

"Monozukuri" Manufacturing in Emerging Countries

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Taking advantage of low labor costs and rich manpower for manufacturing resources, emerging countries have grown economically and now are turning into huge markets. Product development to meet local needs and dramatic cost reduction are necessary for manufacturing companies to survive in today's rapidly changing global market, and with that in mind, I visited China, India, Indonesia and Brazil. Each country has unique manufacturing environment characteristics in areas such as resources, infrastructure, working conditions, and technical capability. Key points for "monozukuri" manufacturing suited to each country's circumstances include the following: In China, production locations must be suitable to fluctuating market and labor environments; in India, cooperation with local companies is required; in ASEAN countries, production methods taking advantage of low labor costs are important; and in South America, production of a wide variety of types in small quantities is necessary. Also, in order to support the strong growth and satisfy the diversifying needs of these emerging countries, Japanese parts manufacturers must make production engineering innovations and establish a production system of a wide variety of types in small quantities at low cost.

Key Words: emerging countries, manufacturing, part production, BRICs, VISTA, LCC

1. Introduction

In 2008, the world economy suddenly collapsed due to a simultaneous global recession. There are now slight signs of recovery, but advanced countries like European countries, the U.S. and Japan are still struggling to recover. On the other hand, China and India are sustaining a high level of growth, which indicates how high the potential of emerging countries is. This trend is clearly seen in Fig. 1, which shows the transition of automobile sales in the main countries. These emerging countries have begun to lead the world economy. Various business restrictions related to the global environment and natural resources cannot be ignored either. In order for JTEKT to survive in this rapidly changing global market, it inevitably must change its paradigm and break from the status quo. With these situations in mind, I visited India, Indonesia and Brazil early in 2010 and had the

opportunity to observe actual cases of their "monozukuri" manufacturing operations. I would like to discuss herein the directions of "monozukuri" manufacturing we aim at and production engineering capability that must be strengthened in these countries.

2. Changes of "Monozukuri" Manufacturing in Emerging Countries

Although emerging countries are now watched with keen interest as huge markets, they used to be regarded merely as manufacturing bases, much like a sub-contractor, with low labor costs and as exporting countries without their own consumption. Japanese parts manufacturers reached the limit of cost reduction in Japan in fierce price competition due to high labor costs and high facility costs, and they have transplanted their production operations to emerging countries called Leading Competitive Countries (LCC) as manufacturing bases for further cost reduction in response to the transplants of automobile manufacturers, their main customers.

Specifications for facilities and production lines as well as development methods have been determined based on Japanese needs with the aim of reducing labor costs by automation and reducing depreciation costs by high-speed operations. The idea was to create facilities and production lines at the overseas plants using specifications in which unnecessary portions had been removed from Japanese specifications. This idea was based on mass

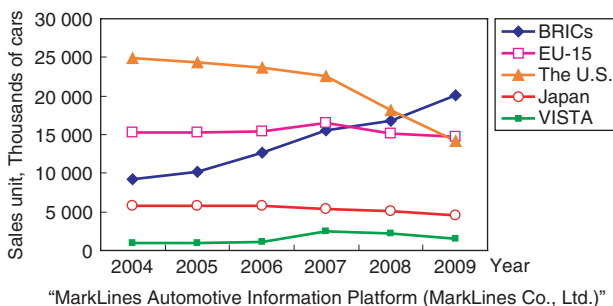


Fig. 1 Transition of automobile sales in main countries

production and did not bring about substantial reduction of facility costs. As a result, the facilities and production lines became more specialized and less suitable for production of a wide variety of types in small quantities, lacking multipurpose capability.

As mentioned earlier, emerging countries have grown and become a huge market for consumption, which requires that we develop products and "monozukuri" manufacturing in response to local needs and tastes. At the same time, local manufacturers have grown up as well and market competition has been getting fierce among manufacturers regardless of the foreign or local ownership. In order to survive in such a business environment, it is an urgent need to increase the speed of product development and realize epochal low-cost products.

Conventional "monozukuri" manufacturing has limits in achieving such low-cost products. To reduce production costs by "monozukuri" manufacturing innovation and hedge against exchange risks, we must procure low-cost materials, equipment and parts and design quality and performance based on such materials, equipment and parts. A key in carrying out these tasks is establishing strategies for development, production and procurement in each region and changing paradigms.

How emerging countries will grow from now and change is another important thing for us to watch. Our assumption is that labor costs will gradually increase, demands for higher levels of performance and quality will grow, the engineering capability of local manufacturers will improve, economic growth will slow down, new countries will emerge, etc. These things will affect Japan in that the hollowing out of industries may happen and the competitiveness of Japanese industries may be lowered. It is quite important for us to judge, from a long-term viewpoint, what we should do to maintain and improve our competitiveness and decide the right direction in which to go.

Directions we aim at in each region will be discussed in the next chapter of this report.

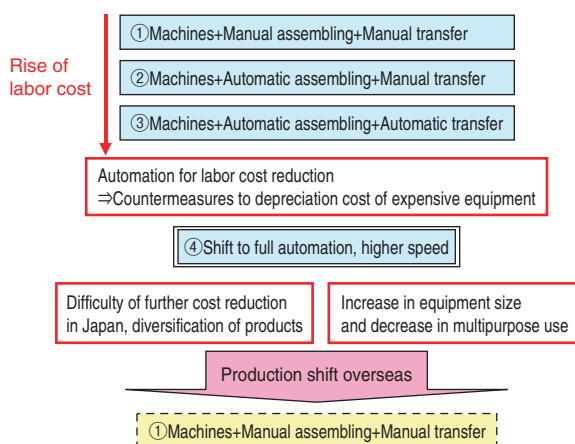


Fig. 2 Trend of "monozukuri" manufacturing in Japan

3. Trends in Emerging Countries by Region

(1) China

China has developed to such a scale as to be called "a world factory" or "an exporting base to the world" as a result of continuous investments of foreign capital for labor-intensive production for export. An abundant supply of labor resulting from the inflow of populations from farming regions to urban regions has supported stable, low-cost production. In recent years, as inland areas have become industrialized and grown economically, the population flow has begun to go the opposite way, bringing about a big change in the labor market. Moreover, the rapid economic growth is expanding domestic demand in China, turning it into the world's largest market for consumption. With this progress, two large changes in "monozukuri" manufacturing trends are appearing.

The first change is localization of production, including design and development. Local needs can be met locally, development and design are carried out based on local materials and parts, and products are supplied to the local market. China is a resource-rich country, which makes it possible to link all production processes from material procurement to product supply.

The second change is a change of production systems. Economic growth has induced a sharp increase in labor costs, resulting in the appearance of the two changes shown in Fig. 3. Foreign-owned companies are forced to choose one of two alternatives, i.e. to raise the automation ratio of production or shift to other countries with low labor costs. As a trend of post-BRICs, production for some export products began to move to other countries like Vietnam (VISTA).

Currently China is promoting production automation countrywide and is at a turning point in the field of "monozukuri" manufacturing. We would like to carefully pay attention to how "monozukuri" manufacturing in local companies will change.

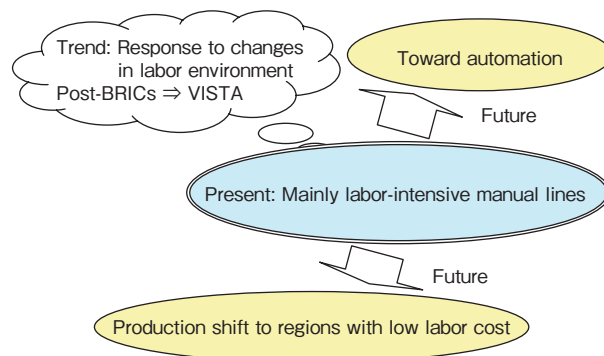


Fig. 3 Trend of "monozukuri" manufacturing at foreign-owned companies in China

(2) India

When we look at the history of India, the world's first company, "The East India Company," used to be there, and India has introduced much English culture and technology. Like China, India has great potential for economic growth as a resource-rich country as well as a large domestic market. It is worth noting that many global companies such as in the steel mill industry exist in India, and the capability of local companies is high.

In relation to my discussion of "monozukuri" manufacturing trends in India, an example of an excellent local company is shown in Fig. 4. The owner of this company (domestic capital) works hard day and night to achieve effective corporate management and growth with a strong desire to contribute to national growth. The company has a clear top-down management system in which the company's management policy is decided by the owner and reflects his strong intentions. It is common to all Indian companies acknowledged as global companies to have speedy decision-making and their thoroughly developed policies. Managers directly reporting to the owner seem to be very close to those in Europe, the U.S. and Japan in terms of talent and technical capability and include many who studied in Europe or the U.S. or experienced in working at excellent European or U.S. companies, and there is no language barrier (English is an official language in India.). This will surely help in transplanting technology and "monozukuri" manufacturing systems created in Europe, the U.S. and Japan over many years to manufacturing facilities in India in a short time. In India there also are many manufacturers of machine tools, cutting tools and other tools, which are the basics of "monozukuri" manufacturing. Japanese manufacturers have begun to use locally made equipment and tools for rough machining, and as a result, more than 50% of their equipment is now made in India.

In many cases foreign-owned companies in this region have established a supply chain with strong local companies. Partnerships with local manufacturers are very important for foreign-owned companies in India in "monozukuri" manufacturing. This is the same in China, too.

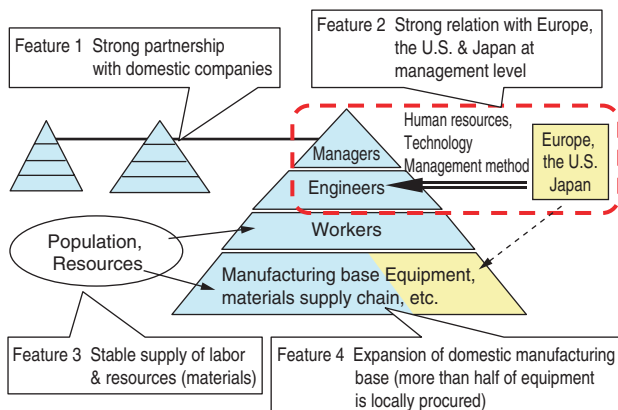


Fig. 4 Excellent local company in India

(3) ASEAN

ASEAN has a history of being basically farming and fishing countries with few natural resources that managed to develop only slightly through being intermediate trade stops. Industrial infrastructures have not yet been established, but people's (especially women's) strong desire to work is outstanding, and they are hard workers.

At present, labor-intensive production of export products is the core industry. The scale of local companies is small, and therefore foreign-owned companies are the main players with "monozukuri" manufacturing in this region. There is difficulty in procuring raw materials, and these countries play the role of machining and assembling parts within international production systems in or extending beyond the region. Figure 5 shows the features of an automated production line and a manual production line. In this region, human-based "monozukuri" manufacturing is practiced. Equipment is simplified, and tooling has been modified to make effective use of low labor costs. Production flexibility (a single set-up, etc.) to cope with a wide variety of product types is increased by lowering the level of automation, and as a result, operating availability and first time good ratios are equivalent to or higher than those in Japan. This indicates that we need to regard flexibility as important to future "monozukuri" manufacturing in Japan.

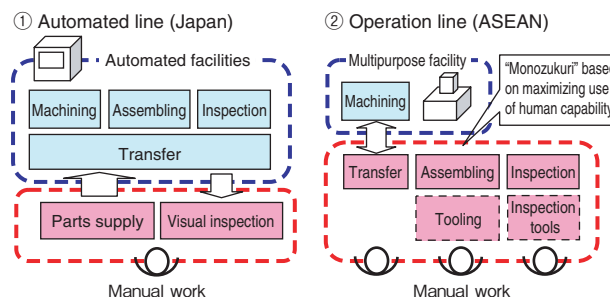


Fig. 5 "Monozukuri" manufacturing in ASEAN countries (comparison with automated line)

(4) South America

In South America, cultures have been deeply influenced by European control, and cities have an atmosphere like European cities. Especially, Brazil and Argentina continue to grow as resource-rich countries and are globally important in the fields of mining and dairy farming. Consumption in these countries has been substantially increasing, and their presence as markets has been strengthened. "Monozukuri" manufacturing has developed partly in heavy industries related to resources. Recently, the local production of automobiles has been expanding, and changes are appearing in light industries too. "Monozukuri" manufacturing of local companies is gradually shifting to one-piece-at-a-time production from lot production by independent process layout as shown in

Fig. 6. The idea of complex processes cultivated from the production of a wide variety of types in small quantities by an independent process layout has the possibility of developing into a cell production system in future.

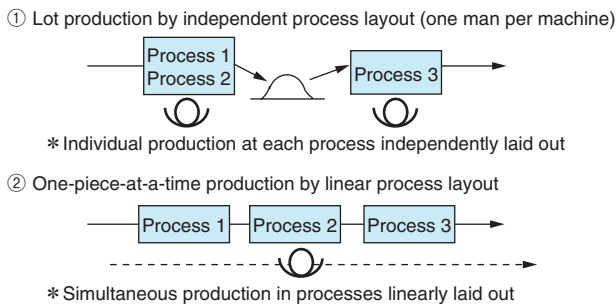


Fig. 6 Independent process layout and linear process layout

4. How to Strengthen Production Engineering Capability in the Future

When we think of "monozukuri" manufacturing in emerging countries, it is very important for us to review the path of improvement Japan has walked on until now. The current economic state in China is often compared to the economic state of Japan in the 1970s, and we similarly can compare countries' "monozukuri" manufacturing levels as a means of resolving problems and making improvements. For example, with regard to the quality of local materials, looking back on the product designs and manufacturing processes Japan used when it was similar quality levels will enable us to see what methods we can use with local materials. If past experience and knowledge can help us foresee potential problems that may happen in the course of development, we can minimize the occurrence of problems. However, development in emerging countries has been progressing several times more quickly than it did in Japan, and I guess that emerging countries will make up the gap in just a few years.

Constantly required ability for "monozukuri" is to respond to diverse consumption tendencies, production of a wide variety of types in small quantities, and constant efforts to reduce costs. Production lines designed based on the concept of maximizing use of human capability have been successfully working mainly in emerging countries. We should further improve such production lines to create smaller lines able to generate profit even with production in small quantities as shown in **Fig. 7**. In order to cope with changes in the labor environment, we need to shift from production lines based on maximizing the use of human capability toward a new automation system having enough flexibility to adapt to changing labor cost levels. To this end, it becomes necessary to harmonize product design with equipment design, distinguish work

to be done manually from work to be done by machine, reduce the costs of equipment and robots, study the best mix of tooling and robots, etc. In order to avoid the risks associated with overseas localization, we must continue developing new automation technology for application in Japan.

Along with such advances in production engineering, the development of new equipment is required. In addition to being a parts manufacturer, we have a machine tool division in our group. Taking advantage of this, we simultaneously are pursuing process design and production method development, process & equipment planning and equipment development, and product planning and product development. For the purpose of shortening processes and eliminating equipment, we will further pursue production engineering innovations such as eliminating machining, heat treatment, die, distortion correction, matching, and inspection processes and achieving net shaping.

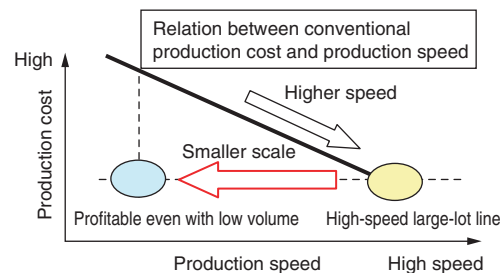


Fig. 7 Production line for generating profits in small quantities

5. Conclusion

I have discussed the trends and future directions of "monozukuri" manufacturing in the face of the rapid development occurring in emerging countries, but we also should pay attention to environmental changes such as global warming that force products themselves to change. As automobiles powered by engines will be replaced by automobiles powered by electric motors, some products will be forced to disappear, some products will have an opportunity for further improvement, and new products will appear. There is no way for us to survive in the area of "monozukuri" manufacturing in Japan unless we have the capability to achieve innovations in product materials and processing methods. While striving to adapt "monozukuri" manufacturing to the local needs in overseas markets, we will endeavor to continue advancing our products and manufacturing plants in Japan.

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