

# A Study on the Business Strategy of Highly Profitable Electronic Component Manufacturers

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**Abstract**—This paper aims to analyze the source of competitiveness of highly profitable electronic component manufacturers from perspective of product characteristics and patent information. In the electronic component industry, on the one hand there are some companies having a high ratio of operating profit on sales for a long period of time, but on the other hand there are many companies remaining low profitability. Therefore, the fact is that profitability ratios differ widely according to the company. Firstly, the case analysis of Keyence, a leading factory automation manufacturer, and Hirose Electric, a leading connector manufacturer is conducted from perspective of product characteristics and patent information. Secondly, the differences and similarities between these two companies are clarified. Thirdly, some factors delivering competitive advantage to these two companies have been analyzed by two distinctive strategic management approaches: Porter's five forces analysis and Barney's resource-based view. Finally, the implications drawn from these analyses are discussed, and the issues for future research are posted.

**Keywords**—Highly profitable company; Commoditization; Standardization; Competitive advantage; Strategic management

## I. INTRODUCTION

The purpose of this study is to analyze the source of competitiveness of highly profitable electronic component manufacturers from perspective of product characteristics, patent information and strategic management approaches. Although the electronic component industry has been performing strongly supported by positive business performance because of expanding demand for such as smart devices and automotive products, on the one hand there are some companies having a high ratio of operating profit on sales for a long period of time, but on the other hand there are many companies remaining low profitability. The fact is that profitability ratios differ widely according to the company.

Under these circumstances, Keyence, a leading factory automation manufacturer and Hirose Electric, a leading connector manufacturer are recognized as one of the highly profitable electronic component manufacturers in Japan. Then, why these companies secure higher profitability than competitors and sustain them? As to these questions, this paper clarifies the similarities and differences between Keyence and Hirose through comparative analysis and the factors contributing to long-term profitability by using business strategic approaches. Then, the implications drawn from this case analysis are discussed.

Keyence established in 1974 is one of the leading comprehensive factory automation manufacturers in Japan, and it is known as a highly profitable company with an operating profit margin of approximately 50% on average as shown in Figure 1.

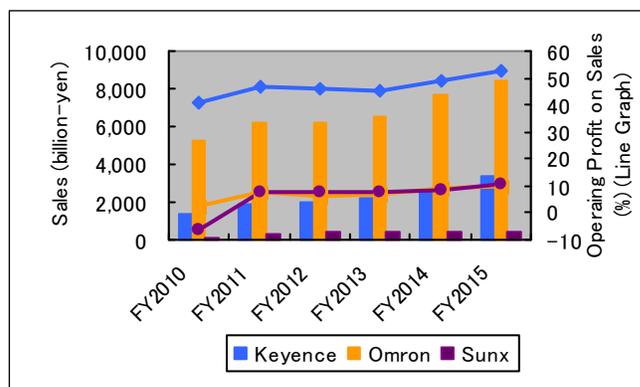


Fig. 1. Sales and operating profit on sales since FY2010

Compared financial data of FY2015 to a national competitor Omron in the sensor market, Keyence posted sales of 334,034 million yen and operating profit on sales of 52.6%, however Omron posted sales of 847,252 million yen and operating profit on sales of 10.2%. Consequently, operating profit on sales of Keyence is more than five times compared to Omron's one.

On the other hand, Hirose Electric established in 1937 is one of the leading connector manufacturers in Japan, and this company is also known as a highly profitable company with an operating profit margin of more than 20% in listed companies as shown in Figure 2. Compared financial data of FY 2015 to a national competitor Japan Aviation Electronics Industry (JAE) in the connector market, Hirose posted sales of 125,726 million yen and operating profit on sales of 25.9%, however JAE posted sales of 191,155 million yen (Sales only as for the connector business are approximately 169,000 million yen.) and operating profit on sales of 13.5%. Consequently, operating profit on sales of Hirose is higher than JAE's one by more than 10% .

Why these companies secure high profitability over other competitors and sustain them? This paper examines product characteristics and patent information of Keyence and Hirose and clarifies the similarities and differences between these two companies through the use of IR information, various materials and patent information. Then, some factors delivering competitive advantage to these two companies have been analyzed by two distinctive strategic management approaches: Porter's five forces analysis and Barney's resourced-based view.

## II. CASE ANALYSIS RESULTS

### 1. Case of Keyence

#### 1-1 Product characteristics and patents

Keyence mainly produces sensors, and differences between Keyence and other competitors can be seen in the kind of products put into the sensor market. Other competitors, Omron and Panasonic Industrial Devices SUNX (Sunx) bring the mechanical switches (contact type) such as micro switches or limit switches to the market, however only Keyence does not bring contact type products to the market. This means that Keyence prevents ineffective product development by specializing in non-contact type products and takes the strategy which is clearly different from other competitors. Also, Keyence is recognized as singular company for the good reason that approximately 30% of sales amount are new products, and approximately 70% of them are "the world first" or "the first in the industry"<sup>1</sup>. In one to three years cycle, this company develops higher characteristic products and brings them to the market.

On the other hand, if the number of new products increases, the lineup of products spreads, and it results in diversifying its product mix. The production process, as a result, is expected to be complicated. Table 1 summarizes the comparison of the number of series and models of the proximity sensor by each company. This comparison table suggests that Keyence has approximately 53 models, on the other hand Omron has approximately 691 models, and Keyence, as a result, offers models one thirteenth of Omron's models. This means Keyence mainly develops general purpose products with a small number of models, therefore this company is thought to have a superior cost competitiveness compared to other competitors for a unique reason to offer a large number of products per one model.

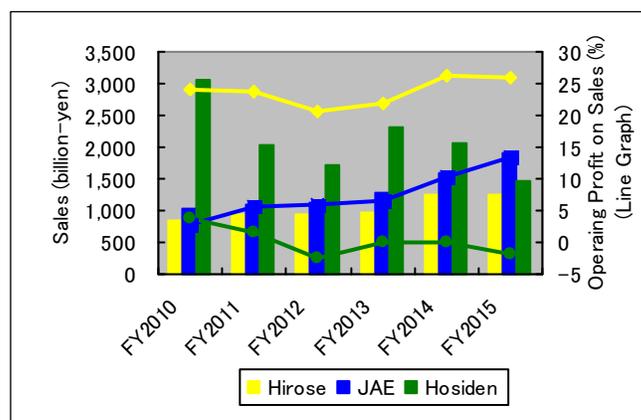


Fig. 2. Sales and operating profit on sales since FY2010

1 President Online <http://president.jp/articles/-/6772> (accessed 2013-12-03).

TABLE 1. COMPARISON OF THE NUMBER OF SERIES AND MODELS OF PROXIMITY SENSOR

Company Name	The Number of Series	The Number of Models	Breakdown by Category
Keyence	6	53	Built-in Amplifier type (31) Separate Amplifier type(22)
Omron	27	691	Built-in Amplifier type (657) Separate Amplifier type(34)
Sunx	9	255	Built-in Amplifier type (242) Separate Amplifier type(13)

Source: Home page of each company (as of May, 2015)

## 1-2 Trend analysis from patent data

When compared patent data of Keyence to other competitors from 2004 to 2013 at the company level<sup>2</sup>, Omron has a high number of both patent applications and registrations than Keyence and Sunx. As for the number of patent applications, Keyence is second and Sunx is third, as for the number of patent registrations, Sunx in second and Keyence is third as shown in Figure 3.

Next, when 1,779 patents total of Keyence (after computerization) are classified according to a product type, and 158 patents out of them are classified into sensor field, on the other hand Omron has 15,300 patents total, and 984 patents out of them are classified into sensor field as shown in Table 2. Similarly, Sunx has 1,467 patents total, and 429 patents out of them are classified into sensor field. This number is approximately three times as much as Keyence.

Contents of patents should be analyzed in details, as far as three companies in the sensor market are compared, the results suggest that Keyence is not forward enough to apply and register patents compared to other competitors, and this company is supposed to be aggressive to secure profitability by developing characteristic new products rather than applying and registering patents and utilizing them for the purpose of securing profitability.

## 2. Case of Hirose

### 2-1 Product characteristics and patents

Taking look at the domestic connector market of 2011<sup>3</sup>, Hirose is third in connector for printed circuit board with a 14% market share, and second in narrow pitch connector with a 21% market share, then third in connector for FPC with a 15% market share. As Hirose relatively captures a large share in almost all kind of connectors with the exception of IC socket, this company is considered to apply small lot multi-production.

Table 3 summarizes the comparison of the number of part number (PN) of round shape and square shape connectors. These connectors are classified into multiple connectors, which account for approximately 81% of sales by segment in Hirose. This comparison table suggests that Hirose has 3,522 PN total, and competitor JAE has 1,867 PN total, then Hosiden has 210 PN total. This means that Hirose has a higher ratio of operating profit on sales than JAE, even though JAE has PN less than Hirose and outstrips the sales of Hirose by approximately 30%.

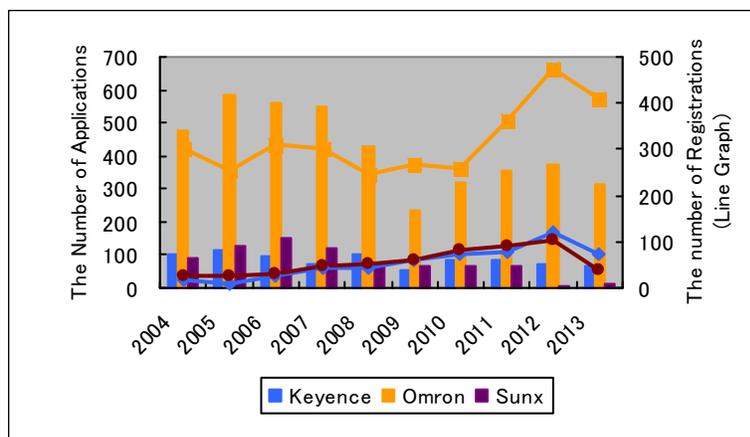


Fig. 3. The Number of Patent Applications and Registrations in Three Sensor Manufacturers since 2004

<sup>2</sup> Patent data used in this analysis are provided by Bizcruncher® of Patent Result Co., Ltd.

<sup>3</sup> "2011 Connector Market", Market Survey and Outlook for Electronics Components, Sangyo-joho Limited

TABLE 2. RESULTS OF PATENT CLASSIFICATION BY PRODUCT IN THREE SENSOR MANUFACTURERS

Company Name	The Number of Patents in Sensor Field	% of Patents Total	Extraction Method
Keyence	158	8.8%	The word of "Sensor" is described in the noun clause at the end of Claim1 (e.g. Photoelectric sensor, Multi axis photoelectric sensor)
Omron	984	6.4%	
Sunx	429	29.2%	

If the number of model numbers is small and the sales per one number or model are large, cost competitive is generally thought to become higher. However, as Hirose carries out through small lot multi-production, the number of PN is thought to be necessarily increased. However, Hirose's connectors have a short product life cycle enough to be replaced 30% of products with new one in three years. Moreover, this company carries out a policy that they retire their products involved in the start of competitive price cuts and followed by competitors<sup>4</sup> and emphasizes on finding a new market for securing profitability by retiring products experiencing commoditization and involved in price competitions. Moreover, this company is originally based on the idea that continuing to manufacture without securing enough profitability brings a loss on themselves and sets up a target profit of 20% by each product<sup>5</sup>. Withdrawing products from the market means creating new products for Hirose, and this enables this company to develop high value-added products.

## 2-2 Trend analysis from patent data

When compared patent data of Hirose to other competitors from 2004 to 2013 at the company level<sup>2</sup>, JAE has a high number of patent applications and registrations than Hirose and Hosiden, and Hosiden is second, then Hirose is third as shown in Figure 4.

Next when 978 patents total of Hirose (after computerization) are classified according to a product type, 691 patents out of them are classified into connector field, on the other hand JAE has 4,445 patents total, and 1,854 patents out of them are classified into connector field, then Hosiden has 1,493 patents total, and 358 patents out of them are classified into connector field as shown in Table 4. In comparison with a competitor JAE that mainly develops connector business, the number of Hirose' patents is approximately one-third that of JAE.

Contents of patents should be analyzed in details, as far as three companies in the connector market are compared, the results suggest that Hirose is not forward enough to apply and register patents compared to other competitors. This company is supposed to be aggressive to secure profitability by developing characteristic new products rather than applying and registering patents and utilizing them for the purpose of securing profitability just as Keyence is.

As described before, Hirose announces its policy that developing new products with operating profit on sales of more than 20% is a great contribution to this company, in contradiction to this, if operation profit of sales is lower than the target, these products become an object for being withdrawn from the market. Developing new products which other competitors have not yet developed is considered to be important for them to enjoy the "first-come-first-served" merits. Therefore, this company is supposed to give particular priority to develop new products for securing profitability for the purpose of persevering this policy.

TABLE 3. COMPARISON OF THE NUMBER OF PN OF SQUARE SHAPE AND ROUND SHAPE CONNECTOR

Company Name	The Number of Series	The Number of PN	Breakdown by Category
Hirose	85	3,522	Square Shape(1,630) Round Shape (1,892)
JAE	44	1,867	Square Shape(285) Round Shape (1,582)
Hosiden		210	Including Mini DIN Connector, DIN Connector

Source: Home page of each company (as of May, 2015)

4 "Mugendai", 2007 Summer, pp. 52-55.

5 "Nikkei Business", 1996.10.7, pp. 24-25.

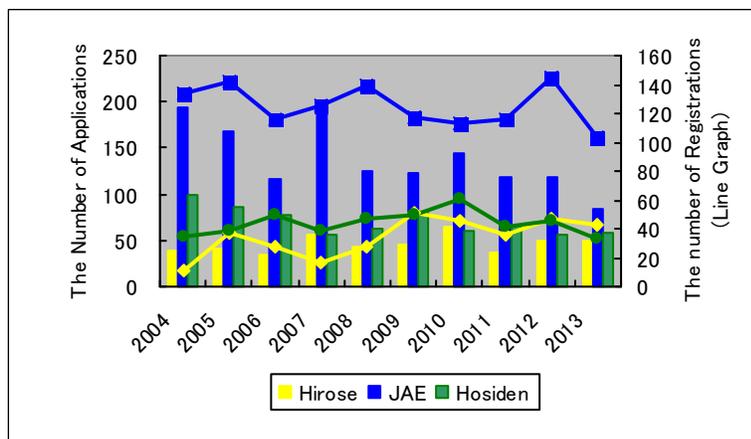


Fig. 4. The Number of Patent Applications and Registrations in Three Connector Manufacturers since 2004

TABLE 4. RESULTS OF PATENT CLASSIFICATION BY

Company Name	The Number of Patents in Connector Field	% of Patents Total	Extraction Method
Hirose	691	70.6%	The word of “Connector” is described in the noun clause at the end of Claim1 (e.g. Electrical connector, Optical connector)
JAE	1,854	41.7%	
Hosiden	358	23.9%	

### III. APPROACH FROM PORTER AND BARNEY’S FRAMEWORK

#### 1. Analytical methods

##### 1-1 Five forces analysis

Five forces analysis (Porter, 1985) is a framework for analyzing industry forces and finding the way the company positions itself in the industry to contribute to long-term profitability. This framework is consisting of the following five forces: (1)Threat of new entrants, (2)Threat of substitutes, (3)Bargaining power of buyers, (4)Bargaining power of suppliers, and (5)Rivalry among existing competitors. The threat of new entrants is determined by an entry barrier in the industry. In the case that a high entry barrier is created for competitors, it causes less competition in the industry. On the contrary, in the case that a low entry barrier is created for competitors, new entrants make an entry into the market after another, and the industry gets more competitive in the result. The profitability in the fiercely competitive industry becomes less attractive to the company, because it's harder than ever to gain excess profit. The appearance of substitute products or services satisfying customer needs becomes a threat for the company. In the case that substitute products and services are superior to existing one, also current potential profit in the industry is drastically reduced by the growth of substitutes, they are facing a growing threat. In cases where buyers of products and services exercise strong power over the industry, the industry is involved in fierce competition, and if the suppliers have a much higher position and a stronger negotiation power in the industry, it promotes further competition in the industry. The more power these five forces have, competitions become very keen in the market, and the industry experiences a significant decrease in profitability as a result of these competitions. The analysis of these five forces enables the company to identify industry structure from a comprehensive perspective and helps to position itself in the industry with competitive advantage.

##### 1-2 Resource-based view

Resource-based view (Barney, 1991) is a framework for finding the sources of competitive advantage in the internal unique characteristics of the company. This means successful company has an accumulation of unique, excellent capabilities and resources. When the company addresses to maximize profitability, the most influential factor is in the internal resources of the company not industry structure. This framework is contrasted with Porter’s approach, however these two theories complement

each other. Barney provides VRIO analysis consisting of the following four factors: V (Value), R (Rarity), I (Inimitability), and O (Organization). The value gives an economical perspective for analyzing whether the internal management resources of the company are of great value in customers. Next, the rarity gives a perspective for analyzing whether the internal management resources of the company show rarity in the market. In case that rarity is light, market entry of competitors becomes much easier. Then, the inimitability gives a perspective of analyzing whether the company possess an inimitability in the internal management resources. In case that the imitation is easy, there is a possibility to be caught up by competitors in a matter of time even though they have differences in the internal management resources at present. The last is a factor of the organization, which give a perspective for analyzing whether the organization is prepared for utilizing internal management resources effectively. If the organization is not organized properly, these management resources make no sense for the company.

The most important factor to secure sustainable competitive advantage in the market is thought to be inimitability among this VRIO framework. The internal resources having inimitability include the following cases, e.g. imitation behavior required so much cost and time, having internal management resources which are difficult to imitate from a business perspective, even if it costs and spends much more time for imitating, imitation itself is difficult due to the nature of business, in case that competitors cannot identify an object of imitation and have no idea to imitate for the good reason that it is too complicated and so on and imitate due to own reasons although there is nothing is impossible, however it is impossible to imitate. The company is possible to place itself in the position of sustainable competitive advantage by having inimitability in the internal management resources. However, the resources may not always become the source of competitive advantage. Because if the internal resources of the company have no value for customers, these resources cannot create clear competitive advantage in the market.

## *2. Competitive advantage analysis*

### *2-1 Analysis from five forces model*

The electronic component industry has been analyzed by using Porter's five forces model and identifies Keyence and Hirose's positioning in the industry. According to Japan Electronics and Information Technology Industries Association (JEITA), the amount of 2014 world shipment of the electronic components by Japanese electronic component manufacturers was 3,937.2 billion yen and a 10% increase compared to the previous year. They have a strong competitive strength in the various fields such as passive components (e.g. resistor, capacitor, coil), connecting components (e.g. connector, switch), transducers and electronic boards and control the world's top market share. Taking some examples of them, "ceramic package" of Kyocera Corporation and "laminated ceramic capacitor" of Murata Manufacturing Co., Ltd. are widely used for such as smartphones and have the largest sales amount.

As for the rivalry among existing competitors, this industry is the ever-changing business due to innovations, price competitions and others. An environmental change of the market such as entry of competitors, development of in-house production and shifting production oversea in customers may have an influence on the business performance, therefore survival race among existing competitors should intensify now and in future years.

With respect to the threat of substitutes, electronic components are required for various fields such as medical equipment, automobile, smartphone and cloud computing in the future, especially used for next-generation vehicles have a high degree of expectation because these components are mostly used for the engine motor of electric vehicles and hybrid vehicles in comparison with a traditional gasoline engine. It seems to be much less likely to have a threat of substitutes in this industry because a huge business opportunity will be created with the growth of next-generation vehicles.

As for the threat of new entrants, electronic components used for smartphones and tablets are expected to experience a reduction in profitability because they will be increasingly commoditized in the future. Moreover, it is concerned about the possibility that shifting to a low-priced model for emerging countries or developing countries results in a reduction in the price, and domestic electronic component manufacturers might well have to face competition from Korea, Taiwan, China and other countries.

The suppliers for electronic component manufacturers are material makers, and soaring material prices have also become a pressure factor on company profits. In addition, there is a possibility that electronic component manufacturers are greatly affected by the trend of set makers because many of them have a relation of subcontractor with set makers.

The most notable point is that as this industry has a relatively low barrier to entry, inexperienced small and medium-sized company and small company with certain technical capacity have many opportunities to enter into the market. The fact of the matter is that domestic electronic component manufacturers have advantages especially in custom products, as the commodity market is increasingly competitive due to catch-up by China, Taiwan, Korea and other countries. In addition, the set maker which buys an enormous quantity of electronic components inevitably have price bargaining power over electronic component manufacturers. However, in some cases, suppliers like Keyence and Hirose become a threat for set makers. Keyence provides

not only sensors but solutions for customers, and it results in increased productivity of customers. Consequently, Keyence is possible to set a higher price to investment cost of customers. As for Hirose, this company is the most successful company for putting added-value new products into the market faster than competitors, and it results in setting a comparatively high price. In addition, because these two are fables companies that specialize in R&D and the development of prototypes and outsource all or a part of production processes without maintaining all production plant of their own, this enables them to strengthen their presence in the market and create a strong bargaining power.

## 2-2 Analysis from resource-based view

Keyence applies consulting sales under direct marketing system without an agency<sup>6</sup>. And sales staff members consisting more than half of full staff directly visit customers frequently, go deeply into customer's production line and R&D environment, then summarize customer's needs in standardized product development<sup>7</sup>. Through such a way of product development, they never produce special order products for special customers, as a result this enables Keyence to put products widely used by standard customers not an advanced customers in the market from a beginning.

Also, this company provides the best solutions to the problems that customers recognize only vaguely from a customer's perspective. Although Keyence offers products at a higher price, customers purchase them including solutions even if the price of products is higher than competitors. Here is one of the reasons that enables Keyence to secure high profitability.

If other companies imitate Keyence's business model, the profitability should remarkably increase. Why cannot competitors imitate it? This is exactly that Keyence has capabilities of rarity and inimitability in the internal resources. From the VRIO framework, value and rarity are absolutely necessary for the internal resources of the company to give competitive advantage in the market. However, the company is easy to be followed by competitors and lose both value and rarity if they did not have inimitability. Keyence is thought to have extraordinarily high capabilities of inimitability in the internal resources, therefore competitors cannot follow this company.

However, why Keyence's inimitability is higher than competitors? There is a key solving this problem in the organization. In Keyence, in addition to visit customer frequently, they accumulate knowledge about own products in study session, think out a method or a way for solving customer's problems and offer solutions to them. Then, they understand customer responses and improve products based on customer's feedbacks<sup>6</sup>. Building an organization consisting of such a staff is considered to be very difficult and hard, therefore competitors cannot imitate this company easily.

As for Hirose, this company develops new connector business through small lot multi-production, which other connector manufacturers tend to avoid and responds to quick delivery and variation in demand fluctuation. This kind of connectors allows companies to set a couple of higher price than standardized products. Hirose's engineers go into the market to receive inquiries for new products in a developmental stage from customers. The engineering and sales work cooperatively, anticipate potential products in a couple of years advance by collecting necessary information and proceed to develop products by putting half the number of engineering staff members before inquired by customers<sup>5</sup>. Therefore, they are able to enjoy "the first-come-first-served" merits through the development new products satisfied customer needs ahead of competitors.

However, at the time when new products are standardized in the market, Hirose withdraws from its production promptly before they get caught in a price war due to the entry of competitors into the market. This enables Hirose to deliver a steady stream of innovative products required by customers preceding to appearance of competitors and win without fighting. By repeating this cycle, Hirose is considered to realize high price, quality and profitability, and competitors cannot imitate Hirose's business model easily.

## IV. CONCLUSION AND FUTURE RESEARCH

In this study, Keyence and Hirose, which are highly profitable companies in the electronic component industry are focused, and the similarities and differences between these two companies are clarified from perspective of product characteristics and patent information.

The results show that as for the product characteristics, Keyence basically reduces the number of series or models as much as possible and generally produces general purpose products, while Hirose has a high number of series or PN than other competitors and corresponds to diversification of customer needs flexibly through small lot multi-production. As small lot multi-production probably brings high cost and difficulties in maintaining high quality, other connector manufacturers tend to avoid this production method, however Hirose has an organizational capability corresponding to small lot multi-production. This is especially Hirose's strength and the differences between these two companies. On the other hand, both Keyence and Hirose make a strong effort to develop value-added new products, and they are estimated to place importance on know-how

6 "Hitotsubashi Business Review", 2009 SPR., pp.118-119.

7 "Nikkei Business", 1997.10.6, pp.27.

such as specialized experiences and methods rather than applying and registering patents. On that point, these two companies have a lot of similarities.

In the case of producer's goods makers, if they experience commoditization due to competitor's entrances in the market and have found themselves in price competitions, they are involved in losing a market share. Therefore, how to develop patent strategy is supposed to be important in order to avoid commoditization of products. On the other hand, product development for securing profitability without relying on patents is suggested to be one of the effective ways rather than securing competitive advantage by owning patents in the market.

Then the factors enhancing competitive advantage to these two companies are explained by two strategic management approaches, Porter's five forces and Barney's RBV. It is clarified that these two companies possess internal unique characteristics such as management knowhow and strategy, and this results in maintaining a relatively strong position in the market and securing high profitability.

This paper attempts to compare and analyze product characteristics and patents of major highly profitable electronic component manufacturers through case analyses and strategic management approaches. However, factors associated with high profitability are necessary to be considered from a different perspective such as a relation with customers and a relation between design and production. The issues should be discussed for future research.

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#### BIOGRAPHY

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