Knowledge-Intensive Mother Factory: How Can a Mother Factory Support Foreign Factories without Mass Production Activity?

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Abstract: This study clarifies that a home base without mass production activities can support foreign factories by acting as a mother factory through the case of Minebea Co., Ltd. Minebea’s home base has aggressively gathered information on mass production from their foreign factories and has continued to accumulate knowledge on mass production, even after discontinuing its own mass production activities. Although the home factory is inactive in terms of mass production, it has succeeded in supporting mass production at their foreign factory as a “knowledge-intensive mother factory,” the factory that possesses knowledge on mass production without engaging in any mass production activity. It was found that a home base can possess knowledge that exceeds its boundary of activities, enabling it to act as a mother factory supporting mass production at foreign factories without engaging in any mass production.

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Introduction

This study clarifies that a home base without mass production activities can support foreign factories by acting as a mother factory. Unlike their Western counterparts, Japanese multinational corporations have concentrated their resources and responsibility at their home base (Bartlett & Ghoshal, 1989; Kim, 2015; Oki, 2013). For example, Japanese companies’ home bases have strong capabilities compared with that of their foreign factories (Fukuzawa, 2015). Because Japanese companies’ home bases are superior, they have supported their foreign subsidiaries by transferring their knowhow to the foreign subsidiaries (Mukai, 2015; Oki, 2012b). In particular, it is known that domestic factories have taken the role of “mother factories” to their foreign manufacturing subsidiaries (foreign factories) (Nakayama, 2003; Suh, 2015; Yamaguchi, 1997, 2006; Yasumuro & Westney, 2001).

No clear definition exists for the term “mother factory,” even though this term is widely used in Japanese academia and business. For example, Yamaguchi (1997, 2006) defines a mother factory as “a large-scale organizational unit in a parent company that serves as the hub for its technology transfer strategy by accepting overseas personnel, conducting training, and developing manufacturing technologies that are easy to implement overseas.” On the other hand, Nakayama (2003) asserts that a mother factory system is a way by which a manufacturer provides technological support by sending personnel, such as engineers and managers, from a model factory in its home country to provide on-site instruction to local sites as
appropriate; While these definitions vary, it can generally be said that the term “mother factories” refers to organizations that provide ongoing support to foreign factories.¹

Mother factories implement technology transfer when overseas factories are starting their operations, develop human resources in overseas factories, and provide assistance in problem solving at overseas factories (Yamaguchi, 2006). For example, it has been noted that Toyota Motor positions a Japanese factory as its mother factory; this Japanese factory has played a major role in building the capabilities of the company’s foreign subsidiaries (Nakayama, 2003; Suh, 2015).

These discussions concerning mother factories assume that the mother factory engage in mass production activity similar to that of the overseas factories. The standard image of the mother factory in a Japanese company is one that creates advantages in terms of mass production of goods and then transfers such as the resultant technologies and organizational routines or provides guidance to overseas factories based on the experiences of mass production gained in the mother factory.

However, home bases of Japanese companies have not necessarily engaged in mass production in recent years. The international division of labor has resulted in home bases specializing in high value-added activities such as research and development, and sometimes they even stop mass production activities altogether (McKendrick, Doner, & Haggard, 2000). After discontinuing mass production, home bases may be unable to support mass production overseas by transferring the advantages discovered in the home country. This situation leads to a doubt if home factories that have discontinued mass production can still support overseas mass

¹ The term “mother factory” (or “mother plant”) implies sites that continuously provide diverse support to overseas factories, and thus differs from a “parent factory,” as the term is used in Japan.
production by acting as a mother factory. However, this concern has not yet been sufficiently addressed.

This study considers the case of Minebea Co., Ltd. (hereinafter, “Minebea”) to clarify whether a home factory that has discontinued mass production activities can support mass production activities overseas and examines the benefits of such a situation. In addition, it presents a new image of the home factory as a “knowledge-intensive mother factory.”

Method

This study examines the case of Minebea. A case study is an effective method for presenting new theories (Eisenhardt, 1989). This study uncovers a potential new theory that home factories without mass production activities are able to support mass production overseas and discusses the significance of that theory. Thus, the case study method is suitable for this study.

The subject of the case study is the bearing and bearing-related business of Minebea—a manufacturer of bearings and electronic components. Minebea has maintained a unique organizational structure wherein one of its Japanese factories has been supporting mass production at the company’s foreign factories even after discontinuing its own mass production activities. This organizational structure of Minebea makes it appropriate to be considered for a case study.

Data on occasional performance trends and on the role of Minebea’s Japanese factory was obtained from the company’s annual reports from 1995 to 2009. Two books (Igarashi, 2000; Iwai, 1995) were used to investigate the earlier history of Minebea. With an understanding of the company’s history, a two-hour interview was conducted with Mr. A—Minebea’s public relations head—in October 2010. This interview confirmed the facts found in the
published material, and inquiries were made as to specifics concerning recent overseas expansion and human resource development at Minebea. During the interview, Mr. A provided a general explanation and an opportunity for Q&A based on list of questions submitted in advance. Facts covered in this study were later confirmed with Mr. A.

Case

Outline of Minebea

Minebea is a Japanese company whose main lines of business are bearings and other machine components, rotary components, and other electronic devices and components. In fiscal 2009, the company's sales totaled 228.4 billion yen, with operating income at 12 billion yen. The company is the world's leading manufacturer of bearings, with a 60% share of the global market for miniature ball bearings—its primary product—in fiscal 2009.

Minebea quickly expanded overseas. The company was established in 1951, and its Karuizawa factory in Japan began operation in 1963. To secure labor, the company quickly established factories overseas, primarily in Asia. Manufacturing factories for the bearing business were established in Singapore in 1972, in Thailand in 1982, and in China in 1994.

In conjunction with this overseas expansion, Minebea’s factories in Japan gradually reduced their production volumes. Production volume in Japan declined from 2–3 million units per month in the 1980s to several tens of thousands per month in the 2000s, a tremendous decline compared with the decline in the volume of other countries (Figure 1).

These changes in production volumes manifest changes in the functions of the Japanese factories. In 2010, functions performed at
the Karuizawa factory did not include the mass production of bearing-related products. Production activity was limited to manufacturing extremely small-lot products (for example, very high-end products with monthly output of only 200 units) and the manufacture of prototype samples for new products, which is akin to development. No mass production activity provides large quantities of products to the market. However, “support of overseas factories for bearing-related products” is clearly noted as one of the factory’s functions. Though this Japanese factory had already discontinued mass production activity, Minebea has positioned it as a “mother factory” supporting its overseas factories.

2 From an explanation of the Karuizawa factory on Minebea’s Website. http://www.Minebea.co.jp/company/factories/japan/1181965_2709.html
Mother factory system of Minebea

Minebea has created a “mother factory system” in which the Japanese factory plays the role of transferring new technology to overseas factories, collecting information from individual overseas factories and subsequently transferring it to other overseas factories. Details of the Japanese factory’s support functions for the overseas factories are given below.

One of the support functions provided to Minebea’s overseas factories is the transfer of manufacturing and mass production technologies from the home factory. Minebea develops manufacturing devices at the Karuizawa factory, strengthens basic manufacturing and mass production technologies, and transfers those technologies to its factories overseas.

In addition, the Japanese factory provides in-house training to facilitate technology transfer. When Minebea established the Singapore, Thailand, and China factories, they sent local employees (factory operators) hired by the overseas factories to the Karuizawa factory for training. In 2010, the Karuizawa factory provided training on manufacturing equipment, product development, and production management. Production management training in this case concerned the role of the Japanese factory and its methods and philosophies regarding production planning. The 2010 training conducted at the Karuizawa factory was more advanced than that provided for operators before.

A second important function of the Japanese factory is the collection of information from overseas factories and the transfer of such information among the other factories. At Minebea, departments responsible for each basic technology at the Japanese factory administer the overseas factories. For example, bearings are manufactured using cutting, heat treatment, grinding, and assembly processes. The Karuizawa factory has a department for each of these
processes. The Karuizawa factory’s cutting department administers the cutting operations at the Thailand, China, and Singapore factories, and a similar horizontal architecture for each process horizontally divides the organization of each factory. The company has thus implemented an organizational structure through which the Japanese factory can collect information of process from each overseas factory.

For example, the offices in the Karuizawa factory have six displays showing current production volumes, target production volumes, costs, and others for each overseas factory. Production volumes and other types of data are updated every six hours, whereas cost data are updated every 24 hours. When a problem occurs with the data (for example, target production volume is way off), the Japanese factory can telephone or e-mail the overseas factory to find out what happened. Similarly, the overseas factory can easily telephone or send an e-mail to Karuizawa factory to ask for advice if a difficult problem occurs. In this manner, the mother factory can advice based on its own experience or its experience in solving the same problem at another factory. This type of communication between the Japanese factory and the overseas factories occurs frequently, and everyone feels free to contact in case of need.

In addition, the Japanese factory can gather information on best practices developed at an overseas factory. Once the Japanese factory is able to understand the reason why that best practice is effective, it can transfer it to factories in other countries. Daily improvements are important for the mass production of ball bearings. Product precision and productivity does not depend on only the manufacturing equipment, but it also depends on innovations in the cutting methods used in daily production or the manner in which components are transported. Sharing the creativity and innovation as well as the knowhow of each factory thus enhances the capabilities of other factories.
For example, if innovations in cutting methods developed at a certain factory improve product precision, or if lead times can be shortened, the Japanese factory will understand the situation and have the overseas factories do the same thing in approximately a week. The Japanese factory can therefore manage better routines developed at each factory and transfer them to the other factories, thus increasing the capabilities of all factories.

**Historical change in the role of the mother factory in Minebea**

How does the home factory support overseas factories? When Minebea’s Singapore and Thailand factories were established, the Karuizawa factory was a typical mother factory engaged in mass production. In 1987, the factory began manufacturing a new bearing-related product. In the 1980s, the Karuizawa factory had its own mass production activities and was using its knowhow to support the overseas factories.

Mass production at overseas factories expanded by the 1990s, and the Japanese factory was no longer considered as a site for mass production. During that point, the Japanese factory that discontinued mass production began to support overseas factories by leveraging its past experience in mass production. During that time, the overseas factories had insufficient capabilities, which made it more important for the Japanese factory to focus on using its experience to engage technology transfer, training, and problem resolution support for overseas factories than for it to collect information among the overseas factories.

In the 2000s, collecting information among the overseas factories became important because each factory developed their ability to improve. The Japanese factory became a clearinghouse for information on these improvements because the overseas factories were able to improve in each category. Because the Japanese factory understood the reason for the improvements, it was able to transfer
them to the other countries.\(^3\)

What are the merits of this type of organizational structure? The answer lies in the continued support of the Japanese factory for building the capabilities of the overseas factories. In the 1990s, the capabilities of overseas factories were low; they needed support from Japanese factories to solve their problems. Using mass production knowhow built from the Japanese factory’s experience, overseas factories were able to progress with building their capabilities. As Minebea entered the 2000s, mass production at its overseas factories stabilized. After these factories became capable of making their own improvements, the Japanese factory turned into a clearinghouse of information gathered from other countries and began playing an advisory role. This helped in problem solving at overseas factories and furthered the development of their capabilities.

Based on the above considerations, one factor enabling Minebea’s rapid overseas development and competitiveness in global production is the company’s division of labor, with the Japanese factory discontinuing mass production, yet maintaining its knowledge of mass production and continuing to offer support for mass production activities at overseas factories.

**Why can the Japanese factory support foreign factories?**

How was Minebea’s Japanese factory able to build up a knowledge base that enabled it to support other countries even after it ceased mass production? Here, we will focus on the people who supported this knowledge base.

Minebea’s Japanese managers frequently take business trips

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\(^3\) Since 2010, Minebea has moved toward having its overseas factories take the lead in starting up overseas factories. This means that the overseas factories are themselves becoming mother factories. The possibility that Minebea’s current organizational structure could change in the future should thus be considered.
Knowledge-intensive mother factory

overseas. For example, in the 1990s, then President Goro Ogino visited factories throughout Asia once or twice a month (approximately 20 times per year) and saw the factory floors with his own eyes. He wrote reports on the issues faced by these factories and sent the reports to the Karuizawa factory (Igarashi, 2000). He continued doing this for over 27 years (Igarashi, 2000). In the case of middle managers at the section chief level, as many as 400 to 500 managers per month visit overseas factories worldwide (Matsuzaki, 2003). The Japanese managers thus frequently go overseas, and this organizational structure was established from the 1970s until 2010 to support overseas factories. Maintaining this system enabled the company to be updated regarding production factories.

Furthermore, the company has provided abundant opportunities for overseas business trips to even younger employees. Engineers are sent on business trips to overseas factories soon after they join the company. As no mass production facilities exist in Japan, sometimes these engineers are posted to overseas factories to learn regarding mass production technologies in the actual mass production factory. For example, Mr. B—a former Minebea employee who joined the company in the 1980s— noted that he was assigned to work in Singapore six months after joining the company. The recruiting page for new graduates on Minebea’s Website states that “young engineers in their 20s and 30s are placed in positions of responsibility at overseas factories”; thus, it is clear that Minebea employees are sent on business trips to and stationed at overseas factories at the very beginning of their career. This enables employees to acquire experience on mass production that they would not obtain in Japanese factories. Japanese employees can therefore

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4 From an interview with Mr. B, a former Minebea employee, on August 21, 2007.
5 From a Q&A session with a new graduate on the Minebea Website. http://www.minebea.co.jp/recruit/fresh/qa/index.html
develop knowledge of mass production from directly understanding actual mass production operations and acquire knowledge of problem solving.

Besides acquiring mass production knowhow, another purpose of overseas business trips and overseas job assignments early in an employee’s career is to engender a sense of solidarity with employees at overseas factories. Young Japanese employees sent overseas receive the same treatment as local employees. This results in building relationships with employees at overseas factories that transcend nationality. Therefore, when people at the home factory are trying to understand the situation at overseas factories, communication between the two sides becomes much smoother. In addition, these relationships facilitate support from the Japanese factory because the employees at the overseas factory are less reluctant to approach the Japanese factory.

**Discussion**

Minebea’s Japanese factory has continued to support the development of mass production capabilities in overseas factories, even after the Japanese factory discontinued mass production of bearings. In the 1990s, the capabilities of overseas factories were still low; thus, the Japanese factory leveraged its knowledge based on their experience of mass production to transfer operations that had been performed overseas as well as to solve problems. After overseas factories were able to make improvements to the manufacturing floor on their own, the Japanese factory became the repository for knowledge regarding the outcome of these improvements, as well as problems and their solutions, and used this knowledge to support the overseas factories.

While the Japanese factory no longer engages in mass production, it has been able to remain involved in mass production at Minebea’s
overseas factories because of its mass production knowledge. Even after discontinuing mass production, some Japanese employees are still involved in it. Taking business trips or job assignment at the overseas factories, Japanese employees can not only maintain a fundamental understanding of mass production but also build knowhow regarding best practices and finding and solving problems.

Minebea’s Japan factory differs from the Japanese companies’ traditional concept of a mother factory. The traditional view of mother factories assumes that they have mass production activity and support overseas factories based on the mother factory’s knowledge of mass production (Nakayama, 2003; Yamaguchi, 2006). However, in the case reviewed in this study, the Japanese factory has already discontinued mass production and is not providing support based on real mass production activities. Rather, it has been collecting information from overseas factories engaged in mass production activities and supporting the development of capabilities at overseas factories based on that knowledge. The Japanese factory therefore supports the overseas factories using the knowledge it has gathered, differentiating itself from the traditional mother factory. This can be referred to as a “knowledge-intensive mother factory,” one that can support capability building at overseas factories, without engaging in any mass production activities.

The advantage of the knowledge-intensive mother factory is its ability to simultaneously shrink or discontinue mass production at the mother factory while supporting overseas sites. In the case of the Japanese companies that have focused on having the home factory support overseas expansion, reduced resources at the home factory may lead to a sudden lack of support to the foreign subsidiaries (Oki, 2014). However, although a home factory may discontinue mass production, keeping knowledge at the home factory enables a company to maintain an organizational structure that promotes the capability building of foreign subsidiaries and pursues efficiencies by
aggregating activities. Thus, maintaining knowledge at the home factory beyond its own activities as a “knowledge-intensive mother factory” becomes an attractive option.

Indeed, maintaining knowledge beyond the boundary of a factory’s activities is difficult to accomplish. In the case of Minebea, changes to human resources management served as a means for this to happen. Personnel in the Japanese factory that lacked mass production activity were proactive in going to overseas factories involved in mass production and acquiring knowledge there. In particular, young employees were sent to overseas factories and worked together with the local employees, which enabled them to obtain knowledge they could not have found in Japan.

Moreover, having human resources working in overseas factories has been beneficial when the Japanese factory supports the overseas factories. By going into the overseas factories, Japanese employees have built informal relationships with their overseas peers. These informal relationships have enabled smoother communication between the two sides. The Japanese factory contacts an overseas factory soon after it determines that a problem has arisen in the overseas factory. The overseas factory in turn seeks advice from the Japanese factory soon after a difficult problem arises. Human resource management that proactively includes an organization into its counterpart organization enables not only the acquisition of information but also facilitates the use of that information by knowledge-intensive mother factory.

This study has identified the manner in which a home base without mass production activities can act as a mother factory to support mass production in overseas factories. The home base can continue to support overseas factories by becoming a “knowledge-intensive mother factory” that maintains a knowledge base regarding mass production even after it has discontinued mass production activities. This study has also illustrated the potential for effective
human resource management through rotation of domestic personnel from home bases to overseas subsidiaries in order to realize the knowledge-intensive mother factory.

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