest growing capability in world's industrialization process. Unprecedented improvement has been achieved in terms of the output value, product structure, as well as industrial technologies. Entering the twenty-first century, iron and steel is still an irreplaceable raw material for human beings and an important indicator for measuring a country's overall national strength and industrial level. Growing from nothing, China's iron and steel industry has also experienced a gradual development process. Product types and quality of domestic iron and steel enterprises are constantly improving, and the scope and depth of services provided to the downstream industries are also increasing.

(1) Product quality development process. The quality of China's steel products has experienced a development process from the inability to meet domestic demand to the basic satisfaction, and then to the continuous improvement of product quality. It has obtained strong competitiveness even in the international market.

During the 10th Five-Year Plan period, China's iron and steel industry embarked on a rapid development track, and in the 11th Five-Year Plan period, China's steel product structure was further optimized with complete product varieties and improved product quality. Self-sufficiency rate of most steel varieties reached 100%. Significant progress has been made in key steel varieties, high-strength construction steel plates, high-performance pipeline steel, steel for large hydropower stations, high-magnetic-oriented silicon steel, rails for high-speed railway, alloy materials for spacecraft, high-strength re-bars for earthquake-proof construction, and other high-performance steel materials have supported the development of the national economy-related fields and guaranteed the smooth implementation of major national projects and key construction projects such as the Beijing Olympic Games, the Shanghai World Expo, the West-East Natural Gas Transmission, the Three Gorges Project, the Beijing-Shanghai High-speed Railway, Manned Spaceflight, and Post-disaster Reconstruction.

After entering the 12th Five-Year Plan period, the contradiction in the quantity of China's iron and steel industry has been greatly weakened. Product structure adjustment was no longer simply a quantitative increase or decrease, but had begun to focus on improving the quality of steel products, facilitating the transformation, and development of the downstream industries, as well as promoting resource saving, energy saving, and emission reduction. During this period, improving the quality, grade, and stability of iron and steel products with large quantity, and market coverage was taken as the top priority of product structure adjustment.

Since 2010, along with the accelerating transformation and upgrading of the downstream industries, the structure of China's steel products has been further

optimized, and the localization rate of high-grade special steel has been significantly improved. For example, the localization rate of high-magnetic-oriented silicon steel for large transformers, ultra-high-strength steel plates for sedans, high-grade gear steel, and bearing steel for machinery, high-temperature and high-pressure resistant boiler tubes for power generation equipment, and other high-grade special steel products has been continuously improved. Reduction of steel usage has become the development trend of this industry. High-strength and material-saving steel products, represented by the Grade III deformed steel bar, high-strength automobile sheets, and high-strength shipbuilding plates, have seen an increase in the output and proportion. The steel product structure was, therefore, further optimized and the quality of steel products was further improved. Taking the high-strength re-bars in China as an example, we have witnessed the steady increase of its output and proportion. In 2004, the output of the high-strength re-bars of Grade III (HRB 400) and above was only 3.4 million tons, accounting for 5.8% of the national total re-bars output; but in 2015, this output has increased to 140 million tons and accounted for 92.2% of the total consumption. Output of the high-end products like automobile sheets, home appliance panels, and silicon steel in China has also grown substantially. In 2004, the output of the cold-rolled and galvanized automotive sheets in China was only 3.2 million tons, and by 2015, the output had reached 16.39 million tons. In 2005, China's oriented silicon steel output was only 132,000 tons, and the self-sufficiency rate was only 33.8%. By 2015, the output had reached 904,000 tons, achieving domestic self-sufficiency basically. The product quality and performance also saw significant improvement.

(2) The development history of service quality. For a long time, China's iron and steel industry has attached importance to production, construction, and operation while ignoring the coordination and cooperation with customers in the downstream industries, and attached importance to products manufacturing while ignoring providing services. Integration with the downstream industries is in low degree and the contacts among iron and steel products' R&D, production, and application are not close. Especially in the period before 2005, steel iron and enterprises often entitled themselves the "king in the industrial chain", with a weak sense of service and low level of after-sales service. Downstream customers generally had a lot of complaints about them.

The low service quality and service awareness in the iron and steel industry will affect the upgrading of steel products and the promotion of new products. For example, high-strength re-bars and other high-performance steel materials with mature production technologies have experienced a long promotion period; domestic industrial application of some high-end products like nuclear power evaporator tubes with production conditions and stainless steel furnace tubes for ultra-supercritical power station boilers has also experienced a relatively long process.

In recent years, the overall service level of China's iron and steel enterprises has been improved, but most enterprises only focus on improving production

process equipment and increasing product quality without paying enough attention to the demands of the downstream customers. Some measures to bring relations between the two parties closer are not in place, so that there is still a certain gap in adapting to the development of manufacturing industry. Here, is an example. During the joint product R&D between the iron and steel enterprises and the downstream customers, Chinese enterprises lag far behind the foreign enterprises in terms of the initial involvement. In recent years, only a few domestic iron and steel enterprises like Baosteel have made real-time early involvement with downstream customers in the joint product R&D.

Iron and steel enterprises in China lack the initiative to cooperate with downstream customers while just passively accept their requirements for material performance. With the development of steel products lagging behind, iron and steel enterprises still cannot get involved in the early stage to obtain the first-hand demand information so as to better guide the R&D of steel products. Currently, ThyssenKrupp in Germany and Nippon Steel and JFE in Japan have achieved an all-around early involvement in the R&D of automobile sheets. Nippon Steel and JFE have already conducted cooperation in depth with automobile manufacturers in Japan, the USA, and Germany. The two enterprises have been involved in the design, selection, and stamping of steel products in the early stage of new models' R&D and design to guide customers in selecting steel.

It is precisely because of the importance of service quality that mindsets have been changed at both the national and enterprise-level during the 12th Five-Year Plan period, emphasizing that iron and steel enterprises should transform their service concepts, enhance service awareness, and establish strategic cooperation mechanisms with downstream customers so as to promote the transformation of Chinese iron and steel enterprises from steel producers to service providers.

3. Development Process of Quality Focused Enterprises

Quality focused development, which means attaching importance to brand building and product quality improvement, is an important guarantee for an enterprise to achieve sustainable development. Therefore, the development process of quality focused enterprises is also the process of brand building and product quality improvement.

(1) Brand building. From the perspective of brand, brand effectively differentiates the products and services, and reduces the risk and complexity of purchases, and spreads the benefits that products or services can provide so that recognition will be fostered and trust will be established. In the past, enterprises engaged in the consumer goods sector have placed more emphasis on brands than manufacturers in the industrial sector. The growing contradiction between homogenized products and individualized demand in the industrial product market indicates that, in the future, marketing competition will be a brand battle and a competition for brand ownership.

Enterprise brand strengths include brand stability, brand leadership, and international awareness. In the long run, to achieve success in all the three

dimensions, the brand building generally employs the following five steps: brand planning, brand analysis, brand strategy, brand establishment, and brand auditing.

Brand planning. The key issue of brand planning is to strike a balance between sustainability and involvement. In order to achieve such balance, the following processes, steps, and procedures must be integrated within a enterprise: first, create an atmosphere for continuous transformation and the management should focus on the strategic orientation of the brand; second, determine the process of timely delivery of information, complete the competitiveness analysis report of brand positioning and brand recognition; third, develop relevant action plans based on the competitiveness analysis; fourth, ensure strong implementation; fifth, let everyone get involved into the plan.

Brand Analysis. On the basis of sufficient market research, the consumers, competitors, and the enterprise itself are analyzed in detail to determine and form the brand mission, characteristics, and brand value in line with its vision.

Brand strategy. Brand strategy formulation includes the brand's target market, brand positioning as well as brand architecture. Among them, the brand architecture includes three modes, which are company-led, product-led, and mixed-led.

Brand establishment. This includes establishing appropriate brand recognition, creating proper brand meaning, guiding right brand response, and fostering sound brand relationship with consumers.

Brand auditing. Brand auditing is designed to evaluate the strengths and weaknesses of a given brand or brand portfolio. The auditing usually consists of internal and external surveys.

(2) Quality construction. Quality concept is an important part of enterprise values and the core of brand awareness. Without a high-quality product as the foundation, it is impossible for an enterprise to build a famous brand. To create a famous-brand product, apart from promoting quality standards and ensuring the quality level, the key is whether the quality level of the product can meet the quality level demanded by consumers to the greatest extent, and whether an excellent quality culture has been formed. A sound quality culture will contribute to the long-term implementation of the brand strategy and is an integral part in the success of a quality focused enterprise. Creating a sound quality culture includes the following aspects:

The first is to establish a quality concept and formulate strict quality management standards; the second is to spread quality awareness through practical actions establish quality awareness through management tool innovation and implement quality awareness by relying on organizations; the third is to strengthen quality awareness through internationally accepted standard certification so as to improve the internal quality management level; the fourth is to gradually form its own unique quality management philosophy and quality culture, for example, Haier has formed its own featured High Quality Theory, OEC Management Mode, 6S Site Management Method, 6 Sigma Quality Management Method and so on; the fifth is the wide application of such quality culture.

Another example of Haier is that it has successfully merged many enterprises by using its enterprise culture, which is formed from the application of the intangible assets—quality culture. Quality culture has provided powerful support for enterprises to grow bigger and stronger.

7.1.2 Status Analysis

1. Brand Building Status of Domestic Iron and Steel Enterprises

For a long time, some iron and steel enterprises in China, such as Baosteel, Anshan Steel, and Taiyuan Steel, have been continuously implementing the brand image strategy based on enterprise culture, the top-quality strategy based on technological innovation, customer satisfaction strategy based on service innovation, and integrated spreading strategy based on core values. They have formed a brand cultivation system of their own and can guarantee to fulfill its commitment to the market and customers, thus establishing an enterprise brand. *China's 500 Most Valuable Brands* ranking list is evaluated by the World Brand Laboratory, chaired by the Nobel laureate in economic sciences and father of the euro, Robert Mundell, according to the financial analysis, consumer behavior analysis and brand strength analysis. The list has become an important basis for the intangible assets evaluation in many M&A processes with international authority. In 2016, (13th) *China's 500 Most Valuable Brands* list, five brands from the iron and steel industry rank among the Chinese national top brands based on financial, customer behavior, and brand strength analysis. See Table 7.1.

In 2013, on the basis of *Guiding Opinions on Accelerating the Brand Building of China's Industrial Enterprises* jointly issued by the Ministry of Industry and Information Technology and the National Development and Reform Commission, China Iron and Steel Association released the *Notice on Launching the Pilot of Iron and Steel Enterprises Brand Cultivation*, aiming to guide the enterprises which were implementing brand strategies to establish a comprehensive brand cultivation and management system, improve the ability and performance of brand cultivation, lead more enterprises to conduct brand cultivation in a more scientific way, and

Table 7.1 Ranking of the *China's 500 Most Valuable Brands* in 2016

Ranking	Brand name	Brand ownership	Brand value/$\times 10^8$ yuan
41	Baosteel	Baosteel Group Co., Ltd.	887.73
56	Anshan Steel	Anshan Iron and Steel Group Corporation	447.18
104	Shougang	China Shougang Group	280.57
141	Shagang	Jiangsu Shagang Group Co., Ltd.	237.59
258	Taiyuan Steel	Taiyuan Iron and Steel (Group) Co., Ltd.	129.64

lay a foundation for accelerating the cultivation of a number of self-owned brands with international influence. Iron and steel enterprises such as Shagang, Baotou Steel, Liuzhou Steel, and Shenglong Metallurgy have been included into the list of the brand cultivation pilot enterprises of the Ministry of Industry and Information Technology. More steel enterprises in China have entered the stage of rapid growth in brand building with their brand cultivation system being increasingly mature and brand cultivation ability and performance improving significantly. But looking at the overall status of the brand building in China's iron and steel industry, although we have long been one of the world's largest iron and steel producer, well-recognized Chinese steel brands in the global market are rarely seen no matter in terms of plates, long products or steel pipes. Lack of brand influence is still one of the important issues facing Chinese iron and steel enterprises. In fact, most Chinese iron and steel enterprises are not failing to pay attention to brand building. The difference lies in how high the brand building is placed in each enterprise, and how to systematically manage the cultivation activities relating to brand value appreciation so as to make it more efficient with better effect. The problems are mainly manifested in the following three aspects: weak brand management awareness, insufficient planning for brand building system, and insufficient brand cultivation and promotion of key products.

China's iron and steel industry are in a critical period of deepening reform comprehensively. It is of more important strategic significance to promote steel brands building and improve the brand cultivation ability of iron and steel enterprises. Iron and steel enterprises should take honesty as the foundation, improving product and service quality as the core, promoting the value of products and services as the guide, and scientific brand cultivation methods as the orientation, pay attention to technical innovation and product quality assurance as well as scientifically and rationally determine the brand cultivation strategies, goals, and management methods, so as to continuously promote their brand building.

2. Current Product and Service Quality of Domestic Iron and Steel Enterprises

(1) Status of product quality. After nearly ten years of rapid development in China's iron and steel industry, the quality of steel products can basically meet the domestic demand.

During the 12th Five-Year Plan period, steel products quality has been greatly improved, effectively serving the transformation, and upgrading of the downstream industries. The number of steel products that have certified by the foreign advanced physical quality level and won the *Golden Cup Award* has reached more than 500, with their production volume accounting for about 40% of the total steel output. Breakthroughs have been made in the development of such key varieties as high-speed rails, steel pipes for 600 °C ultra-supercritical thermal power generating units, 690 U-pipes for nuclear power, nickel-based low-temperature steel for LNG ships, and steel for offshore platforms under level EH36. The third-generation automobile high-strength steel, high-grade-oriented silicon steel, T4003 stainless steel, and other products are in the world's leading level.

Re-bars products: Production ratio of high-strength re-bars and anti-seismic re-bars has increased significantly. Finished rolled re-bars have been put into systematic production and the highest strength can reach 1,080 MPa. Finished rolled re-bars PSB500, PSB785, PSB830, PSB930, and PSB1080 have been in volume production and widely used in the large-scale water conservancy projects, industrial and civil buildings, and the large and medium-span bridges for roads and railways. High-strength finished rolled re-bars with level of 1,230 MPa have entered the research and development stage.

Automobile sheets: All varieties of steel products for the automobile and home appliance can be provided by domestic large iron and steel enterprises represented by Baosteel, Wuhan Steel, and Anshan Steel in large quantities with stable and reliable quality. High-end cold-rolled automobile sheets for domestic and Korean, Japanese, German, and other joint-venture cars can be provided by Chinese enterprises. It is understood that most of the steel products used by China's leading home appliance enterprises such as Meidi, Gree, and Haier are domestically made.

High-quality special steel bar: Remarkable progress has been made in its development and production as the quality of bearing steel and gear steel has been closed to the international advanced level. Taking bearing steel as an example, the average oxygen content of CITIC Pacific Special Steel Group's bearing steel is $5.5 \times 10^{-4}\%$ with high purity of liquid steel and low composition segregation. Bearing made from such steel has a long fatigue life and the quality reaches the international advanced level. The bearing steel has been certified by many well-known bearing manufacturing enterprises (such as SKF) in the world. The oxygen content of the bearing steel products made by Northeast Special Steel can be controlled at $5 \times 10^{-4}\%$, the titanium content can be stabilized at less than $20 \times 10^{-4}\%$, the nitrogen content can be less than $60 \times 10^{-4}\%$, and Ds is below Grade 1.0.

Certainly, many problems still exist in the quality of domestic steel products, such as implementation standards of some domestic steel products are not strict enough so that it is difficult to guide products' optimization and upgrading; for some varieties with high technology content, their quality and performance stability have always had a certain gap with foreign products and the demand of domestic downstream customers; backward production capacity still exists in large quantity due to unsatisfying backward capacity elimination. In addition, basic research of China's iron and steel industry lacks a solid foundation. The technological progress of the iron and steel industry mainly relies on the introduction and absorption from foreign countries with insufficient supply of original innovation, lagging collaborative innovation between enterprises and customers, and inadequate R&D investment and application of cutting-edge technologies and key common technologies, which restrict the further brand quality improvement of iron and steel products.

In the future, the iron and steel industry should firmly establish quality awareness and build a brand system with quality as its core. Enterprises should actively adopt such quality improvement technologies as clean steel production, precise

rolling, and consistent product quality management, and use tools and equipment with information and intelligent technologies to reduce human impact on quality control and improve the stability and consistency of actual product quality. Focusing on the quality benchmark, domestic enterprises should enhance their brand cultivation efforts and strive to produce more quality products in line with the international standards.

(2) Service quality. At present, some advanced iron and steel enterprises in China can be customer-centered with good service and quality while carrying out service standardized operations that can meet customers' requirements. Many iron and steel enterprises have extended their business to deep processing services, improved distribution, and logistics systems, provided standardized inventory management and timely delivery services, expanded sales channels, and strengthened technical support and after-sales services. They also provide material testing, steel saving, low-cost application technologies, and other services during processing. Some iron and steel enterprises even have opened up new service areas such as e-commerce and iron and steel Internet finance to promote service upgrading and create and share industrial chain value together with their customers.

Although the service awareness of iron and steel enterprises has been strengthened in recent years, the service quality still has a gap with the development of downstream customers. Initiative of China's iron and steel enterprises to cooperate with downstream customers is improving, but only some of them can make early involvement to obtain the first-hand information on demand to guide the R&D of steel products. Most iron and steel enterprises still lack deep cooperation with the downstream customers and few can participate into the design, model selection, and process test to guide the customers in selecting steel products in the early stage of R&D and design.

As a result, iron and steel enterprises should continue to strengthen the construction of the industrial chain. They should attach importance to establishing close cooperation with the downstream customers and timely understand or even guide their demands. With social progress, downstream customers do not only have new demands on the quality of steel products, but also put forward higher requirements for the relevant services. Iron and steel enterprises must keep in tight contact with customers so as to keep abreast of the changes in customers' demand. Facing increasingly fierce market competition, iron and steel enterprises should also push forward to the transform their service concepts and improve their customer management and service level. Compared with the products sales, providing services are of higher requirement and broader meaning, which covers the whole life cycle from product R&D, production, and application to recycling. Only by taking customers as the center and establishing an open service system that provides complete solutions for the downstream customers, iron and steel enterprises can continuously improve their service and take the lead in market competition.

3. Status of Quality Focused Development of Competitive Iron and Steel Enterprises

Today, the supply-demand gap of domestic steel products has been bridged, but problems in quality and varieties still exist. In particular, the development of key steel products in China lags behind, hindering further transformation, and upgrading of the iron and steel industry. Despite that China has become a net steel exporter, key steel products still heavily rely on imports. Steel products for some key areas such as offshore projects, aviation, and energy are not self-sufficient, which has brought bottlenecks to the development of the downstream industries. Domestic iron and steel enterprises with strong competitiveness like Baosteel, HBIS, and TISCO have strengthened their brand building and comprehensively improved product quality and service quality through technological innovation and enterprise culture construction. They have now embarked on the path of quality focused development.

Baosteel, as a new type of enterprise in China's reform and opening-up, has been shouldering the task of narrowing down the gap between the domestic iron and steel industry and the world's leading ones, realizing the leap-forward development and modernization of China's iron and steel industry, and meeting the demands for high-quality steel products in the national economic development. Through development of more than 30 years, the overall equipment and technical level of Baosteel has reached the international advanced standard, becoming the leader in the domestic iron and steel industry with its comprehensive competitiveness ranks among the top ones. Automobile sheets, home appliance panels, pipeline steel, electrical steel, ship plate, boiler and pressure vessel plate, steel for engineering and machinery, nuclear power steel, and other products produced by Baosteel have greatly met the needs of national economic development and provided strong support for the development of automobiles, home appliances, electricity, shipbuilding, energy, machinery, and other industries. It should be mentioned particularly that Baosteel has defined its automobile sheets as the strategic products. As it has successfully developed the 05 sheets, cold-rolled high-strength steel, and other automobile steels, Baosteel has established its leading position in the domestic automobile sheet field. With the world-class quality of the automobile sheets, the enterprise is now ranking among the first tier of the world's automobile sheets supplier.

(1) Market share. Currently, the market share of Baosteel's automobile sheets accounts for about half of the domestic market. The sales volume and market share of Baosteel's auto sheets have ranked the first in China for many years. Figure 7.1 shows the sales volume and market share of Baosteel's auto sheets in China in recent years [1, 2].
(2) Technology R&D. On the path of promoting quality focused development, Baosteel attaches great importance to the development of talent team and investment in technology research and development, and intensifies technological innovation, especially to enhance the reserves of future innovative products.

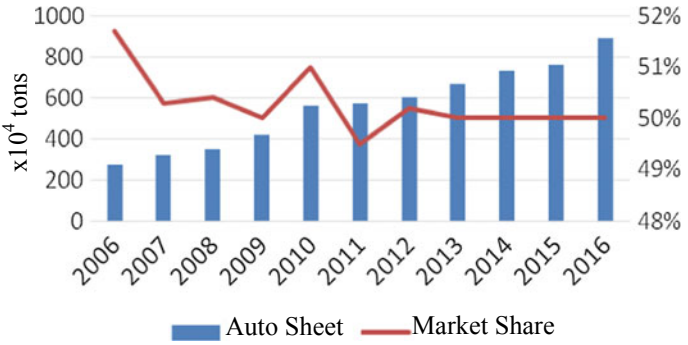

Fig. 7.1 Sales volume and market share of Baosteel's auto sheets

R&D personnel. Baosteel boasts the most powerful R&D team for the development and application of automobile sheets in China. In 2016, the total number of R&D personnel in Baosteel was 1,060, accounting for 2.8% of the company's employees.

R&D investment. In 2016, Baosteel's R&D expenses amounted to 3.662 billion yuan with an input rate of 2.0%. In 2015, 623 items with intellectual property rights were newly approved in China, including 326 invention patents, 253 new trial patents, and 44 software copyrights.

Development of new products and new technology. In recent years, new product development has made outstanding progress in Baosteel. Global issuance was achieved in the third-generation automobile steel QP1180GA and medium-manganese steel; BW300TP new wear-resistant steel has been successfully applied in the production of CIMC' s mixer trucks, extending the machine service life by more than two times. S-class ultra-high toughness drill stem successfully realized drilling of 8038 meters, breaking the record of the deepest well in Tarim Oilfield. NSGO B27R080, B30R090, and coiled tubing CT110 achieved world debut. All these have strongly supported the development of equipment manufacturing industry and major engineering in China. Products from the first domestic industrialized demonstration production line of thin strip continuous casting and rolling independently integrated by Baosteel has been put into the market in batches, marking a major breakthrough in the technological innovation of China's thin strip continuous casting process.

(3) Scientific and technological achievements. Baosteel adheres to take the path of technological innovation. Development and industrialization of low-temperature NSGO manufacturing technology have been realized. Innovation and application of 600 °C ultra-supercritical thermal power unit steel tube have won the first prize in the National Prize for Progress in Science and Technology. Independent-integrated UOE welded pipe production process has won the first prize in Metallurgical Scientific and Technological Progress Award.

Achievements, such as the integrated technology R&D for advanced high-strength (super-high-strength) thin strip steel product and equipment, development, and industrialization of high-grade non-oriented silicon steel manufacturing technology, have won the first prize in Shanghai Scientific and Technological Progress Award.

(4) Standard system. In order to meet the needs on production, research and sales of automobile sheets, Baosteel has sped up the standardization of new technologies and new products by adopting the technical standard strategy and playing the leading role of standards. Through these efforts, it is striving to demonstrate and reflect Baosteel's technology in domestic and international standards, expand its influence and grasp the initiative in market competition. A series of enterprise standards have been developed in succession, and enterprise standard system for Baosteel's automobile sheets has been initially shaped. Under the support of the authorities in charge of metallurgical industrial standards, Baosteel has planned and prepared the national standard system for automobile steel, filling the gap of China in this regard. At the same time, through the implementation of the technical standard strategy, on the one hand, the industrialization of innovation results is achieved, which can reflect the value of innovation results, on the other hand, market competitiveness of Baosteel's automobile sheets is further improved.

(5) Quality culture. Taking Volkswagen as an opportunity, Baosteel proposed "two transformations", i.e., to transform the product quality from satisfying the standard to meeting customer's requirements, and put forward the concept of "standard + α". α is the additional technical conditions of the customers apart from the supply standard. The second is to transform quality improvement from the closed type (solving the enterprise's own problems) to an open type, which means to put researches on the customer's needs and opinions on products in the first place, so that a "customer-centered" business philosophy has been gradually formed. With the enrichment of the "customer-centered" business philosophy, customer services have penetrated into the pre-sale, in-sale, and after-sale phases of products, including various aspects like product consulting and trial use, agent ordering, settlement, contract execution, supply channels, warehousing and transportation, cutting and distribution, KANBAN supply, disputes handling, technical support, customers' training, and early market intervention, so that customer service characteristics of Baosteel have been formed.

Baosteel advocates the "customer-centered" business philosophy and sticks to the strategy of "continuously meeting the needs of customers". With the idea of "focusing on customers, improvement, efficiency, value, and providing world-class products and services to society" which highlights the "consumer-centered" business philosophy, Baosteel takes making continuous improvement, quick response and efficiency increase as the starting point of all works and takes providing the society with the world's first-class products and services to maximize the value of the company and its social value as the foothold of all work, and these have become the guidelines for the company's sustainable development and continuous pursuit of excellence.

Based on the strategic goal of "becoming the world's most competitive iron and steel enterprise and the most valuable listed company worth investment", Baosteel takes improving competitiveness and achieving operational excellence as the striving direction of enterprise quality culture construction. The market "quick response" mechanism has been established. Through the implementation of ESI, it has established a continuous improvement mechanism for Six Sigma operations, implemented customization in large scale, created a learning-oriented organization, built a credit system, simplified departments, reorganized the business to achieve reengineering in a purpose to further improve work efficiency, management efficiency, and enhance Baosteel's core competitiveness.

(6) Brand core. Over the years, Baosteel has been committed to becoming "the best performance partner of leading automakers", which requires synchronization with the world-class quality assurance, execution capability, R&D level, and response speed. Therefore, "synchronization" has become a solid brand core of Baosteel's auto sheets. The brand meaning of "synchronization" fully reflects that Baosteel has been continuously made its auto sheets geared to the development of China's auto manufacturing industry, to the increasing demands of customers, to the continuous updating of the world's auto sheets technology, and to the comprehensive coordination and sustainable development of the society, which is the best interpretation of Baosteel's quality-oriented development.

7.2 Development Environment and Policy Orientation

7.2.1 Development Environment

General Secretary Xi Jinping pointed out in the *Proposal of the Central Committee of the Communist Party of China on Formulating the 13th Five-Year Plan for National Economic and Social Development* that during the period of the 13th Five-Year Plan, China is still in a period of important strategic opportunities to achieve great development, but the connotation of the opportunity period will undergo profound changes. Specifically, the period of important strategic opportunities for China's development is shifting from "accelerating the development pace" to "changing the development mode", and from "rapid expansion of scale" to "improvement of developing quality and efficiency". This is not only related to the changes in China's own development, but also closely related to changes in the international environment. Recognizing the new characteristics of the current international and domestic economy and market environment will help the iron and steel enterprises to have a more comprehensive and profound understanding of the importance of the quality building in the iron and steel industry.

1. Quality building is the inevitable choice for the iron and steel industry to adapt to economic globalization

   (1) Medium and low-speed growth in the world economy accelerates economic globalization. After a "golden development period" of the world economy in the past few decades, the USA subprime mortgage crisis in 2008 triggered the global financial and economic crisis, bringing the world economy into a long period of deep adjustment. Both the developed and developing countries are facing profound pressure of adjustment in that the medium and low-speed growth of the economy has become a new normal state.

   According to the update report of *World Economic Outlook* released by the International Monetary Fund (IMF) in April 2017, under the support of the long-awaited periodical recovery in the active financial market, the manufacturing industry, and trade sector, the global economy in 2017 and 2018 registered a growth rate of 3.5% and 3.6%, respectively. In the medium to long term, the global economy will gradually emerge from the impact of the financial crisis. As it is estimated by the IMF, by 2020, global economic growth will reach 4.0%. The IMF believes that the downside risks facing the world economic growth include: first, rise of trade protectionism pose increased restrictions on global trade and immigration, which will damage the productivity and people's income and exert adverse influence on the market sentiment; second, long-term demand insufficiency of private demand and stagnant reforms in developed economies may lead to sustained declines in economic growth rates and inflation rates; third, potential vulnerabilities, such as high corporate debt, declining profits, weak bank balance sheets, and weak policy buffers still exist in some emerging economies, which may influenced by the balance sheet effect generated from the tightening financial environment, capital-flow reversals, and the sharp depreciation of the currency; fourth, geopolitical risks and other non-economic factors continue to affect the economic prospects in all regions. For advanced economies, the risk of continued low inflation still exists so that an easy monetary policy must be maintained and unconventional strategies should be adopted depending on the circumstances. But easy monetary policy alone is not enough to fully boost the demand. As a result, financial support is of critical importance to the growth momentum of developed economies. Emerging markets and developing economies should strengthen their financial resilience and risk management to effectively cope with the challenges brought by the tightening global financial environment, sharp fluctuation of exchange rate and capital-flow reversals.

   Economic globalization refers to the globalization of trade, investment, finance, production, and other activities, that is, the optimal allocation of production factors on a global scale. Fundamentally, it is the high development of productivity and international division of labor and the outcome which requires further crossing the boundaries of nations and countries. Economic globalization is one of the important features of the contemporary world

economy and an inevitable trend of global economic development. In the new world economic environment, market opening has become an important impetus for world development. Economic globalization has not only provided a broader space for enterprises development but also presented great challenges. For enterprises, quality building in line with the international level will boost the development of enterprises, and at the same time, facilitate customers' recognition and sharing of products and services in various countries and regions. Faced with the new normal of medium and low-speed growth in the world economy, features like accelerating economic globalization, trade liberalization, internationalization of production, financial globalization, and globalization of science and technology have become more prominent.

(2) Quality building is a realistic need for iron and steel enterprises to adapt to the economic globalization and improve the level of international management level. Brand internationalization is an important means to implement the strategy of "going out", and quality is the most direct embodiment of the enterprises core competitiveness. With the acceleration of economic globalization, possession of internationally renowned brands, and high-level product quality has become an important means to lead the global resource allocation and market expansion and is the magic weapon for enterprises to win the market and customers. Against the backdrop of world economic globalization, the domestic steel market is facing severe challenges. Multinational steel giants such as Europe, Japan, and South Korea have rushed to occupy the Chinese market, putting tremendous pressure on the Chinese market while more and more Chinese iron and steel enterprises have moved to the global market due to the increasingly fierce competition. Competition in China's iron and steel industry has extended to the global market. The problem of "being big but not strong" in China's iron and steel industry has always existed, especially reflected by the lack of globally well-known brand. The competition among modern iron and steel enterprise is not only the competition of products and technology, but also the competition of quality. Implementing a quality focused strategy has become a sharp weapon for the marketing of domestic iron and steel enterprises. Faced with the radical changes in the domestic and international steel market environment, the survival and development of domestic iron and steel enterprises are under huge pressure. Implementing the quality focused strategy and creating world-class quality and brand will not only help the development of enterprises, but also facilitate the recognition and the sharing of products and services of customers in various countries and regions. It is an inevitable choice for enterprises to become bigger and stronger and to face up to the challenges of economic globalization.

2. Quality building is an important strategy for the iron and steel industry to respond to the new market atmosphere

(1) The new market atmosphere facing the industry.

1) Overcapacity in the iron and steel industry will intensify the competition. In recent years, with the large-scale construction of China's iron and steel projects and the release of production capacity, China faces severe overcapacity in the iron and steel industry as the demand growth slows down. China's crude steel capacity utilization rate has been 66% by the end of 2016.
2) Intensified trade friction has increased the difficulty in steel exporting. Due to the quality improvement of China's steel products and the low-cost advantage in competition, steel exports have increased significantly since 2004. In 2015, China's steel exports reached a record high with a total volume of 112.399 million tons, an increase of 19.9% on the previous year. However, with the growth of China's steel exports, trade frictions have also increased, and trade protection has become an important factor hindering China's steel exports. In 2015, there were 37 cases of trade friction in the iron and steel industry, involving a total amount of 4.7 billion US dollars; in 2016, 21 countries or regions initiated 49 investigations, involving a total amount of 7.9 billion US dollars, a year-on-year increase in the number and amount of cases. Under such influence, China exported 108.49 million tons of steel in 2016, down 3.5% from the previous year.
3) Enterprises have generally optimized their product structure, and the competition in the high-quality and special steel field become fiercer. In recent years, with the intensification of overcapacity in China's iron and steel industry, China's steel products have also entered an era of overall surplus, especially the excessive surplus in products such as re-bars, wire rods, and medium and heavy plates, and even in the high-grade steel varieties like oriented silicon steel, tire cord steel, stainless steel, etc. As a result, China's iron and steel enterprises have proposed to optimize and upgrade their product structure and develop competitive varieties that fit their realities. Many enterprises with a focus on plain steel have extended their businesses to the field of high-grade and special steel, making the competition in this sector more severe.
4) Customers put new and higher requirements on quality. As the downstream customers are committed to transformation and upgrading, there some new changes in the demand for steel materials: more common use of high-strength steel, and increasing requirements on steel's comprehensive performances. For example, in the machinery industry, steel for engineering machinery is transforming to high-strength and high-wearing type with special performances; in the shipbuilding industry, demand has been raised for the corrosion resistant, ultra-low-temperature, high-strength plates with ultra length, width and thinness or of special shape in building the liquefied natural gas (LNG) ships. At the same time, customers have more urgent requirements for the stability, consistency, and applicability of steel products and lay more emphasis on the integrated pre-sale, in-sale, and after-sale individualized service.

On the whole, the demand of downstream customers for iron and steel enterprise has evolved from pure quantity to quality focused requirement integrating quality, variety, and service.

(2) Quality building is an important strategy for the iron and steel industry to respond to the new market atmosphere and grasp the new competitive edge. Confronting severe market environment with weak domestic and external demand, serious overcapacity, and fierce competition of product homogeneity in the steel market, for the iron and steel enterprises to reverse the passive situation and achieve stable operation and sustainable development, they must actively adjust their development and management strategies, produce brand products with high quality, high credibility, high market share, and high economic benefit through market segmentation, specialized production, individualized service, and enhance the core competitiveness with quality and brand advantages to win market recognition.

7.2.2 Policy Orientation

Facing the complicated domestic and international economic situation and severe market environment, China put forward a series of guiding opinions on quality building from the perspective of policies, which is of great significance to the quality focused development of China's iron and steel enterprises.

1. *Guiding Opinions on Accelerating Brand Building of Industrial Enterprises in China* ([2011] No. 347, Ministry of Industry and Information Technology).

In July 2011, the Ministry of Industry and Information Technology, the National Development and Reform Commission, and other departments jointly issued the *Guiding Opinions on Accelerating Brand Building of Industrial Enterprises in China*. Its main purpose is to implement the guidelines of "promoting the building of independent brands, enhancing brand value and effects, and pushing forward the development of the large-scale enterprises owning globally well-known brands and international competitiveness" pointed out in the *Outline of the 12th Five-Year Plan for National Economic and Social Development of the People's Republic of China*. "Accelerating brand building of China's industrial enterprises is an inevitable requirement for promoting economic restructuring, transforming development models, and taking a new road of industrialization with Chinese characteristics; an objective need to adhere to the strategy of expanding domestic demand, release consumption potential, and enhance international competitiveness; a support to promote the development of industrial innovation and the transformation of scientific and technological achievements into practical productivity; a solid foundation for establishing and maintaining the quality reputation and creating an international image and influence of Made in China" are proposed in the guiding opinions. The overall goal of

brand building in the opinions is: "By 2015, China's industrial enterprises' innovation ability and brand cultivation ability will be significantly enhanced, and the market environment for the growth of industrial enterprise brand will be significantly improved. More than 50% of the large and medium-sized industrial enterprises will have formulated and implemented their brand strategies and their market share of brand products and brand added value will increase significantly. Focus will be attached on cultivating a number of self-owned brands with international influence".

This guiding opinion has raised the brand building to a strategic level that affects the overall development of the national economy and is of great significance for understanding the brand building of industrial enterprises. More and more iron and steel enterprises have incorporated brand building into their enterprise development program, and the international influence of Baosteel, Shougang, TISCO, and so on has been continuously enhanced. According to the *Proposal of the Central Committee of the Communist Party of China on Formulating the Thirteenth Five-Year Plan for National Economic and Social Development*, during the "13th Five-Year Plan" period, quality building is still the priority of development of manufacturing enterprises, and the main ideological line of the *Guiding Opinions on Accelerating Brand Building of Industrial Enterprises in China* will be maintained.

2. *Quality Development Outline* (2011–2020) (No. 9 [2012] of the State Council)

In February 2012, the State Council issued the *Quality Development Outline* (*2011–2020*). Development goals put forward in the Outline are: "By 2020, the construction of a strong country in quality will achieve remarkable results, quality foundation will be further consolidated, the overall quality level will be significantly improved, and the achievements of quality focused development will benefit all the people. A group of competitive enterprises with internationally renowned brands and core competitiveness will be cultivated, a batch of modern enterprises and industrial clusters with outstanding brand image, complete service platform, and first-class quality will be fostered, the inspection system for product quality safety and key products' quality will be established basically. Therefore, a solid foundation will be laid for building a moderately prosperous society in an all-round way and basically achieving socialist modernization in the middle of this century".

The Outline puts forward the work policy of "winning by quality" and requires to "comprehensively improve the quality management level, promote the construction of a strong country in quality, and boost the sound and rapid development of the economy and society". This has played a guiding role for the iron and steel industry to improve product quality awareness.

3. *Guiding Opinions on Accelerating Brand Building of Central State Owned Enterprises in China* (No. 266 [2013] of SASAC)

In December 2013, the State-Owned Assets Supervision and Administration Commission issued the *Guiding Opinions on Accelerating Brand Building of Central Government Enterprises in China*. The main purpose of this document is to help to improve the brand building level of central government enterprises, facilitate the

transformation and upgrading of central government enterprises, and achieve the goals of strengthening and perfecting central government enterprises and cultivating world-class enterprises with international competitiveness. It points out that "central government enterprises, as a major force in the international competition, must lead China's mature products, technologies and standards to go global, compete or cooperate with multinational companies in a wider field and at a higher level and strive to build a brand strength that matches the economic strength through positively building international famous brands". The guiding thought is to "gradually establish a sound institutional mechanism for brand cultivation, protection, and development of central government enterprises and achieve the goal of 'being stronger and better with world-class strength' by adhering to the scientific outlook on development as the guide, transformation of economic development mode as the main principle, independent innovation as the core, high quality as the cornerstone, refined management as the guarantee, and honesty as the lifeline". The main objectives are: "By the end of 2020, a number of enterprises with clear brand strategies, sound brand management systems, and outstanding brand building achievements will emerge; a number of well-known brands with high-quality products, excellent service, and wide influence will be formed; a batch of self-owned brands with proprietary intellectual property rights and international competitiveness will be fostered".

This document puts forward the main contents and implementation measures for the brand building of the central government enterprises, which charts the course for cultivating world-class central government enterprises, improving the level of international operations, winning new competitive advantages, and realizing the value maintenance and appreciation of state-owned assets. At the same time, it also provides guidance and reference for the state-owned and private iron and steel enterprises.

4. *Notice on Building Industrial Quality Brands in 2016* of the General Office of the Ministry of Industry and Information Technology (No. 104 [2016])

In February 2016, the General Office of the Ministry of Industry and Information Technology issued the *Notice on Building Industrial Quality Brands in 2016.* The notice is intended to require that "the local industry and information authorities and relevant industry associations should implement the *Proposal of the Central Committee of the Communist Party of China on Formulating the Thirteenth Five-Year Plan for National Economic and Social Development* and *Made in China 2025* based on the regional and industrial requirements to strengthen the planning of quality and brand building, formulate regional and industrial quality brand planning (action plan), or put quality improvement and brand cultivation at the prior place in relevant planning (action plan), as well as determine the work objectives and work content".

Quality and brand building will be included in the key tasks during the "13th Five-Year Plan" period to provide necessary conditions for a good start of the "13th Five-Year Plan". When iron and steel enterprises formulate their own "13th Five-Year Plan" for enterprise development, they should also incorporate quality building into the important development strategies by clarifying the direction and construction content of the enterprise's own quality building and carrying out works related to quality building in an orderly, efficient, and scientific manner.

7.3 Case Analysis

From the growth and development experience of the first-class iron and steel enterprises at home and abroad, product quality and service quality as well as building a brand system integrating quality, service, innovation, and culture are crucial to create a strong enterprise with international renowned reputation and comprehensive competitiveness.

7.3.1 Pohang Iron and Steel Co. Ltd. (POSCO)

Founded in 1968, Pohang Iron and Steel Co. Ltd. (hereinafter referred to as POSCO) is the largest steel complex in Korea and one of the most competitive iron and steel enterprises in the world.

The late 1990s was the second half of the rapid development of POSCO. During this period, POSCO was committed to improve customers' satisfaction and had become a world-class iron and steel enterprise through high-quality products and competitive technologies. POSCO successfully combined the traditional production process of blast furnace with new technologies like thin slabs to ensure an environmentally friendly and competitive process to the greatest extent, and to achieve greater competitive edge through high value-added products, and appropriate product combinations.

The auto sheet is POSCO' s flagship product and the key to keep its optimal competitiveness. Although the output of auto sheets accounts for only about 24% of POSCO' s total volume of products, the operating profit account for more than half of its total profit. Vehicle manufacturers across the world are using the auto sheets made by POSCO due to its excellent brand and quality. At present, the development direction of POSCO' s auto sheets is mainly making high value-added products such as TWIP steel and hot-forming steel. At the same time, it is actively promoting the application of magnesium sheets in automobiles. POSCO' s future development strategy is to steadily increase the sales of high value-added steel plates to improve economic performance.

In recent years, POSCO has maintained a strong competitive advantage by vigorously developing World Premium (WP) products and providing solution-based marketing service. Despite the sluggish global steel market, POSCO's 2016 financial report showed that its steel sales volume fell 5.0% to 24.32 trillion won due to the average sales price of carbon steel decreased 6.6% from KRW 606,000/ton in 2015 to KRW 566,000/ton in 2016. However, by expanding the sales of high value-added WP products and reducing costs while increasing efficiency, its operating profit increased by 17.7% to 2.64 trillion won with an profit margin of 10.8%, up 2.1% from the previous year. This was the first time since 2011 that the operating profit margin has reached double digits; the net profit in 2016 was 1.79 trillion won, with a significant year-on-year increase of 35.4% and the debt ratio fell to 17.4%, which

is the lowest level since it was founded. POSCO aims to improve its sales volume of WP products to 16.86 million tons in 2017, with an increased sales proportion to 52% and increase the number of products sold through solution-based marketing to above 4.5 million tons.

Thanks to its high-quality steel products and efficient marketing services, POSCO has earned considerable profits and achieved sustainable development, which well demonstrates what a world-class enterprise with quality focused development is.

7.3.2 Nippon Steel & Sumitomo Metal Corporation (NSSMC)

Nippon Steel & Sumitomo Metal Corporation (NSSMC) was formed through a merger between Nippon Steel Corporation and Sumitomo Metal Industries Co., Ltd. in 2012. For many years, high-strength auto sheets, high-corrosion resistant ship plates, high-power electrical steel sheets, and special material for steel cords are the four leading cutting-edge products of Nippon Steel. The company's focus is on materials for the high value-added sheets, pipes, and metal products in machinery, electronics, automobiles, home appliances, light industry, etc. These high-grade auto sheets and high-grade long products have brought enormous economic benefits to Nippon Steel.

With strong technical strength, Nippon Steel & Sumitomo Metal has long been committed to the development of high-end steel products and it can produce most of the special steels for world's supply. At present, Japanese iron and steel enterprises, including Nippon Steel, top the world in terms of output and export volume of high-quality and high-value-added steel.

Nippon Steel & Sumitomo Metal has been at the leading level in such products as the ultra-high-end seamless steel tubes, special engineering and machinery steel, and high-end auto spare parts. Based on the close cooperation with the automobile and energy industries, it has established a long-term common development mechanism with the customers. Meanwhile, after the integration of the manufacturing technology, commodity technology, and R&D capability of Nippon Steel Corporation and Sumitomo Metal Industries Co., Ltd., the company has further consolidate its strong market status by continuously improving the productivity and the comprehensive competitiveness of high value-added products via process innovations.

Nippon Steel & Sumitomo Metal uses its advanced technology and brand advantages to implement the globalization strategy so as to seize the emerging high-end steel consumption market. The main featured product of Nippon Steel & Sumitomo Metal is the high-grade auto sheets. The company has established joint ventures with ArcelorMittal and Baosteel, a leading domestic enterprise, thus increasing the production capacity of high-grade auto sheets on a global scale and becoming a technological leader in auto sheets manufacturing. High-grade auto sheets production bases of Nippon Steel & Sumitomo Metal locate in Mexico (TENIGAL, with annual production of 400,000 tons), Thailand (NSGT, 360,000 tons), India (JCAPCPL,

600,000 tons), etc., while the production bases of high-grade steel for energy locate in the USA (NSBS, 1.4 million tons), Vietnam (CSVC, 1.2 million tons), etc. In the future, it will continue to expand overseas production lines and seize the global market.

Nippon Steel & Sumitomo Metal aims to become the world's first iron and steel enterprise in comprehensive strength. It has been constantly pursuing the world's most advanced technologies and manufacturing capabilities to provide customers with quality products and services. Through promoting global development, strengthening cost competitiveness, and leveraging the advantages of advanced technologies, it will build an optimal production system and enhance the system of an iron and steel group company. The development path of quality-assisted internationalization is well reflected by Nippon Steel & Sumitomo Metal Corporation. The company has been vigorously optimizing its production technology, continuously increasing the market share of its flagship products while enhancing innovation, improving services, and expanding the downstream industry chain of high value-added products. As a result, it ultimately achieves sustainable development.

7.3.3 ArcelorMittal

ArcelorMittal is the world's largest iron and steel enterprise with businesses covering more than 60 countries and regions. ArcelorMittal is also the world's leading iron and steel enterprise, with its downstream markets, including automobiles, construction, household appliances, packaging, etc. Boasting the world's leading research and development capabilities and technologies, the company's businesses cover the world's major iron and steel markets, from the emerging markets to mature markets.

ArcelorMittal's becoming the world's best steel company is inseparable from its strong technological innovation system centering on product R&D. The R&D work of ArcelorMittal is carried out by the members of the Group's Management Board and the Senior Executive Vice President. The funds are all raised internally from the enterprise and directly allocated by the President for the product and process, quality assurance as well as long-term strategic development and research.

Auto business is one of ArcelorMittal's main businesses. In the global automotive steel sector, ArcelorMittal ranks the first among all suppliers of flat products. It also provides tailor-welded blanks, long products, and pipe products. In the field of advanced high-strength steel, coated steel, and patented products, ArcelorMittal is also a forerunner in technology. The company has an automobile department, which specializes in the production, R&D, and service of auto steels and the related products. It has established dozens of service centers related to the automobile industry in Europe in which hundreds of researchers have long been engaged in the design and research of the steel varieties for auto sheets and customer application technologies, such as stamping simulation, component performance, welding, etc. ArcelorMittal also built its own R&D laboratory in many countries.

Arcelor Automotive Steel R&D Center has established a common "design and partner" partnership with automobile manufacturers. Such partnership has ensured a close strategic collaboration with customers throughout the entire process of automobiles' development, design, and production. The center develops a full range of new automotive steel varieties, and researchers have conducted collaborative researches in hundreds of projects with car manufacturers, equipment manufacturers, and distributors. Currently, the group company has set up its new technology centers, respectively, in Detroit, the USA and Tokyo, Japan to jointly develop new series of steels for automobiles and strengthen cooperation with automobile manufacturers and equipment manufacturers.

Automotive steels of ArcelorMittal are outstanding in performance, including coating and surface treatment. Its technologies for external parts' galvanized steel and hot-stamped coated steel are all at the forefront status. By striking the best balance between light weighting and formability and assisted by its own international network and the co-processing centers, tailor-welded blank manufacturers and stamping manufacturers, the company provides products and technical services on a global scale.

ArcelorMittal's emphasis on the quality focused development by relying on innovation and its development model featuring innovation-driven brand building are worth learning by large domestic iron and steel enterprises.

7.3.4 China Baowu Steel Group Corporation Ltd. (China Baowu)

China Baowu Steel Group Corporation Ltd. (hereinafter referred to as "China Baowu") is the most powerful and modernized iron and steel enterprise in China. Apart from its unique product quality, its product service concept and service level are also far ahead among all domestic iron and steel enterprises.

China Baowu is the first one in China to carry out product R&D and customer technology research with the "early involvement" model, thus creating a strategic alliance of "Industry-University-Research Application". Creating value for customers is the long-standing service concept that China Baowu has been adhering to. Targeting at the needs and characteristics of China's auto industry, China Baowu carries out the "early involvement" to participate in the early stage of automobile design, provide technical solutions for steel materials application, conduct researches on advanced materials as well as provide technical support during application so as to meet the needs of automobile manufacturers. As a result, it has promoted the common progress of China Baowu and the automobile plants. For example, China Baowu has signed long-term technical cooperation agreements with many domestic automobile plants. It has carried out researches on auto steel sheets application with SAIC Volkswagen, built cooperation on auto body development and auto steel technologies with Hainan Automobile Company, and established a "Joint Laboratory of Auto Steel" with FAW; together with the power generation equipment manufacturing enterprises, research institutes, and higher-education institutions in Shanghai, a "Joint Entity for

Key Problems-Tackling of Equipment Materials and Its Heavy Castings and Forgings of the Power Station in Shanghai" was established to accelerate the progress of key materials for advanced power station equipment and heavy casting and forging and enhance Shanghai's major equipment manufacturing capability; it also established a "Joint Laboratory for Application Technologies" with the research center of Tsingtao Brewery Co., Ltd. to promote the application of tinplate. China Metal Packaging Research and Development Center was also founded to promote the overall technical level of China's metal packaging industry.

In order to enhance the opportunities and capabilities of early involvement and to provide customers with a "package solution", China Baowu also carried out researches on the extension technologies of related products. In the field of auto sheets, researches on the forming technologies of automobiles' spare parts such as hot stamping and hydroforming have been carried out, and industrialization of related technologies have been achieved, therefore, promoting the products application of China Baowu (hot-stamped steel sheets and high-strength steel) in domestic vehicles, stabilizing, and increasing the market share and facilitating the development of the iron and steel industry.

China Baowu also explores the "early involvement" that suits the development of the downstream industries. In the future, based on the automobile industry, it will expand into industries such as construction, home appliances, shipbuilding, and energy.

7.3.5 CITIC Pacific Special Steel Group Co. Ltd.

CITIC Pacific Special Steel Group Co. Ltd. is a specialized group company controlled by CITIC Pacific Limited, a Hong Kong-listed company subordinated to CITIC Group. At present, CITIC Pacific owns such core enterprises as Xingcheng Special Steel, Hubei Xinyegang Steel, Tongling Pacific Special Materials, and Jiangdu Pacific Special Materials. The group now has an annual production capacity of 9 million tons of quality special steel and is one of the global professional special steel enterprises with the most comprehensive production process equipment, varieties, and specifications.

Special steel is the key material for major equipment manufacturing and national key projects. With high technological requirements, special steel's production and application represent the level of industrial development of a country. Quality requirements for special steel products are very strict, including narrow chemical composition, high purity, good surface quality, high shape and dimensional accuracy, compact and uniform macrostructure, and desirable metallographic structure. Therefore, the proportion of special steel in total steel volume and the product structure, quality, and application of special steel are important indicators reflecting the development level of a country's iron and steel industry.

CITIC Pacific Special Steel Group Co. Ltd. has been implementing the strategy of creating famous brands. Xingcheng Special Steel has obtained well-known trademarks and famous provincial trademarks in terms of domestic brand building and enjoys a high reputation among domestic and foreign counterparts. Special steels with high quality, high grade, high surface quality, and high added value in line with international quality standards have been developed by Xingcheng Special Steel. Some products have even occupied the high ground of domestic and international markets and met the needs of major domestic customers. "Xingcheng" special steel products mainly include high-quality bearing steel, high-pressure tube billet, spring steel, high-performance gear steel, free-cutting non-tempered steel, mooring chain steel, automotive steel, etc. With relatively a high domestic market share, these products have well satisfied the demand of the downstream market, earning a high reputation in the special steel industry at home and abroad. Among them, "Xingcheng" high-standard bearing steel is the only special steel enterprise in China that has passed the certification of Sweden's SKF, German FAG, French SNR, Japanese NSK, etc. "Xingcheng" anchor-chain steel has passed the certification of classification societies in the USA, Britain, Germany, Japan, ROK, China, and Norway; "Xingcheng" engineering machinery steel has been the qualified supplier for the world's largest engineering machinery manufacturer Caterpillar Inc. for many years.

CITIC Pacific Special Steel takes the professional, special, and refined route of quality focused development. Built on its high-quality special steel products, it has been continuously enhancing its brand influence at home and abroad, and the goal of it in the future is to become the most competitive special steel enterprise in the world.

7.4 Prospects and Path Analysis of Quality Focused Trend

7.4.1 Prospects of Quality Focused Trend

Under the new normal, China's economic growth has transformed from high speed to medium-high speed. With the transformation of economic structure, development impetus, and development modes, the consumption intensity of steel per unit of GDP has decreased significantly and steel consumption has passed the peak value and begun going down. The "double reduction" of production and consumption indicates that China's iron and steel industry has entered a new era of development with decreasing quantity. During this period, iron and steel enterprises should attach great importance to brand building and product quality improvement to take the road of quality focused development.

Quality building covers both the brand building and product quality. The trend of quality focused development is to create a brand enterprise with strong comprehensive competitiveness by laying emphasis on brand building and promoting product quality.

Brand Building. Brand building is an integral part of an enterprise's decision-making and operation. It determines the image of the enterprise itself and the brand

image of the enterprise's products and also directly affects the survival and development of the enterprise so that every enterprise should attach great importance to it. Quality is the cornerstone of brand building, service is the guarantee of brand promotion, innovation is the source of brand continuation, and culture is the essence of brand promotion.

Product quality. Product quality is the foundation for the survival and development of an enterprise. Stable quality and excellent products are the basis for doing a good job, and the key to winning the market and achieving success. Through technological innovation and cultural construction, a "four-in-one" quality system of standardization, inspection, traceability, and informatization shall be built, so as to comprehensively improve product quality and service quality, and fully build a brand system that integrates quality, service, innovation, and culture, therefore, creating a brand enterprise with strong comprehensive competitiveness.

7.4.2 Path Analysis

1. Brand Building

Doing well in brand building to support the sustainable development of an enterprises mainly centers on brand building in product quality, service, innovation, culture, etc., and improving the enterprise's comprehensive competitiveness through these quality focused development measures.

(1) Quality culture construction. Construction of corporate quality culture should be promoted to continuously improve the quality management level. The first is to establish and improve the quality management system. Enterprises must establish and improve a management system and a consistent product quality model with quality as its core. The second is to implement the quality responsibility system. The quality responsibility system, production condition confirmation system, and process compliance system should be fully implemented. The third is to focus on process control. Enterprises should intensify the internal control management mode of product quality, lean quality management activities in production process and information platform building for quality process. The fourth is to promote the construction of quality culture. Enterprises should comprehensively promote the construction of quality culture featuring "integrity quality".

(2) Construction of the service system. A secondary customer service system for the company and the workshop should be established. The company should be responsible for the service guarantee of the core product customers and strategic customers, promoting the connection with the downstream customers' industrial chain and guarantee of product research and development, promoting EVI service model, enhancing the interdependency and tightness of cooperation between the two parties, and maintaining the market status of core products. Each production plant is responsible for the quality assurance and special requirements of all products, forming a rapid resolution method for quality

objections, and assigning quality tracking to key customers. The workshops are responsible for quality assurance in the manufacturing process.

(3) Construction of technological innovation. Technological innovation and new product development efforts should be encouraged. In accordance with the idea of "a generation of promotion, trial production, research, and planning", iron and steel enterprises should continue to invest in R&D and talent teams, vigorously develop new products, and implement quality brand strategy. Relying on the integration mechanism combining internal Industry-Sale-Research and external Industry-University-Research, enterprises should adapt to market changes and tap potential market demand, strengthen the development, and promotion of new products and new technologies, make innovations for the customer demand-oriented products, and take the initiative in market competition.

(4) Cultural construction.

1) Building culturally advanced company. In the critical period of accelerating transformation and upgrading of the iron and steel industry, enterprises should start from the four dimensions of "cultural progress", "value creation", "production safety", and "green development" to carry out the building of culturally advanced companies internally. Such effort is of essential and practical meaning to guide the management to pay attention to the basic management work, enhance the ideological and moral cultivation of civilization of all employees, further reinforce the overall cohesiveness and effectiveness of the team, promote stable, and sound development, and improve the positive image of the enterprise. Formulating enterprises' documents needs to be integrated with the system construction. By making integration into the culture of employee responsibility, it can be more standardized on the foundation of laws so as to push ahead the implementation of building culturally advanced companies.

2) Perfection of Enterprises Culture Handbook. Cultivation of cultural atmosphere requires standardized management, guidance, and publicity. Therefore, it is very important to establish an effective publicity platform to maximize and sustain the positive cultural impact. Enterprise Culture Handbook is an effective formal publicity platform that can exert lasting influence.

Enterprises should further optimize the Enterprise Culture Handbook with the goal of establishing a cultural handbook for internal learning and external communication. It should be ensured that the mission, vision, core values, related concepts guided by core values, and the enterprise spirit are complete and expounded clearly combined with the enterprise's key emphasis in the handbook. Content in the handbook should clearly answer the questions of "why", "what", and "how to do", and provide targeted descriptions at the organizational, individual, and departmental levels. Preparation of the handbook should be conducted from the perspectives of awareness, capability, behavior, effect assessment, mechanism improvement, and establishment of system process. In-depth enrichment of the concept and content of the culture handbook can be made in which the concepts of talent, quality,

marketing, etc., corporate spirit and corporate image could be added. Meanwhile, consistency between the content and form in the handbook should be strengthened to make designing based on the overall style and ensure the color and picture are matched in each part and each page. Via the cultural handbook, the purpose of enhancing internal quality while building external image can be achieved.

2. Quality Improvement

(1) Quality system requirements should be improved, and product research and development production process should be optimized. Enterprises should implement full process management control by adhering to the links of contract review, quality planning, and process control, etc., and set up an inspection point to conduct review, analysis, and summary for critical technologies, quality, delivery, service, and others, improve the technical level and the ability in stabilizing the quality of key processes so as to ensure a stable product quality.

(2) Strengthen quality management and improve the stability of product quality. Enterprises should strengthen process quality control, take effective corrective or preventive measures to solve problems in-process quality control, continuously improve the capability in-process quality control, and improve process management level; they should establish process quality control points and adopt effective control methods to have control on key processes and ensure the normal processes are under control; meanwhile, delicacy management should be strengthened and operating procedures should be strictly performed to reduce product quality problems caused by human and improve the overall product quality.

(3) Strengthen the Industry-University-Research Application cooperation study, accelerate the R&D of new products and improve quality. Enterprises should strengthen the Industry-University-Research Cooperation, carry out technical cooperation with relevant universities and research institutes, actively draw from advanced product development and production technologies at home and abroad, and realize the R&D, production, and sales services for high-end varieties through cooperative joint venture development and patent technologies transfer so that product quality and market share can be improved gradually.

While making cooperation with research institutes, they should attach great importance to the collaboration with downstream customers. Special new products for customers can be developed jointly with the customers through "early involvement" to extend the cooperative relationship from simple sales to comprehensive services, and the product quality can be improved via the first-hand feedback to enhance product competitiveness.

7.5 Industrial Practices of Quality Building

In the past several years, the concept of quality focused development has been actively implemented by China Metallurgical Industry Planning and Research Institute (hereinafter referred to as MPI) in its planning and consulting processes, which has guided the industry and enterprises to embark on a path of quality focused development.

As a staff department for the central government and local authorities at all levels, MPI participates in a large number of the researches and preparation for the policies in the iron and steel industry as well as in the development planning for some major steel provinces and regional industries. Among these efforts, requirements for quality focused development run through the whole process of policy-making and industry development planning. For example, the institute has participated in preparation of the *Planning for Adjustment and Upgrading in Iron and Steel Industry* (*2016–2020*), in which chapters on "Improving Quality Level" and "Strengthening Brand Building" are illustrated and the importance of improving product quality is repeatedly emphasized through the text.

During making planning for iron and steel enterprises, MPI is also guiding them to head toward quality focused development. When doing consulting research of market analysis and product positioning for enterprises, it will have an in-depth understanding of downstream customers' demand for steel varieties, specifications, and quality, as well as market demand trend for product quality and service so as to chart the course for enterprises' product quality improvement, adjustment in variety, and structure and brand establishment.

As an state-level authoritative consulting institution for iron and steel, MPI has been continuously innovating the concept of consulting services, playing a role in innovation and transformation and leading the development of the industry, which includes the steel brand evaluation and iron and steel enterprise competitiveness rating. MPI has formulated the steel brand evaluation system, which evaluates the steel brands of domestic iron and steel enterprises from five aspects: quality, market, service, innovation, and brand building. By focusing on brand strategy, brand recognition, brand communication, brand crisis, brand assets, brand applications, etc., this system helps steel companies to cultivate their brands, expand brand influence, and enhance internal quality. In addition, MPI has carried out and issued the "Competitiveness Rating for Iron and Steel Enterprises" for seven consecutive years since 2011. The rating is based on three aspects, namely the enterprise's basic competitiveness, development competitiveness, and business performance competitiveness, 13 elements and 25 indicators. The result is evaluated combined with experts' study and assessment, exerting a strong influence inside and outside the iron and steel industry. Above two tasks have effectively aroused the attention of a great number of enterprises on the role of brand and quality in enhancing the overall competitiveness of enterprises, and have strongly promoted the quality focused development of the whole industry. In the future, China Metallurgical Industry Planning and Research

Table 7.2 Practice of China Metallurgical Industry Planning and Research Institute in promoting industrial quality focused development

No.	Type	Main content	Typical case
1	Policy research and formulating	Including the basic research and preparation of the national iron and steel industry development plan, a series of research projects in the major steel provinces and regional industrial planning, etc.	*Planning for Adjustment and Upgrading in Iron and Steel Industry (2016–2020) Study on Major Issues in China's Iron and Steel Industry in 2020—Variety*
2	Planning and consulting for enterprises	Including steel varieties, quality, brand, and other aspects	Development plan in the "13th Five-Year Plan" period for a batch of large and medium-sized iron and steel enterprises such as Wuhan Steel, HBIS, Shandong Steel and Ma'anshan Steel
3	Evaluation and rating of brand, competitiveness, etc.	Incorporating indicators like quality, innovation, service, and brand building into the evaluation of steel product brand and enterprise competitiveness	"Competitiveness Rating for Iron and Steel Enterprises" has been released for 7 consecutive years since 2011

Institute will continue to fulfill its role in promoting the quality building of the industry while being a good consultant for the government, an industry leader, and a think tank for enterprises.

The specific practices of China Metallurgical Industry Planning and Research Institute in promoting quality focused development of the industry is shown in Table 7.2.

References

1. Annual Report of Baoshan Iron and Steel Co., Ltd., 2006–2016.
2. Memoir of Baoshan Iron and Steel Co., Ltd., 2006–2016.