

The Human Capital Role in the Process of Transformation of Chinese Manufacturing Enterprises

Gao Yan* • Wang Li Hong**

Abstract Under China's supply-side reform, to transform and upgrade has become the inevitable choice to develop Chinese manufacturing enterprises. Human capital is a strategic premise for manufacturing enterprises to transform and upgrade, and this is why it is particularly urgent for Chinese manufacturing enterprises to implement human capital strategy.

This paper first states the status quo of human capital of Chinese manufacturing enterprises, then discuss the characteristics of core competencies and human capital at different development phases through analyzing the developing path of manufacturing enterprises for transformation and upgrade, and finally proposes the corresponding human capital strategy for Chinese manufacturing enterprises to transform and upgrade.

Keywords: Chinese manufacturing enterprises; core competence; characteristics of human capital; human capital strategy; transformation and upgrading.

JEL classification: J24 ; O15; F16

1. Introduction

Since the reform and opening-up, the manufacturing strength of China has greatly improved, and China has become the world's largest manufacturing country. However, compared with developed countries, manufacturing industry of China is still mainly in the low-end links in the international division of labor. Increasing labor costs, overcapacity, lack of technical competitiveness, rising purchase prices, per capita efficiency bottlenecks and other problems plague most of Chinese manufacturing enterprises, so the transformation and upgrade of manufacturing enterprises are imminent. "The purpose of industrial upgrading is to improve labor productivity, especially the total factor productivity, which reflects the higher requirements for human capital of labor force".¹ The "Made in China 2025" describes a magnificent

¹ Cai Fang, Wang Meiyuan. For the future economic growth accumulation of human capital [J]. Shanghai

Gao Yan*(✉), Wang Li Hong**

*Ph.D. Professor at School of Economics and Management, Northwest University, Shan Xi, China
e-mail: nwyangao@126.com

**Northwest University, Shan Xi, China

blueprint of the construction for manufacturing power, takes the human capital as the fundamental to build manufacturing power, and puts forward the new and higher requirements for human capital development.^{2[2]} To this end, this paper focuses on the transformation and upgrading of manufacturing enterprises and human capital strategy.

This paper first states the status quo of human capital of Chinese manufacturing enterprises, then discuss the characteristics of core competencies and human capital at different development phases through analyzing the the developing path of manufacturing enterprises for transformation and upgrade, and explores the corresponding human capital strategy to build organizational competitive competencies, hoping to provide a theoretical and practical reference for Chinese manufacturing enterprises to carry out the effective human capital strategy to realize the transformation and upgrading.

2. The Status Quo of Human Capital Development in Chinese Manufacturing Industry

2.1. The Overview of Human Capital in Chinese Manufacturing Industry

Since the reform and opening-up, the total amount of human capital in Chinese manufacturing industry has been increasing. The data shows: the number of manufacturing enterprises is 358,665 in 2015,³ an increase of 1.79% over the previous year; the average number of employees increases from 52, 3615 million in 2010 to 87.1095 million in 2015, and the growth trend maintains(See fig.1). With the market gradually becoming the basic way to allocate labor resources, China initially establishes the market model of manufacturing human capital development.

The expenditure of national finance for education has increased significantly, and the per capita human capital increased from 28,000 yuan in 1985 to 121,000 yuan in 2014,⁴ which lays a good foundation to develop human capital. Meanwhile, human capital investment channels continue to expand.

Personal and family education spending has increased significantly, and has become an important source of human capital development.

Enterprises fully participate in vocational education and become the main part of investment, especially carry out joint research activities with various schools, and at the same time strengthen employees' training.

Manufacturing enterprises and education system form a mutually beneficial cooperation through the transfer of technical results, commission development, joint development, and the establishment of technology development agencies which carry out various forms of production and research cooperation.

Fig. 1. Average annual employment of China manufacturing enterprises (ten thousand people)

Social Science Community Eleventh Academic Annual Meeting, 2013 (10): 15-21.

² Shao Anju. Upgrade Path and Countermeasures from "Made in China" to "Quality Manufacturing" [J]. Economic Aspect, 2016 (6): 42-46

³ China Statistical Yearbook in 2016, <http://www.stats.gov.cn/tjsj/ndsj/>

⁴ Dou Zhengyan, Gao Wenshu. Study on human capital accumulation in manufacturing under the background of China's economic transformation [J]. Human Resources Development of China, 2016 (3): 89-94.



Data source: 《China Statistical Year Book》 & 《China Industrial Economic Statistical Year Book》

2.2. Insufficiency in the Total Amount of Human Capital in Chinese Manufacturing Industry

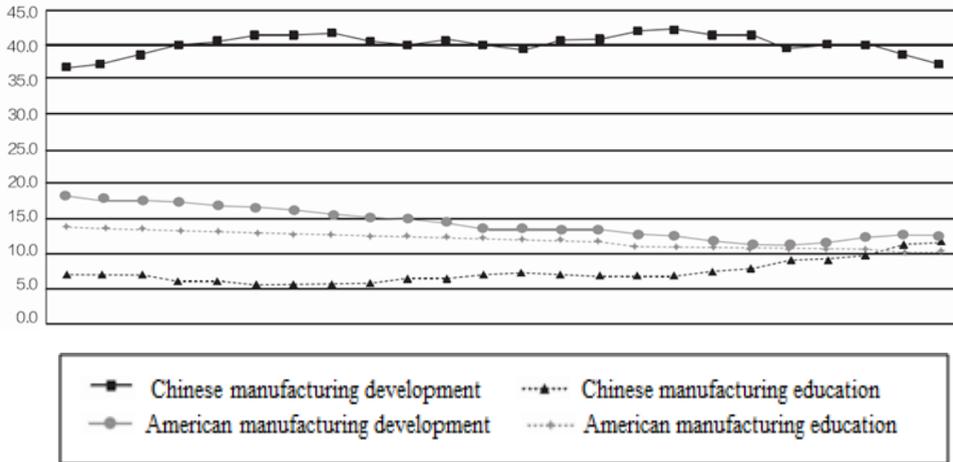
In terms of quantity, China's human resource is very rich. However, compared with developed countries, the level of human capital development in China is lower, far behind the needs of the transformation and upgrading of China's manufacturing industry. Compared with the developed countries in Europe and America, the human capital development of China is lagging behind, especially in the manufacturing human capital education and training system. The United States, Germany, Japan and other developed countries have established a systematic and complete manufacturing talent education/training system to provide high-quality human capital for the manufacturing industry, thus helping the manufacturing enterprises to build up the foundation for technological progress and development.

In contrast, human capital investment, education and training in China's manufacturing industry have not yet formed a complete and scientific system. China's investment, education and training system are still rigid with a "planned color", which is difficult to reflect the reality of the market demands, leading to the mismatch of human capital resources. This has not only led to the loss of educational resources and investment, but also caused talent shortage-especially of skilled human capital and high-end technical talent development lag.⁵

In general, the level of human capital in China is seriously lagging behind the overall level of economic development of the country. Among them, the development of manufacturing human capital is far from the requirements of transformation and upgrading of manufacturing industry (see Fig. 2), which to some extent restricts the pace of Chinese manufacturing transformation from the low-end links to the high-end links in the global manufacturing chain.

⁵ Ibid.

Fig. 2. Comparison of Sino-US Manufacturing Development and Education in 1992-2015



Data source: “China Statistical Year Book” and “World Economic Development Report”

2.3. Shortage of Skilled Human Capital in Chinese Manufacturing Industry

Although the quality of China’s human capital has improved greatly since the reform and opening-up, it is still lower compared with developed countries, which has become a bottleneck for Chinese manufacturing industry competitiveness. First, the low quality of human capital is difficult to adapt to technological progress and the requirements of high-end links in the industrial chain. It can bring negative impacts on learning by doing and restrict the sustainable development of human capital capacity. Second, China’s skilled human capital has a greater gap between supply and demand. The report released by the monitoring center of labor market information network in China shows that the demand rate of various skilled human capital is above 1 since 2005. The demand rate of technician, senior technician and senior technical staff further had been climbing to 2.3-2.7 in 2014.⁶ Therefore, there is an increasing trend for the gap between supply and demand of skilled human capital in China.

In short, shortage of high-quality human capital and the structural problem of human capital has seriously restricted Chinese manufacturing enterprises in enhancing their technical capacity and achieving their transformation and upgrading. How to build effective human capital to satisfy the need of core capability in manufacturing transformation and upgrading has become an important problem to be solved urgently by manufacturing enterprises.

3. The Core Competency and Human Capital at Different Developing Phase in Transformation and Upgrading of Chinese Manufacturing Enterprises

Human capital is an important supply factor of innovation, undoubtedly an essential strategic resource for the transformation and upgrading of manufacturing enterprises.

⁶ Ibid.

However, different transformation and upgrading strategies have different requirements for the “suitability” and “effectiveness” of each enterprise’s human capital. Based on the global value chain theory and the model of transformation and upgrading of enterprises,^{7 8 9} this paper divides the transformation and development path of Chinese manufacturing enterprises into three phases: OEM (Original Equipment Manufacture) , ODM (Original Design Manufacture) and OBM (Original Brand Manufacture) , i.e., from OEM to ODM to OBM. The path shows that the process of transformation and upgrading of manufacturing enterprises is the process of expanding the scopes of “value chain activities” on the basis of continuously upgrading its “core competencies”.¹⁰ In this process, each manufacturing enterprise at different phases has different characteristics and faces different problems and difficulties, requesting to build different human capital to ensure the required core competencies to promote the transformation and upgrading of manufacturing enterprises.

3.1 The Core Competencies and Human Capital at OEM Phase

At OEM phase, OEM enterprises assemble and manufacture according to product specifications and designs provided by the brand customers, and they also deliver goods in accordance with customer-specified forms. OEM enterprises involve only assembly and manufacturing activities in the value chain activities. In general, the core competencies of OEM companies rely on low cost, scale effect, and efficient manufacturing. The enterprise’s competitive strategy at this phase is to strengthen its processing and manufacturing capacity to solidate its position in the value chain. In the production process of OEM phase, enterprises gain the competitive advantage through mastering and constantly improving the production process of midstream products. This advantage allows enterprises to continue to obtain a large number of commissioned processing orders and stable profits. Therefore, the human capital required by enterprises at this phase is mainly production-oriented human capital.

Production-oriented human capital is production line employees who can find and solve problems in production practice by mastering the production process and enterprise technology, also with high operating skills. It is essential for OEM manufacturing enterprise to own a large number of various types of production-oriented human capital. Production-oriented human capital can understand and master the company’s production processes, so receiving more skill trainings. It is more helpful to discover the deficiencies of existing production process, improve the level of enterprise technology, reduce production costs, improve product quality and gain competitive advantages. In addition, the learning curve effect of production-oriented human capital is

⁷ Hobday M.. East Asian Late Comer Firms: Learning the Technology of Electronics□J□.World Development, 1995 (23) : 71-93

⁸ Mao Yushi, Dai Yong. OEM, ODM to OBM: Research on Independent Innovation Path of Enterprises in Emerging Economy [J]. Economic Management, 2006 (10): 10-15

⁹ Amsden, A., 1989, Asia’s Next Giant: South Korea andLate Industrialization, New York, Oxford University Press.

¹⁰ Yang Guiju. Foundry enterprise transformation and upgrading: the evolution of the theoretical model of the path [J]. Management of the world, 2010 (6): 132-142.

more obvious.¹¹ Learning curve effect is an important return on the production-oriented human capital investment. With the increasing work proficiency, the time required at the same work is reduced, bringing the increasing marginal returns to the enterprise.

3.2. The Core Competencies and Human Capital at ODM Phase

At ODM phase, ODM enterprises not only have efficient assembly and manufacturing capabilities, but also have a complete product development and design capabilities. ODM enterprises not only engage in assembly and manufacturing activities, but also involve in R&D and other value chain activities. In general, the core competencies of ODM enterprises lie in R&D design capabilities and business control capabilities. At this phase, the main competitive strategy of enterprises is to transform the manufacturing capacity to R&D design capabilities in order to further enhance the level of technology, reduce costs, improve quality and enhance innovation and brand awareness. From production-oriented to brand-oriented, from low-end value chain to the high-end value chain upgrading, at this phase, enterprises must ensure the production and manufacturing capacity as well as the training to strengthen knowledge and operation skills in the management and R&D. The human capital required by enterprises is mainly firm-specific and innovation-oriented human capital at this phase.

Firm-specific human capital reflects the value of employees that is unique to a single firm. It grows with tenure and experience in the enterprise. Its growth is accelerated by in-house training and structured programs of movement through related jobs. Firm-specific human capital is distinguished by its special value to the employer in which it is developed; thus, it is less marketable to other organization.¹² Innovation-oriented human capital reflects that employees have attributes and qualities to ask questions, solve problems, and create a new situation of cause. Firm-specific and innovation-oriented human capital is the important condition at ODM phase. Because the core values required at this phase focus on diligence, pragmatism and excellence as well as emphasises on innovation and ownership. Product innovation requires not only employees to carry out long-term knowledge development in their jobs, the systematic and group knowledge, but also the need for them to creatively apply knowledge and create new knowledge through connection and integration.

Meanwhile, human capital is required to communicate and collaborate with other functional departments within the enterprise to obtain information and knowledge. Enterprises only with long-term knowledge learning and development, reverse innovation and other ways can gradually reach the deep in the value chain. Japan and South Korea have spent a long time on the upgrading in the manufacturing value chain from manufacturing to the R&D design, and have developed firm-specific and innovative human capital.

¹¹ Yu Maozhao. Specific human capital and the transformation and upgrading of China's manufacturing enterprises [J]. Contemporary Economic Management, 2014 (9): 52-56.

¹² Haig R. Nalbantian, Richard A. Guzzo, Dave Kiffer and Jlay Doherty: Play to Your Strengths Managing Your Internal Labor Markets for Lastng Competitive Advertage, New York: McGraw-Hill, 2004

The human capital is not able to be obtained in the market by way of purchasing but only developed gradually via company's internal training and "learning by doing".

3.3. The Core Competencies and Human Capital at OBM Phase

At OBM phase, OBM enterprises can develop their own products and delivery its own-brand products. Apart from complete product productions and design capabilities, OBM enterprises should invest in brand, channels, after-sales service and other business activities. In general, OBM's core competencies lie in brand marketing capabilities, channel and branding capabilities, higher productivity and faster multi-directional communication, more cohesive and team player, and the comprehensive utilization of resources, which are challenges for many enterprises. Therefore, the human capital allocated by enterprises at this phase is mainly business human capital and interdisciplinary human capital.

Business human capital refers to a human capital with broad knowledge and all kinds of management ability (such as analysis and judgment, comprehensive decision making, organization and coordination, learning and innovation) and can optimize the allocation of resources. It is a kind of heterogeneous human capital with increasing marginal returns capital. Interdisciplinary human capital is a multi-functional human capital, which shows the interdisciplinary and various abilities in many areas, setting business knowledge, network information technology, marketing and other knowledge and skills in one of the human capital.

At the OBM phase, the production of advanced manufacturing products will need to continuously absorb the electronic information, computers, machinery, materials, modern management technology and other aspects of high-tech achievements, and these advanced manufacturing technologies integrate with application of manufacturing products R&D design, manufacturing, testing, marketing services and management of the whole process.

In addition, with the development trend of globalization, network, knowledge and information technology in the world economy, enterprise innovation system has experienced the transformation from a single closed R&D system to an opening innovation system integrated with R&D, manufacturing and market.¹³ If an enterprise wants to improve the efficiency and effectiveness of manufacturing upgrading, it requires a large of business & interdisciplinary human capital to achieve information, automation, intelligence, flexibility, ecological production and economic and social and market results.

Summary of the core competencies and human capital at different phases of manufacturing transformation and upgrading can be described in the following table (See Table 1).

¹³ Zhao Shuming, Bai Xiaoming. Innovation-driven enterprise talent development research [J]. Journal of South China Normal University, 2016 (5): 93-98.

Table 1. The Core Competencies and Human Capital at Different Phases of Transformation and Upgrading of Manufacturing Enterprises

Business phase	Core Competencies	The Characters of Human Capital	Purpose of Transformation and Upgrading
OEM phase	Low cost, scale efficiency, Efficient processing and manufacturing capacity	Production-oriented human capital	From OEM to ODM phase
ODM phase	R&D design capability, Business control capability	Firm-specific & Innovation-oriented human capital	From ODM to OEM phase
OBM phase	Marketing capability, Brand operational capacity	Business & interdisciplinary human capital	From present to bigger and stronger

4. The Human Capital Strategy at Different Developing Phase in Transformation and Upgrading of Chinese Manufacturing Enterprises

By the above analysis, we can see that the core competencies of manufacturing transformation and upgrading at different phases are different, so the characteristics of human capital are different too. It is necessary for manufacturing enterprises to make innovation as the guidance, select the appropriate human capital strategy to develop human capital capacity and improve organizational innovation according to the characteristics of human capital needed at different phases of manufacturing transformation and upgrading.

4.1. The Human Capital Strategy at OEM phase

OEM manufacturing enterprises need to cultivate low-cost, economies of scale and high-efficiency core capabilities of the manufacturing and manufacturing personnel, and to focus on the development of production-oriented human capital in order to promote the transformation and upgrading from OEM to ODM. At OEM phase, the human capital strategy is as follows:

1. Pay attention to production-oriented human capital investment. The development of human capital in this period mainly reflects on the growth scale. Enterprises should be through external recruitment and internal training to form a certain number and quality of human resources for enterprise manufacturing capacity and efficient customer response to the formation of the foundation.
2. Enhance the employees' quality consciousness. Enterprise should make the employees realize the importance of ensuring the product quality, enhance the employee's sense

- of responsibility, improve the comprehensive performance of employees and improve production efficiency and product quality through various forms of training, business skills competition, strict quality inspection and control, etc.
3. Provide various incentives. Enterprise should create a more harmonious and friendly working environment, enhance the sense of belonging, identity and loyalty, better encourage employees to consciously improve the efficiency of the enterprise employee, remain enterprise employee liquidity at a lower level, form the basis for stable production through a variety of means such as the enterprise culture, salary incentive and welfare improvement.
 4. Implement humanized management. Enterprise should change the past management concept to make employees not only management objects but also clients; care about the attitude, career planning and cultural quality of employees; and achieve flexibility and flexibility in the work system as well as scheduling and production scheduling to fully tap the strengths and advantages of employees and also respect employees' personality.

4.2. The Human Capital Strategy at ODM phase

At ODM phase, manufacturing enterprises need to cultivate the ability to enhance organizational R&D design and business control capabilities, focusing on the development of firm-specific, innovative human capital in order to promote the transformation and upgrading from ODM to OBM. At ODM phase, the human capital management strategy of the enterprise is as follows:

1. Guide and stimulate employees to participate actively in firm-specific, innovation-oriented human capital investment. Enterprises should set the priority of human capital investment ideas, continue to increase investment, accumulate employees' firm-specific and innovation-oriented human capital investment enthusiasm and encourage employees to participate in professional skills training to meet the need of technical progress and innovation in the enterprises' transformation and upgrading. Enterprises should motivate employees to consciously participate in multi-skilled on-the-job training adapting to the rotation of the flexibility and improve production efficiency and innovation.
2. Create actively an atmosphere for innovative employees' growth. Enterprises should build a good environment and an open cultural atmosphere for the sustainable development. Enterprises should create a good system environment, working environment, research environment and living environment, create a strong human capital atmosphere with respect, cherishment, love and good care for talents from top to bottom within the industry and the enterprise and also maximize employees' enthusiasm and promote employees' innovation and vitality so that all kinds of professional and technical talents can play a key role.
3. Establish a long-term labor contract. The achievement of firm-specific and innovative human capital mainly depends on "learning by doing", and needs a longer period for human capital accumulation in knowledge and experience. Only if an enterprise

provides long-term labor contracts to employees, employees are willing to invest in firm-specific and innovation-oriented human capital. Japan and Germany in practice are using long-term employment systems, providing a guaranteed job for technical backbone employees.¹⁴ It not only greatly promotes the employees' human capital investment in firm-specific and innovation-oriented capabilities, but also the development of its advanced manufacturing.

4. Implement human capital equity incentive. Equity incentives are one of the most effective incentives.¹⁵ Enterprises can motivate employees through equity arrangements for skilled human capital investment. Among them, the most important means are to make specific, innovation-oriented human capital access to the enterprise's residual claims as corporate shareholders, enjoy the fruits of enterprise development, and completely improve its human capital investment income. From the practical experience of developed countries such as the United States and Germany, we can see that because of the long-term incentive for employees with specific and innovation-oriented human capital, it has promoted the accumulation of human capital and promoted the transformation and upgrading of manufacturing enterprises.

4.3. The Human Capital Strategy at OBM phase

At OBM phase, manufacturing enterprises need to cultivate organizational marketing ability, channel and brand operation ability of talent, focus on the development of business and interdisciplinary human capital in order to achieve organizational bigger and stronger goals. At the OBM phase, the human capital management strategy of the enterprise is as follows:

1. Increase the business and interdisciplinary human capital investment. Enterprise should build a comprehensive system of human capital development, speed up the establishment of a sound scientific and rational human capital development mechanism, and increase the business and interdisciplinary human capital investment and nurture in the recruitment, configuration, training, promotion, career development and other aspects. Enterprise should also cultivate interdisciplinary talents through the creation of internal self-management and creative platform, across the organizational boundaries to stimulate the spirit of independent innovation and ability to promote corporate human capital structure and organizational business strategic adjustment.
2. Build innovative, open, cooperative and shared ecosystems¹⁶. Enterprises should not only strengthen the existing internal talent training and development, but also focus on obtaining senior personnel through the head hunting, network platform and other external media accesses. Meanwhile, enterprises should establish a new global thinking of human capital supply, from regional integration of human capital

¹⁴ Gao Yan. Enterprise human capital management research [M]. Beijing: China Economic Publishing House, 2011.p57.

¹⁵ Jack J.Phillips: Investing in Your Company's Human Capital, AMACOM, 2005.p113

¹⁶ Shao Anju. "China made" to "high-quality manufacturing" to upgrade the path and countermeasures [J]. Economic aspect, 2016 (6): 42-46.

- capacity to its global intergration. Instead of seeking all human capital, enterprises should use human capital and effectively integrate various types of enterprise resources, knowledge and ability to form a “mutual benefit” community.
3. Diversify incentive methods. Enterprise should innovate the employment relationship model, support the human capital partner and other institutional innovation. The staff contribution and encouragement closely linked to enhance the staff self-management ability and participation in the interactive will promote human capital and monetary capital of the enterprise co-governance, sharing and win- Enterprise human capital value chain. Huawei’s employee shareholding plan and Haier are examples of human capital initiative. At the same time, through the establishment of special incentive funds and the principal system, enterprises encourage professional, technical personnel and outstanding top-notch talent come and talent can gain fame and fortune.
 4. Create the corporate culture of “artisan spirit”. Advocate love, dedication and the professional attitude of excellence. Create a firm-specific staff, pragmatic, and the work of the atmosphere. Establish the “quality is the life of the enterprise”, “quality in my hands” business philosophy.¹⁷ Use “operational master contest” and “job skills training” and other labor competition activities to stimulate employee’s work enthusiasm to improve job skills. Establish training mechanisms, and more ways to enhance employee’s job skills and comprehensive quality, to create a self-driving force to promote enterprise development.

Summary of human capital development strategy of manufacturing enterprises at different phases can be described in the following table (See Table 2).

Table 2. The Human Capital Strategy of Manufacturing Enterprises at Different Phases of Transformation and Upgrading

Business Phase	Core Human Capital	Human Capital Development Strategy			
		Recruiting and Configuration	Training and Development	Incentive System	Performance Evaluation
OEM Phase	Production-oriented human capital	A large number of recruitment of skilled workers, emphasize the staff responsibility	Production skills and quality, consciousness training	Material incentives, supplemented by welfare conditions for improvement and cultural construction	Production-oriented evaluation system

¹⁷ Wu Aihua, Su Jingqin. Human capital specialization, innovation ability and new product development performance - based on the type of technological innovation empirical analysis [J]. Science Research, 2012,30 (6): 950-960.

Business Phase	Core Human Capital	Human Capital Development Strategy			
		Recruiting and Configuration	Training and Development	Incentive System	Performance Evaluation
OBM Phase	Business & interdisciplinary human capital	Merger, headhunting access to senior talent, global talent exchange interaction	Both internal and external, comprehensive development	Diversified incentives, innovative corporate employment relationships	Business - oriented & comprehensive evaluation system

5. Conclusion

Under China's supply-side reform, transformation and upgrading has become the key to achieve the sustainable development of Chinese manufacturing enterprises. The transformation and upgrading of manufacturing enterprises needs the integration of various factors such as market, system and enterprise ability. The human capital is an important strategic condition for Chinese manufacturing enterprises to realize the transformation and upgrading. Chinese manufacturing enterprises should not only pursue the low cost strategy in the transformation and upgrading. They should carry out the effective human capital strategies and develop their human capital competence based on the development strategy at different phases of transformation and upgrading in order to encourage employee's initiatives, improve labor productivity and organizational innovation, and acquire the sustainable competitive advantage.

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