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Enhancing the Competitiveness of “Made in China”

Implementing Lean Production

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Introduction

China’s manufacturers have had significant growth and made substantial progress over the past 30 years. A clear cost advantage, upgraded infrastructure, and products tailored to emerging markets have helped enterprises capture enormous market share in numerous product categories. Nevertheless, changes in the competitive landscape and various market shifts pose serious challenges to China’s manufacturers.

Globalization has brought about competition between companies in developed countries and those in emerging markets. Global trade and investment barriers have been lowered, and the vast majority of industrial markets are riding the globalization wave. Enterprises in developed countries are expanding global market share by seeking opportunities in growing emerging markets, and these companies have launched technology and products in order to compete. In response, emerging-market enterprises have invested in technological capabilities and improved product quality—and will have to continue to do so to be contenders.

The deceleration of China’s economy and the expansion of its affluent population are also requiring China’s manufacturers to shift their focus. The recent slowdown of domestic economic growth has resulted in overproduction and forced some companies into intense competition for consumers in a relatively stable market.¹ Meanwhile, China’s affluent population is expanding, reaching 120 million in 2012, a number that is expected to increase to 280 million by 2020. Currently, the annual household disposable income of the affluent is at least RMB 125,000, and their consumption behavior has shifted from mass-produced merchandise to mid-tier and high-end products that signify a discerning taste. (See *The Age of the Affluent: The Dynamics of China’s Next Consumption Engine*, BCG Focus, November 2012.) These are changes that China’s manufacturers cannot ignore.

Finally, the cost of labor and land in China has been surging in recent years, which has led to sending low-value-added labor-intensive manufacturing from China to other emerging markets in Southeast Asia and Central and South America, where such costs are much lower. However, some high-value-added manufacturing may be shifting back to the U.S. Over the past five years, the cost of labor in China has grown, on average, more than 10 percent annually. Research by The Boston Consulting Group (BCG) shows that when consider the variation of labor efficiency, the difference in labor costs between China’s coastal regions and low-cost areas in the U.S. will narrow to less than 40 percent. After logistics costs and import duties are taken into account, the cost advantage of being made in China will be reduced significantly.

Given the above situations, China’s manufacturers must shift their focus to producing products for the middle markets.

Winning New Markets

The key to winning the middle markets lies in manufacturing reliable products at a reasonable cost. To achieve these goals, companies must start by taking the following steps.

First, make a substantial investment in production engineering and equipment. Currently, except in very rare cases, enterprises can purchase advanced equipment, such as large hydraulic equipment, laser-welding robots, and high-precision machining centers, from global suppliers. Such equipment can help manufacturers quickly make improvements to product quality and production efficiency in the short term. Since all enterprises can adopt this approach, however, it rarely leads to sustainable differentiation.

Second, improve internal production-management approaches and capabilities. This is critical to achieving sustainable competitiveness. It is also a highly challenging task. But companies must tackle it to achieve a breakthrough in quality and efficiency. There is no other choice.

Fortunately, enterprises can leverage the experience of companies in developed countries. Germany and Japan, both known for their manufacturing of high-quality products, have companies with experience developing processes that shifted product quality and production efficiency from low to high. These companies also developed theories and principles for others to follow. In Japan, Toyota’s production system became the standard by which other enterprises measured manufacturing quality and efficiency; in Europe and the U.S., the lean production methods derived from Toyota’s model are the underpinning of today’s Western manufacturing industry. Such models can be of great theoretical importance and practical value to enhancing production management at China’s manufacturers.

Years ago, many large Chinese manufacturers started to introduce the philosophy and practices of lean production. Among other things, the companies conducted theoretical training, selected a core production team to visit lean enterprises, promoted fundamental lean factors and tools (for example, visualized management, standard operation, and 5S), built a lean production academy within the enterprise, and invited experts from home and abroad to supervise senior executives in the production department. Enterprises expected to enhance production management’s capabilities using the lean approach.

However, BCG’s experience and observations show that many of these enterprises have yet to achieve favorable results from their efforts. The implementation process encountered so many obstacles and proceeded in fits and starts that the management at some enterprises even started to question whether lean principles could be adapted to manufacturing in China. We have observed the following common setbacks:

- ◇ Production executives understand lean factors and how to use the tools to achieve fast, short-term results, but these managers are unable to sustain the use of lean approaches and reap the long-term benefits.
- ◇ Production executives see results but do not know how to measure the improvements or the return on investment.
- ◇ Companies establish large groups or teams to implement lean production, which sometimes lowers overall efficiency and does more harm than good.
- ◇ Production executives apply lean approaches and tools without customizing them for specific areas or to achieve certain improvements.
- ◇ Production executives fail to obtain cooperation from other departments, which hinders the implementation of lean production.

- ◇ Middle management is preoccupied with day-to-day tasks and doesn't focus on lean production.
- ◇ Front-line workers have not seen the benefits of lean production and therefore continue to operate as they did in the past.

Some of these issues exist because of the current development stage of the Chinese manufacturing industry or specific production situations. For example:

- ◇ Many enterprises operate on a large scale, have a fast development pace, and prioritize sales; the production unit is low on the list of executives' priorities and has little say in matters.
- ◇ Manufacturers that have highly customized products, volatile demand, and short delivery times do not have time to develop the fundamentals right.
- ◇ A weak supplier base and a lack of manufacturing and process know-how leads to unstable production input.
- ◇ Enterprises that do not have enough middle managers rely on young teams with varied capabilities.
- ◇ Some companies have a high turnover rate among front-line workers who lack experience and need professional training.
- ◇ Enterprises are unable to refine managers' tasks or identify processes to consolidate because basic systems and procedures are disorganized.

However, the fundamental reason lean production fails is that enterprises don't understand it from a practical angle and don't implement it in a methodical way. In addition, they lack the ability to organically integrate lean methods with a management system that capitalizes on employees' capabilities. The ultimate goal for production management is to strike a balance among quality, cost, delivery, people, and safety. Traditional lean-production theories provide only a general framework and the standard tools. Enterprises need to customize the principles and tools to design a system that helps them achieve their ultimate goals for production management. The system must take into account the enterprise's strategic priorities, operation, products, and production environment. There is no one-size-fits-all approach or tool.

BCG doesn't believe the essence of lean production resides in a rigid, ready-made framework that relies on universal approaches and tools; rather, the heart of lean is a custom and continuous innovation and improvement process. Enterprises need to involve everyone at all levels so as to embed lean production concepts and tools in the organization. This is the only way to successfully achieve lean production. All sorts of issues crop up in the daily operation of a production unit, and no single lean approach or tool can solve every one. Only if lean concepts and methods become an organizational capability can enterprises address emerging problems and achieve improvement.

To better understand lean production, let us look at the questions that it can help address for a Chief Operating Officer of a manufacturing enterprise:

- ◇ Is the performance of our operation consistent with clients' requirements?
- ◇ Are we continuously and effectively reducing costs and improving quality and delivery?

- ◇ How do we maintain and improve our margins given the rising costs of raw materials and other factors?
- ◇ What can we do to improve product quality?
- ◇ How do we ensure production safety in our facilities?
- ◇ How do we improve inventory management of spare parts, work in process, and finished goods?
- ◇ Have we effectively achieved cross-function synergy?
- ◇ How do we encourage middle managers to take initiative?
- ◇ How do we reduce turnover rate and boost morale?

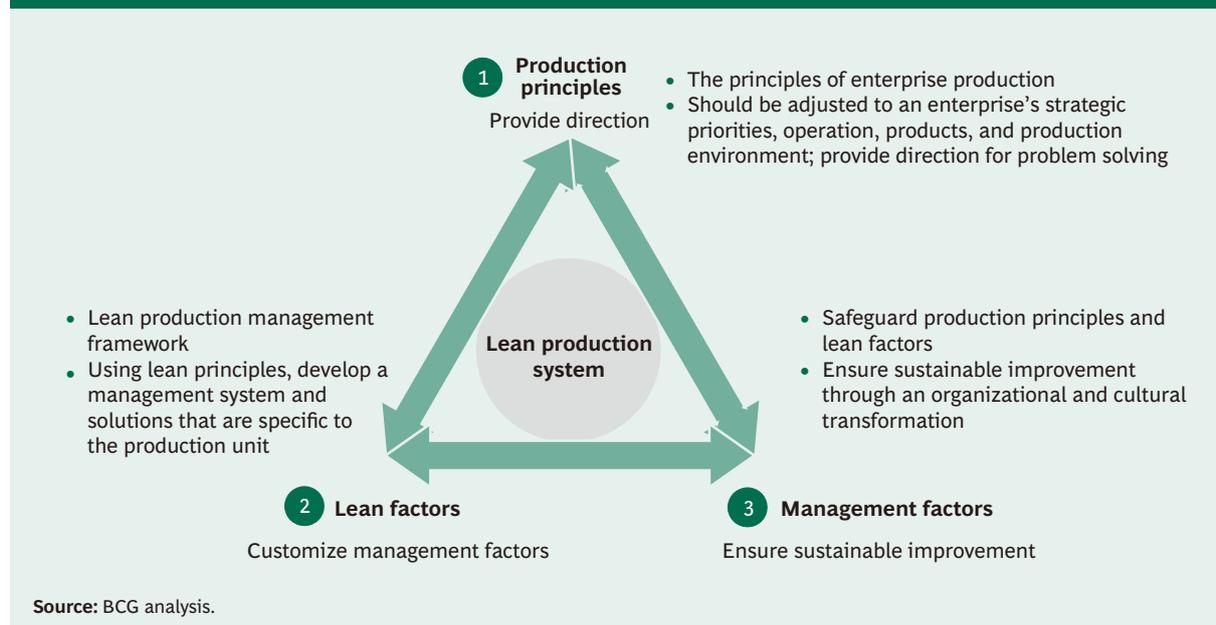
The above questions are key issues that concern all production managers. Enterprises need to build lean production management systems and processes around these issues.

Transforming Production

BCG’s lean-production transformation framework has three dimensions. (See Exhibit 1.)

- ◇ *Production principles*. The production principles should be adjusted according to the strategic priorities, operations, products, and production environment of an enterprise. The principles provide the fundamental direction for a production unit.

Exhibit 1. The Lean Production Transformation Framework



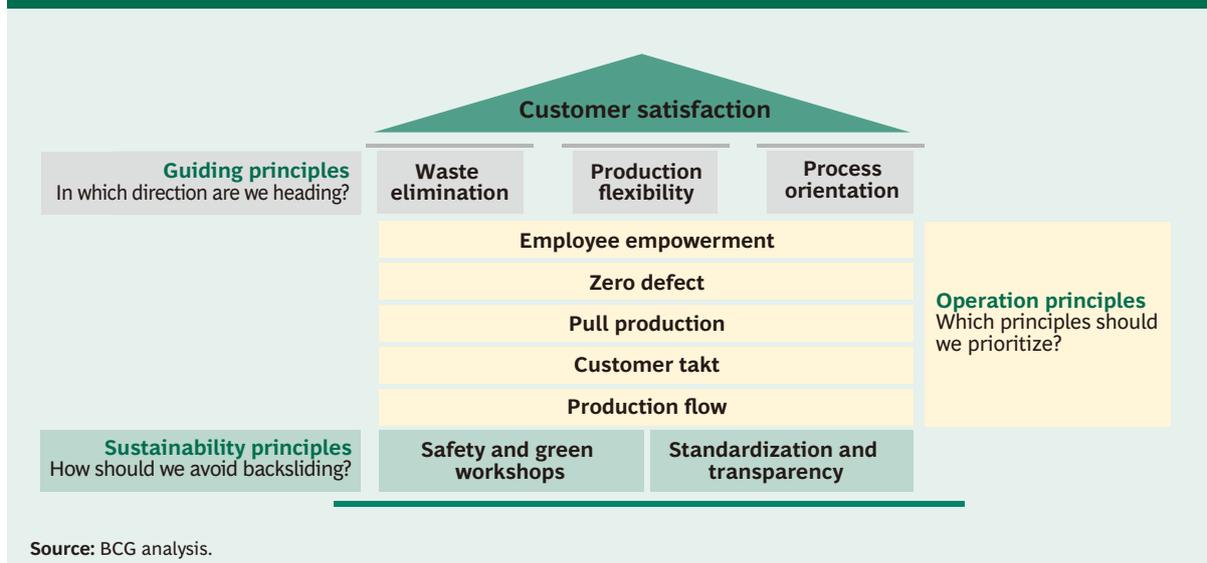
- ◇ *Lean factors.* These factors should be based on the production principles. Lean factors provide a framework for management to address specific issues that arise in a production system.
- ◇ *Management factors.* These factors include an organization’s culture, accountability structure, key performance indicators (KPIs), and the capability to develop its employees. Management factors ensure sustainable lean production and improvement. It is a safeguard mechanism for the first two dimensions.

Lean production has established some general principles such as waste elimination, production flexibility, zero defect, and standardization. Its principles are divided into three categories: guiding principles, operation principles, and sustainability principles. (See Exhibit 2.) Because the principles are general, it is important to interpret, prioritize, and combine the principles according to a company’s development strategy and production environment. For example, production flexibility is crucial to automotive manufacturers but less important to standardized batch manufacturers in the electronics industry. In the latter case, a special production line that’s fixed is a better way to improve quality and efficiency. Another example is employee empowerment, which is very effective for enterprises with extensive experience and a stable team. However, for enterprises with high turnover or employees who have little experience, strict compliance with instructions may be a better approach.

Production principles provide direction for production management. When finalized, the production principles will have a major effect on routine production-management decisions. For example, when a company with high work-in-process inventory has identified process orientation as a production principle, the production unit should focus on the optimization of overall output instead of the independent output of a particular production line in a particular workshop. Process orientation requires a company to continually identify and improve end-to-end bottlenecks, minimize work-in-process inventory, and adjust KPIs for a workshop and its staff.

Choosing production principles also means making tradeoffs. Some enterprises in their history

Exhibit 2. Lean Production Principles



intentionally destroyed products that have quality issues before their employees. This reflects a company’s commitment to quality over delivery and cost. Other organizations sacrifice quality in their pursuit of fast delivery and low cost. To balance quality, delivery, cost, and people, companies do not need to be excellent on all fronts. Surely they need to try their best, but it is hard to be perfect. Rather, production managers and enterprise leaders must have the judgment and boldness to identify production priorities according to the company’s development stage and specific issues, clearly define a direction, and avoid hesitating to act.

Production principles can have a significant impact on an organization. Therefore, they should be discussed and agreed upon at all levels of the enterprise. Then the principles should be communicated to all employees and strictly followed. When companies encounter production issues, they should refer to the principles in order to make decisions. Using the principles in this manner ensures efficiency, since they allow for production decisions to be considered from an end-to-end value-creation perspective and provide a basis for overall decision optimization.

In addition to production principles, the transformation framework commonly has eight lean factors: visualized management, standard operation, materials handling, equipment management, standard organization, quality management, product process, and health, safety, and environment. (See Exhibit 3.) Each factor has a set of approaches and tools. These are general methods that should be customized according to an enterprise’s operation, products, and production environment and then integrated into the organization’s management systems and processes.

For example, many manufacturers use quality gates to identify defects at the earliest stage possible so as to prevent the defect from affecting other workstations and processes on the production line. In workshop management, a quality gate involves many issues, such as:

Exhibit 3. Lean Factors’ Approaches and Tools

Lean factors	Visualized management	Standard operation	Materials handling	Equipment management	Standard organization	Quality management	Product process	health, safety, and environment
Approaches and tools	Team member KPI	SS	Dashboard	Autonomous maintenance	Standardized organization mode	Quality gate	Product and process preparation (3P)	Health and safety risk
	Information dashboard		Material supermarket	Preventive maintenance	Team mode	Statistical control (SPC)	Process preparation (2P)	Environmental risk
	Visual control	Standard operation analysis and definition	Milk run	Corrective maintenance	Help-chain mode	Self-certification system	Early equipment management	Energy consumption
	Visual criteria		Parts planning (PFEP)	Reliability maintenance	Workshop management mode	PDCA		Safety and operation guidance
	Add-on system	Containerization	Maintenance plan and time line	Skill-training mode	Failure model effective analysis (FMEA)	Foolproof error correction	Emergency preparedness and response	
		Level production (leveling)	Spare parts management	Production system training mode			Accident management	
		Pacemaker process	Overall efficiency analysis	Reward and recognition			Equipment self-inspection	
		Parts production interval (EPEI)	SMED	Change management			Safety behavior observation	

Source: BCG analysis.

- ◇ Who (production or quality control) is responsible for setting the assessment criteria for a quality gate?
- ◇ Where should a quality gate be located?
- ◇ What should a quality gate inspect?
- ◇ What measures should be taken after a problem is identified? In what circumstances should a production line be halted and who makes that decision?
- ◇ How do we source and provide feedback?
- ◇ How do we trace quality issues?
- ◇ How do we solve recurring quality issues, and who is responsible for that?
- ◇ What role does a quality gate play in overall quality management? How do we integrate a quality gate with other quality-control tools?

If enterprises fail to address these questions, fail to give a full explanation to quality control, or fail to strictly implement a quality gate, then the result is a quality gate that did not play its proper role, and quality issues will be passed on to other workstations and possibly even other workshops. For managers to say that they are using a quality gate tool is not enough.

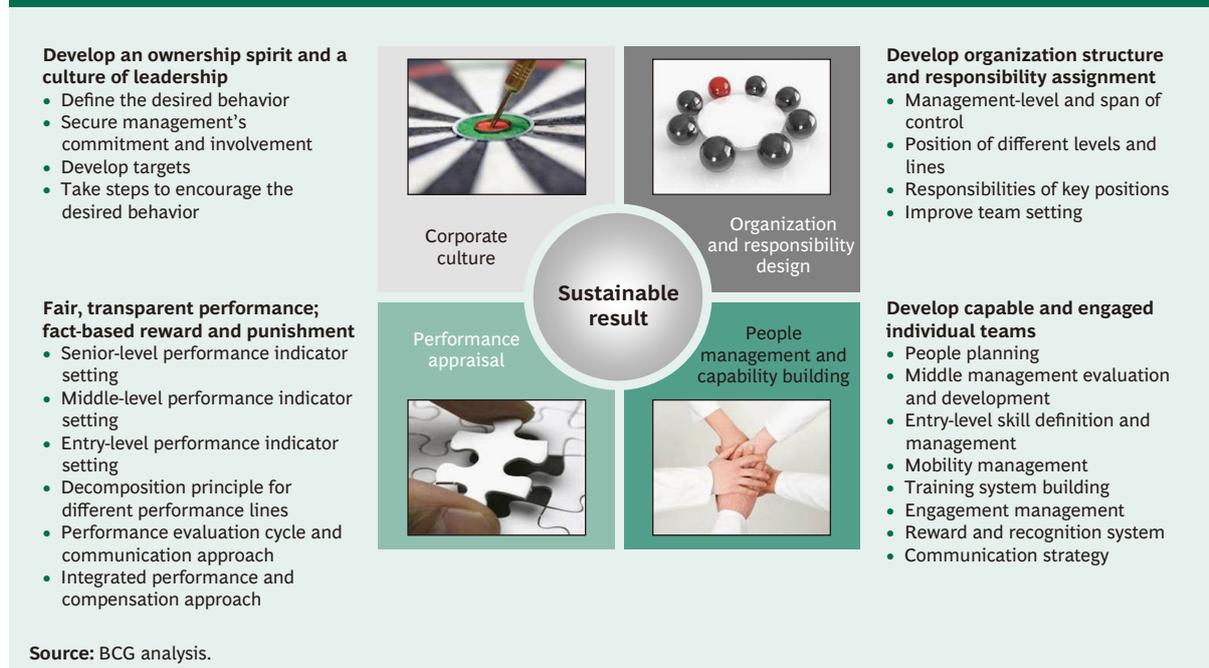
Lean factors need to be put into a detailed process and a customized management system. Enterprises need to clearly define who is involved in each process and what are the required capabilities and respective responsibilities, what are the deliverables at each stage, how much time is required for each process, how should a problem be escalated, and how will those involved be evaluated. Only after lean approaches and tools are converted to internal mechanisms and are accepted and mastered by the relevant people, can these factors realize their full potential. To rephrase the Cannikin Law in terms of lean production, every weakness of every lean factor will have a major negative impact on overall production. Enterprises must concentrate on the lean factors and continue to improve and refine the process, so as to drive continuous improvement of production management.

The third dimension of the transformation framework is management factors. These include an organization's culture, accountability structure, KPIs, and the capability to develop its people. (See Exhibit 4.)

The culture is usually embedded in the enterprise's production principles and lean factors. It should identify expected behaviors and compare them with existing behaviors, thereby clarifying which behaviors are encouraged and which should be avoided. To change behavior requires management's commitment and engagement. Leaders need to encourage and stimulate routine behaviors to gradually achieve the transition to desired behaviors. This is a gradual process and requires a great deal of patience. A crucial factor is the buy-in of the leadership to go to the front-line workers and provide the assistance they need to change. Meanwhile, a communication channel should be built between front-line workers and the leadership. Many enterprises find the process of changing the culture tedious and frustrating; they give up trying, and the status quo persists.

The organization and responsibility structure of a production unit must be built to ensure that front-line workers deliver high-quality products in a highly efficient manner. We suggest three methods to ensure frontline efficiency:

Exhibit 4. Management Factors



- ◇ Focus the organization structure on frontline effectiveness and efficiency. Start designing of the organization and responsibility structure at the workstation level, then at the production line levels, and finally at the workshop level.
- ◇ Reconcile the relationship between supporting functions and core production functions. Avoid setting up monitoring and supervising functions, or creating bureaucratic systems with monitoring functions, that do not add value. Be coaches instead of ‘police man’, otherwise the company may discourage employees in production functions, and the supporting functions will also feel frustrated.
- ◇ Avoid wide spans of control and too many layers. Many enterprises have a tendency to create positions based on peoples’ capabilities and to burden those who are more capable, which results in wide spans of control. In addition, some enterprises have difficulties communicating between the top and bottom levels because there are many organizational layers. Sometimes senior leaders in the production department are far from the front line and rely on periodic reports for information. Enterprises need the right setup of layers and span of control to ensure the management of frontline is efficient.

The design of KPIs needs to consider the organization and responsibility structure. During this process, a company needs to avoid including indicators that are beyond participants’ responsibilities. Additionally, evaluation indicators should integrate not only the result but also how the participants came to this result. This is important because the correct result can only be replicated when it is achieved through the correct behavior. Furthermore, the number of KPIs should be well managed (for example, less than ten). BCG’s experience shows that if the number of KPIs is high, it will significantly lower participants’ performance focus. Ideally, KPIs should be less than seven for middle management to control.

A high turnover rate of front-line workers and a shortage of middle managers are common challenges facing China’s manufacturing industry. It may not be realistic to expect the turnover rate to decline in a volatile market environment. However, companies can lessen the impact in two ways. First, address fluctuations in personnel demands due to changes in production output. By improving staffing management and recruitment, companies can strike a balance between meeting production expectations and optimizing the employee utilization rate. Second, focus on identifying, developing and maintaining a core production team. This team can play a key role in ensuring consistent production quality when turnover rate of others is high.

In terms of middle management, enterprises need to address their career-development paths. The shortage of middle managers means that people usually expect promotions to happen faster than in developed markets. Therefore, managing career expectations is key to improving the stability of middle management. In addition, enterprises need to establish customized training programs that address the company’s needs and employees’ evaluation results. More important, enterprises need to include the training and development of middle management into the evaluation of their senior-level line managers to institutionalize top-down training.

Enterprises need to internalize production principles and lean factors through the design of management factors, so that managers at all levels are motivated and capable to implement lean principles and lean factors. This will ensure solid and sustainable lean improvement as well as production management transformation from both cultural and behavioral perspectives. This important task is most likely to be neglected by enterprises in the implementation of lean production. It is the key to organically integrate production principles, lean factors, management system and employees’ capabilities. The implementation of lean production tends to fail, if this task is missing or not well done.

Summary

Now is a critical time for China’s manufacturers. Global and domestic shifts pose serious challenges. To continue being formidable competitors, companies must improve their internal production-management approaches and capabilities. These efforts must have immediate results as well as sustainable ones.

Lean production provides general principles and methods that enterprises can use to transform the culture and behavior of their production units. However, lean production is not a one-size-fits-all approach. Companies must interpret, prioritize, and combine the principles and methods to fit their strategy, operations, products, and production environment. They must also win the commitment and participation of employees at all levels. It is not an easy undertaking. But those companies that pursue this path will establish a solid and continuous innovation and improvement process that will enhance the competitiveness of products made in China.

Note

1. The Chinese Academy of Social Sciences, The World Bank, *The Economist*, and other authoritative institutions and publications estimate China’s GDP will grow at an annual rate of 6.8 to 8 percent from 2012 to 2020.

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BCG has successfully applied its production transformation theory in developed markets such as Europe and North America and emerging markets such as China and India to help numerous leading manufacturing enterprises transform production management and achieve significant improvement in quality and efficiency. BCG's Operations practice area has over 60 senior lean production experts globally and is equipped with extensive practical production management experience with all kinds of leading manufacturing enterprises. BCG has also established operations centers globally with the commitment to enhance production management capability for clients.

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