Competitiveness of Japanese Electric and Electronics Factories

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Abstract: This study employs data collected from a questionnaire survey of 97 business operations (factories) in Japan’s electric and electronics industry to measure gemba-level and market-level competitiveness based on the framework of Fujimoto (2003). In addition, the employment situations within these sites were surveyed. The results of these surveys revealed that, as strengths of the electric industry gemba in Japan, 1) these gemba are superior in all metrics of competitiveness except for manufacturing cost, relative to overseas sites in the same companies; and 2) the high level of responsiveness to customers is the major source of market-level competitiveness. Nevertheless, the primary issue faced by these gemba is the skewed age composition of the full-time employees. There are few workers to carry forward necessary skills into future, and the labor costs of the veteran workers are increasing. Japan’s manufacturing gemba must develop manufacturing competencies and improve design and development capabilities, in addition to nurturing younger personnel, to gain and sustain competitive advantage.

Keywords: competitiveness, Japanese electric and electronics

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Introduction

This study employs data collected from a questionnaire survey of Japanese electric and electronics industry to measure the competitiveness of Japanese factories. Existing studies on automobile industry have examined the relations among performance, strategies, and manufacturing or R&D organizations (Clark & Fujimoto, 1991; Fujimoto, 2012; Holweg & Pil, 2004; MacDuffie, Sethuraman, & Fisher, 1996; Womack, Jones, & Roos, 1990). On the other hand, few studies have measured the competitiveness of the manufacturing *gemba* in Japanese electric and electronics industry. During the past few decades, Japanese electric and electronics companies have been struggling to compete against lower-priced rivals from South Korea and China. Certainly, some companies have lost international market share, but other companies have maintained competitiveness. Thus, this industry is an appropriate research object to investigate what factors are critical for manufacturing organizations to maintain competitiveness.

This study used the framework of Fujimoto (2003) to measure the competitiveness of factories (business divisions). When measuring competitiveness, the types of metrics used are very important. Corporate competitiveness comprises the competitiveness of the various business divisions. Moreover, competitiveness is not merely a function of organizations, but it is impacted by, for example, environmental changes such as the fluctuating yen. Fujimoto (2003) proposed three layers of competitive performance: profit performance of a firm, market performance of a product, and productive
performance of a manufacturing site (gemba). In addition, he considered that organisational capability supports productive performance. As this framework focuses on stable performance depending little on the macroeconomic changes, this study adopts it as a framework. In this framework, market performance directly influences profit performance (e.g., sales, profit, and stock prices) as providing compelling products and services to customers is a source of corporate earnings. Market performance is measured by metrics such as price, performance, timely delivery, and brands, and it results from productive performance. Productive performance is measured by the metrics of productivity, cost, production lead times, development lead times, and research productivity. Furthermore, productive performance results from organizational capabilities.

In general, market performance is used as a metric of competitiveness, and productive performance is used only rarely. In many industries, competition is based on the metrics of market performance. However, Fujimoto (2003) indicated that Japanese automakers compete on the basis of productive performance and their manufacturing organizational capabilities. A high level of organizational capabilities creates a high level of productive performance, which is linked to a high level of market performance.

However, if a company’s products are unattractive to customers, or the business environment is severe, even a company’s productive performance or the organizational capabilities underlying it may not lead to strong earnings and profit performance. Japanese electric and electronics companies acquired a high level of international competitiveness between Japan’s period of high growth and the mid-1990s (Shintaku, 2005), but thereafter, and through the 2010s, economic fluctuations, a strong yen, and newly developed countries with low costs have caused Japan to stagnate. It is possible that poor business performance can be attributed to the above factors. If so, decisions to temporarily close or shrink strong gemba based on
corporate or market performance could lead to discarding a company’s fundamental strengths. It is important that Japanese electric and electronics companies measure the actual state of their gemba-level competitiveness to avoid losing the core competence. This study will provide one perspective for effectively managing domestic and foreign businesses divisions and factories.

Research Method

Data used in this study’s analysis is from a survey entitled “Denki Sangyou no Genbaryoku Chousa” (“A Survey of Shop Floor Capability in the Electrical and Electronics Industry;” Shintaku, Inamizu, Fukuzawa, Suzuki, & Yokozawa, 2014), where a questionnaire survey regarding the factory, gemba leaders, and workers was conducted.

The questionnaire was created in the following manner. At first, qualitative studies on eight excellent Japanese factories in the industry (plant tour, observation and interviews almost all day for each) were conducted from August to December 2013. In addition to the results of the qualitative studies, existing studies on manufacturing strategies and organizations and feedback from practitioners in this industry were taken into consideration to make up three types of questionnaire (Questionnaire A, B, and C). Between December 2013 and January 2014, the questionnaire was distributed to and collected from manufacturing institutions that have joined the Japanese Electrical Electronic and Information Union and comprise more than 200 union members. Brief information on the questionnaire and responses are as follows:¹

Questionnaire A: The respondents comprised plant and

¹ For more information about the questionnaires, please refer to Shintaku et al. (2014) and Inamizu (2015).
administrative managers who understood the whole situation of their own plants. Questions were asked regarding product configuration, performance (market and productive performance) and the human resource policies of the company. There were 97 respondents (response rate 59.5%).

Questionnaire B: Each plant selected three manufacturing sites and the leaders of those sites responded to this questionnaire. Questions were asked regarding members’ skills, coordination with other departments, attitudes towards work and organisational climate. In total, 354 leaders responded (response rate 79.4%).

Questionnaire C: Each leader of the selected manufacturing sites distributed this questionnaire to ten regular workers under them. Individual worker’s attitude toward work, leadership of his or her manager, and workplace climate were asked. In total, 3,116 workers responded (response rate 78.1%).

From questionnaires A, B, and C, this study uses data from questionnaire A. Inamizu (2015) shows the results of Questionnaire B and C. Questionnaire A inquired regarding products produced in operations; personnel management; frequency of and satisfaction with interdepartmental coordination and the level of cohesion within the operation; organizational situations such as the organizational climate of headquarters and business units; relationships between sites; achievements of the operation; strategy of the overall business operation; and so forth.

In this survey, productive performance was measured by comparing surveyed sites with overseas sites within a company, and market performance was measured by comparing the same survey sites with their external competitors. Productive performance is particularly difficult to measure for two reasons. First, productivity and cost figures are typically not publicly available, making it difficult
to discover them through a questionnaire. Second, even if they can be collected through a questionnaire, it is meaningless to do a simple comparison of collected data when that company may produce many types of products, as is often the case in the electric industry. Accordingly, relative measures are more useful than specific and absolute performance figures. A comparison with competitors that make similar products is ideal as a relative measure, though finding accurate numbers from competitors to use as benchmarks is very unlikely. Thus, this survey used relative performance evaluations with other sites producing similar products within the same company. Because the sites are within the same company, it is highly likely that the company will have accurate benchmarking metrics to compare Japanese factories with their overseas counterparts in the company.\(^2\) Below are the results of this analysis using the averages of respondents to questionnaire A, with a focus on competitiveness and the employment situations of the factories.

Results of the Competitiveness Survey

Attributes of respondents

Of the factories that responded to the survey, 17% had sales below 10 billion yen; 69.1% had sales between 10 billion and 100 billion yen; and 13.8% had sales exceeding 100 billion yen. Thus, approximately 70% had sales between 10 billion and 100 billion yen. 53.2% of responding factories had gross profit margins of 0–9%,

\(^2\) According to an interview survey conducted at the same time as this survey, competitive metrics such as productivity often have the highest productivity within Japanese factories, then the overseas factories of Japanese companies, and finally factories of local companies. Accordingly, if a Japanese domestic factory is superior to a Chinese factory in the same company, it can be assumed that the Chinese factory of the Japanese company will have better metrics than the factory of a local Chinese company.
and 22.8% were in the 10% to 19% range. These two groups comprised 75% of respondents overall.

Respondents were able to select multiple responses as appropriate regarding their business domain. As a result, the highest number of respondents selected “heavy electric/industrial-use electric equipment” at 31%, followed by “electronic components” (23%), “others” (19%), “telecommunications/computers” (17%), “home appliances and audio/video equipment” (12%), and “industrial-use electronic equipment for measuring, etc.” (9%).

With respect to business transformations, (1) approximately 85% of respondents noted that they maintained, as of the end of September 2013, the operations that they had at the end of March 2007. (2) Approximately 76% of respondents said that the percentage of new businesses added during the past five years was 20% of the overall operations or lower.

The breakdown of production methods for products produced in these factories was as follows: 63% were “design to order,” followed by 26% that were “build to order.” Next, 10% were products that were “made to forecast according to catalog spec.” The work of 92% of respondents was “business-to-business,” with “components” comprising 38%; “finished goods” comprised approximately 54%; and “business to consumer” was at approximately 7.5% (N = 86). In other words, more than half of those factories that were the participants of this survey had products that were “built to order” in a B2B business model. It was also discovered that, of the factories that responded to the survey, most were taking responsibility for being the main production site (mother plant) for the company.

Productive (gemba) competitiveness

Figure 1 presents the results of responses to questions of gemba-level competitiveness vis-á-vis other competing sites with similar businesses and products within the company during the last
one year \((N = 73)\). Rival sites for comparison within the company were mostly in China (approximately 62\%), followed by ASEAN countries (approximately 13\%). We used ten items,\(^3\) such as cost, quality, and productivity, to measure productive competitiveness. For each item, we asked respondents to evaluate these items on a 5-point scale compared with their intra-firm competitors (e.g., their firm’s manufacturing sites in China). Some respondents’ factories were superior to their internal competitors for all the items except production cost (Figure 1).

\(^3\) Questions regarding the following 10 items were asked to measure gemba-level effectiveness: customer satisfaction to products, external defect ratio, production costs (e.g., labor costs, materials costs, etc.), productivity (e.g., man-hours per unit of product), delivery (e.g., days from receipt of order to delivery), ability to flexibly change products and their quality in response to changing market demand, number of new product introduce (per year), development of unique production technologies, rapid ramp-up for mass production of new products, proposals for and development of new products. For each item, respondents were asked to make comparisons with other business operations over the past year (October 2012 to September 2013) using a scale of 1 to 5, with 1 being “other sites are superior,” 3 being “equivalent,” and 5 being “our site is superior to other sites.”
Figure 1 indicates that the domestic sites of the respondents is superior to internal competitor sites for all the items except the production cost (e.g., labor costs, material costs). Moreover, the same results were obtained even when comparing only with rival sites located in China ($N = 47$). Regarding manufacturing costs, respondents were concerned with labor and material costs, thus one can assume that sites located in China and other countries will have a relative advantage. While facing a severe business environment during the 2010s, it became clear that the domestic factories have maintained a high level of the gemba competitiveness such as productivity, external defect ratio, development of unique production technology, and launch of the mass production line.

**Market competitiveness**

As market competitiveness is considered to be the benchmark comparison with competitors outside that is performed by respondents themselves, we use the relative evaluation of competitors as a measurement scale for measuring the market competitiveness. Figure 2 indicates that the reason for No.1 sales business (core business) of the respondent in the end of September 2013 is the customer appreciation received compared with the customer appreciations received by the strongest domestic and foreign rival companies.

We used five items,\(^4\) such as low price and customization, to

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\(^4\) A five-point scale was used to respond to this question: “Compared with your largest competitor in this business, either domestic or foreign, which of the following items best correspond to the reason customers rate your business at this site higher than competitors?” Possible responses were: we provide low-priced products due to cost reductions; we provide unique products and services; accurate or short delivery times; responsiveness to customer requests for customization; excellent customer service (post-sale service and technical support). The 1–5 scale has 1 meaning “do not agree at all,” 3 meaning “neither agree nor disagree,” and 5 meaning “very much agree.”
measure market competitiveness. We asked respondents to evaluate each of these items on a 5-point scale compared with their rival firms. The source of competitive advantage in the market is the height of customer response capabilities such as “high ability to respond to a request from the customer” or “excellent customer service.” These have become the focus of competition in recent years of the electric and electronics industry.

Employment

The results of the survey revealed that approximately 21% of full-time employees worked in design, 56% in production, 3% in sales, and the remaining 19% in other areas as of the end of October 2013; thus, most full-time employees were assigned to design or production-related activities within the factory.

Questions regarding employment within manufacturing and changes in the period from the end of March 2007 to October 2013 were asked to respondents ($N = 55$).\(^5\) Results showed that, on

\(^{5}\) As of the end of March 2007, there were approximately 589 full-time employees, 123 contract-based workers, 144 temporary workers, 12
average, the employee headcount decreased by approximately 100 individuals, most of whom were temporary workers. Further, the companies were reluctant to hire temporary workers as regular employees. In addition, 66% of the workers \((N = 86)\) on production lines at the sites in question were full-time employees as of the end of October 2013.

Figure 3 indicates the results of questions asked regarding the age composition of full-time employees. It reveals that there is a skew in the age composition, with few younger workers, and many middle-aged workers. Many workers are in their 30s and 40s. However, those in 30s do not have sufficient experience to teach fixed-term (longer than one year) employees, eight fixed–term (less than one year) employees, and three part-time workers. As of the end of October 2013, there were 582 full-time employees, 111 contract-based workers, 47 temporary workers, 28 fixed-term (one year or longer) employees, 12 fixed-term (less than one year) employees, and four part-time employees.
younger workers. There are some workers in their 20s to whom skills can be passed along in the long term, the number of most veteran workers (55 and older), who also happen to be the greatest source of advanced skills, are declining. However, one may take a more positive view and note that there are many candidates to become the next generation of veteran workers. Following issues would result from this type of skew in age composition: 1) the relatively high cost of labor will increase in the future due to the higher ages; 2) a mechanism must be created to transfer advanced skills of those with 20 or 30 years of experience to younger workers and 3) workers in their 40s, who are most prevalent, should be utilized to pass along the older workers’ skills to younger employees.

Conclusion

The analysis of the results of questionnaire A has depicted the picture of the average Japanese electronics manufacturers in 2013. The strength of gemba in Japan’s electric manufacturers is primarily due to the following two points.

(1) The gemba in Japanese electric manufacturers are superior to those of their overseas counterparts in all measures of competitiveness, except manufacturing cost (the values in Figure 1 exceed those in Figure 3).

(2) The high level of responsiveness to customers (customization of designs, service, and support) are the primary sources of market-level competitiveness⁶ (the values in Figure 2 exceed those in Figure 4).

The simultaneous pursuit of steadily developing manufacturing

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⁶ For companies to maintain and improve their customer responsiveness, it is important that they equip factories with design functions and production technologies. This point was clarified in the interview with factory managers.
competencies and design and development capabilities is critical for acquiring and maintaining the superiority of Japanese manufacturing gemba in the future.

Simultaneously, the skewed age composition of full-time employees is a major issue. Lack of workers to pass along future skills, coupled with the issue of high labor rates for veteran workers, means that the companies must carefully consider measures to secure these resources and implement countermeasures. One of the ways for the companies to maintain and improve their competitiveness would be to aggressively seek customers and develop new businesses by taking advantage of their strengths in manufacturing and design and adding such functions to factories.

In addition, the current high gemba-level competitiveness of Japanese companies is due to the many veteran workers who have been in these gemba for many years. However, the fact that there are not sufficient younger workers to whom these veterans can pass the batons is a major issue that must be resolved in future.7

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References


7 In achieving competitiveness amid environmental changes, the role of managers in understanding business environments and in acquiring and distributing business assets is critical (Fukuzawa, 2015; Takahashi, 2013; Wada, 2015).


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