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Description	

Sourcing Intelligence: The Third Intelligence for Corporate Strategy in the Horizontal Specialization Era

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Abstract--Since the 1990s, fabless companies which have no manufacturing capability have emerged and grown in the electronics industry. Apple Inc., the most well-known fabless company, is considered to have enhanced its competitiveness with extraordinary marketing capability and excellent software technology focusing on customer usability. Its power of competitiveness, however, does not lie only in those capabilities. Apple has adopted cutting edge devices from device suppliers to develop hardware products such as iPhone which have captured consumers' minds. It has also selected the most capable EMS to stably manufacture millions of products each month. In dealing with device suppliers and EMS, Apple controls them. Its sourcing power is also Apple's critical capability.

There have been many discussions about Market Intelligence (MI) since the 1970s, and Technology Intelligence (TI) since the 1980s. However, there has not been so much discussion about intelligence related to sourcing. This paper advocates "Sourcing Intelligence (SI)" as the third intelligence that supports sourcing power following MI and TI, and introduces its basic concept and examples of its practical use. Furthermore, the important role SI plays in corporate strategy is demonstrated.

I. INTRODUCTION

The source of corporate competitiveness differs for each business model. For the Japanese electronics and automobile manufacturers which led the world in the 1980s, it was the realization of low priced yet high quality products [4]. The electronics industry promoted vertical integration by internally manufacturing such key devices as semiconductor and display device, thereby differentiating end-equipment and reducing cost. The automobile industry, on the other hand, enhanced quality and reduced cost by building up a strong supplier group and by promoting vertical integration [7]. Capability to integrate was the source of competitiveness for these closed integral type product architecture companies [6] [8].

The electronics industry which built up its strength through vertical integration experienced a transformation to horizontal specialization type following Intel's promotion of a platform strategy [9]. First, PC industry was changed to open modular type product architecture. Other electronics products followed suit. Today such consumer products as digital TV sets and digital audio players have the same industry structure as PC. The challenges that corporate management in this industry face is identifying what constitutes corporate competitiveness under such horizontal specialization industry structure as well as finding out ways to further enhance such competitiveness.

Examples of DELL and Apple Inc. which enjoy high market share imply that the procurement capability is one of

the sources of corporate competitiveness for horizontal specialization type. The direct sales model of DELL shortened the time distance between the customer and manufacturing site and built up a strong SCM that realized lower indirect costs than those of competitors [10]. It also carried out product marketing which reflected the device market situation. Apple Inc., which is storming the world with such popular products as iPod and iPhone, is a fabless company. It develops its own products and outsources production. For both DELL and Apple Inc., their ability to manage suppliers is indispensable to their success.

This paper looks at the changes in the role of procurement as companies transition from vertical integration to horizontal specialization and then to a fabless company. Based on the findings, it clarifies the differences in required capabilities for each case, and concludes with proposing the key to enhancing corporate competitiveness from the perspective of procurement.

II. LITERATURE REVIEW

Many of the papers on Procurement written in the 1970s argued how the Procurement Division is perceived in the corporate organization. As represented by the research of Ammer [1], the Procurement Division was positioned organizationally distant from management. It did not participate in the business planning or devising management-strategy. Its role was purchasing required parts according to a predetermined plan. There was recognition by top management that Procurement Division did not play a strategic function but simply performed a managerial role. In contrast, from around the 1980s, researches were conducted which incorporated the role of procurement into corporate strategy. At long last, top management began to recognize the role of procurement within a company. Ellram and Carr argue in the research [5] that although the role of procurement was becoming a part of corporate strategy, its involvement was still limited. Such research looks at the role of procurement from the managerial viewpoint.

However, in the 1990s, recognition that procurement can contribute to a company's success started to spread. There is a view that this was because with globalization of the market, competition among companies also became global, and as a result, importance of procurement came to be recognized [3] [16]. Furthermore, Weele and Rozemeijer stated that a change was also required for procurement taking advantage of information technology development [17]. The number of researches on strategic procurement increased.

Many of the researches on strategic procurement offer

frameworks on how to enhance the competitive advantage of a company using procurement function. Rjagopal and Bernard proposed a framework consisting of three phases: information analysis, start of purchase activities, and exclusion of inertia [12]. Sislian and Satir presented a decision flow chart, and verified its validity on two products [14]. There is also a research which looked at a certain topic in a framework. In the research which focused on the relationship with suppliers, Spekman advocated that it was necessary to build a long-term relation with a supplier, foster trust and commit to one another [15]. These are roles which contribute to improving the manufacturing process, i.e., operation capability.

Wynstra and Weele et al argued about the role Procurement Division played in product development, an interface with suppliers, performing the role of coordination function with internal divisions concerned and progress management [18].

In relation to this, there was an attempt to build a strategic Procurement Framework using the choice of make or buy parts as the starting point. This choice is closely related to the subject of which domain and how far internal R&D should be extended, and leads to research of Technology intelligence.

In the preceding researches, the role of procurement is roughly classified into three roles: managerial role which contributes to the improvement of work for procuring non-production materials, the role which contributes to the improvement of manufacturing process and manufacturing operation capability, and the role for finding out the supplier's capability in new product development. Through time, research has advanced from managerial work, contribution to manufacturing process, to contribution to new product development. However, many studies have focused on the role of procurement itself; not so much research has

linked it to changes in industrial structure. For the role of procurement to change, a certain factor must exist. By clarifying this factor, it will become possible to link the role of Procurement to strengthening corporate competitiveness.

In the next section, the migration process from a vertical integration type to a horizontal specialization type is reviewed, and the role of Procurement is considered.

III. THE ROLE OF PROCUREMENT ON THE MIGRATING PROCESS IN THE INDUSTRY STRUCTURE

A. Migration Mechanism to Horizontal Specialization from Vertical Integration in the Most Competitive Electronics Companies

Here the process in which the structure of a highly competitive company in the electronics industry changes from vertical integration to horizontal specialization is renewed from the viewpoint of product architecture [6] [8] in Figure 1.

Stage 0

In Stage 0, the product initially consists of the several key exclusive parts, which lead to differentiation of products, developed and manufactured in the same company. The other non-key parts like standard parts are purchased from outside. Next, the manufacturing of the exclusive parts developed internally are entrusted to suppliers. Finally in this stage, the development through manufacturing is entrusted with only the specification provided.

In this case, the product architecture is closed integral in which many parts are highly optimized with one another. Automobile is of this type [6].

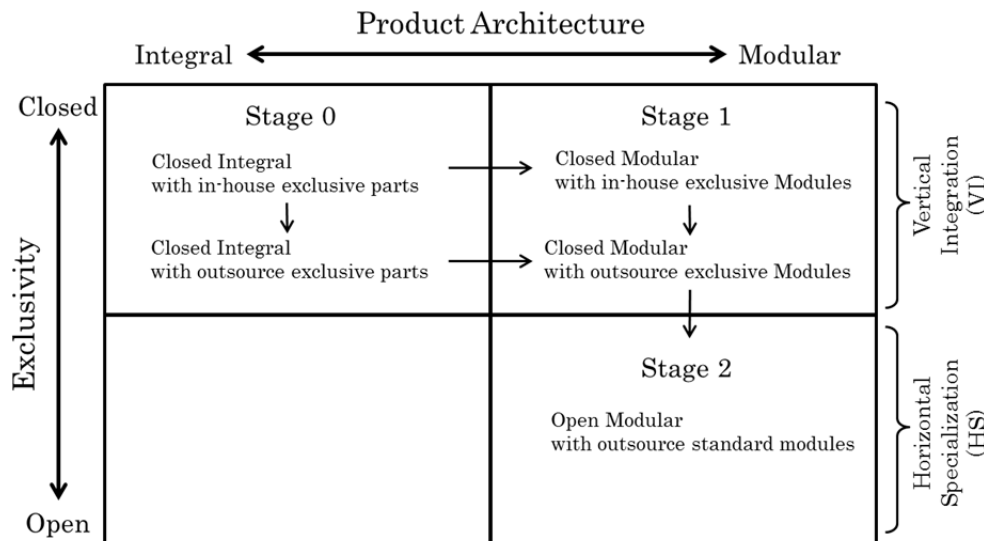


Figure 1. Migration Route from VI to HS in Product Architecture

Stage 1

To deal with the complexity increases or cost reduction of the product, product architecture moves to a modular type where some of the exclusive parts are consolidated to form a functional module. The development and production of module is internally made or entrusted to the reliable suppliers. IBM 360 which was most famous as mainframe computer was closed modular type [2] [6].

Stage 2

Once the interface among modules is decided in modular architecture, the performance and function of the modules themselves can be enhanced without being affected by other parts. As a result, suppliers of modules themselves can start to plan internal specifications of modules and make proposals to equipment manufacturers. The equipment manufacturers make open the interface aiming at the effect of urging competition among suppliers. Then product architecture finally moves to open modular type and such modules are considered as standard parts in the industry.

PC is typical product for open modular architecture. Its configuration parts, such as DRAM, HDD and Optical Disc Drive etc., are often used in other electronic equipment and considered as commoditized parts.

In Stage 0 and Stage 1, exclusive parts or modules are closed in a certain company. The product used such closed exclusive parts or modules, is defined as Vertical Integration product in this paper. Also open modular type in Stage 2 is defined as Horizontal Specialization product as well.

B. What is the Main Role of Procurement in Each Stage?

This clause considers the main role of procurement in each stage.

Stage 0: with in-house exclusive parts

For a product with many exclusive parts which require optimization with one another, communication among engineering teams must be closely conducted. For example, engineers of equipment need to discuss during development, to align the production schedule plans of parts and equipment and to collaborate in dealing with quality problems. In case of internal development and production for exclusive parts, parts division and equipment division can directly exchange information and talk with one another. As cost becomes known as internal information, usually it suffices for the control division to coordinate the internal transfer cost. Therefore, Procurement Division is hardly even involved with internal dealings. The role of procurement becomes that of procuring mainly general standard parts from outside the company, since usually little consideration with development division is required to optimize the use of standard parts. The focus of the work becomes that of routine such as ordering and delivery control, resulting in procurement to assume the role of non-strategic indirect work [1].

Stage 0: with outsource exclusive parts

Since exclusive parts are procured from external suppliers, exchange of information is restricted more than in the case of internal procurement. For example, it is difficult to accurately grasp the actual cost information of parts and their transaction information with other suppliers. Long-term relationship must be constructed to prevent suppliers from pursuing opportunistic behaviors and that capability must be applied to its own products [7] [15]. Procurement Division plays a major role in serving as interface between the supplier and the development team during the development stage [18]. First the Procurement Division evaluates the supplier's capability and decides on which supplier to place a purchase order with. After the supplier is decided, procurement follows up the development progress to prevent delay in the schedule. In mass production stage, it is necessary to place an emphasis on managing the delivery schedule and quality and if a problem occurs, to guide the supplier to swiftly meet the requests for improvements. Regarding cost management, although the actual cost is unknown, appropriate cost should be calculated by estimating from the market prices of parts, materials, and equipment and manufacturing process, and the suppliers made to achieve that cost.

In this stage, the role of procurement focuses on building and developing relations with suppliers worthy of long-term business and managing cost and delivery date. Those roles are still on the supportive side.

Stage 1: with outsourced exclusive modules

The role of procurement is basically similar to that in Stage 0. After interface specification of the module is defined, suppliers can propose new modules, reducing the frequency of communication among engineers. As a result, the degree of procurement involvement can be assumed to increase.

Stage 2: with outsourced open modules

Since the product consists of standard parts for key functions, there are less frequent discussions of technology issues with suppliers. Although failure sometimes occurs in analog areas such as malfunction due to noise occurrence, there is basically no area which requires optimization since specification is already determined as industry standard. With low switching cost to other suppliers, it is not necessary to maintain close relations with the supplier. On the other hand, as the supplier takes an opportunistic behavior, such ingenuities as long-term supply agreement and large purchase order are required to secure stable supply.

The role of procurement focuses on seeking the optimum supplier with well-balanced quality, cost and delivery date for the company's product and securing parts by being sensitive to the changes in the parts market and predicting opportunistic behavior of the supplier.

C. Hypothesis Derived from the Considerations

These considerations seem to show an existence of difference between the areas of Stage 0 to 1 and Stage 2. In

other words, the difference appears to be dependent on exclusivity of the part. In this paper, the product using closed parts or modules is defined as “Vertical Integration Product” and the product using open standard parts or modules is defined as “Horizontal Specialization Product”. Two hypotheses about the role of procurement have been created as follows.

Hypothesis 1: for Vertical Integration Product

In the case where exclusive parts are produced mostly internally, the role of procurement is managerial and distant from corporate strategy. When exclusive parts are outsourced, the role becomes that of a coordinator connecting internal divisions and suppliers. At this stage, procurement still remains in support function.

Hypothesis 2: for Horizontal Specialization Product

The role of procurement focuses on seeking the optimum supplier with well-balanced quality, cost and delivery date for each product. It secures parts by being sensitive to the changes in the parts market and by predicting opportunistic behavior of the supplier. Procurement thus assumes a strategic function in the company.

These hypotheses are examined using the case study of company A.

IV. CASE STUDY OF COMPANY A

A. Methodology

Case study of an electronics maker Company A with both vertical integration products and horizontal specialization products is examined. This is based on the reasoning that the differences in the role of procurement within one company with the same corporate culture and operation system will depend almost entirely on product features. Figure 2 shows commercialization process in Company A.



Figure 2. Commercialization Process

The role of procurement was investigated for each type of product architecture obtained by classifying typical product categories. In addition, engineers were interviewed to ask for their views and expectations on the subject to enable a more objective perspective. Other data include procurement related records and meeting documents from Company A. The name of Company A as well as the names of interviewees are not disclosed due to NDA.

B. Survey of the Role of Procurement in Vertical Integration Product

At Company A, Digital Still Camera (DSC) corresponds to Vertical Integration Product. Company A internally

produces and supplies image sensors, batteries, and LCD panels, as key parts of DSC. System LSI which is designed internally is produced at a silicon foundry. Internal production rate of parts in DSC reaches nearly 50% on amount basis.

1. Involvement of Procurement Division with internally produced parts

A senior engineer commented, “Internally produced parts, in most cases, are critical to the end-equipment they are mounted on. Thus there is a need for close coordination to attain the optimum parts. Because it’s internal, engineers of end-equipment division and parts division can discuss issues directly by visiting one another’s workplace. There is no need for Procurement Division to mediate.” Since parts and raw materials which Procurement Division purchases and which are used in making key parts are not highly customized, production phase was often handled by production management division. Thus here also, it became clear that Procurement Division does not play a major role when it comes to internally produced key parts.

2. Involvement of Procurement Division with exclusive parts purchased from suppliers

In many cases, key parts were decided at the product engineering design concept stage after product planning. However in most cases, by the time Procurement Division was informed, the development division had already contacted the most suitable supplier for them and decided on the rough specifications of these exclusive parts. All that was left for the Procurement Division to do was price negotiation. In some cases, even the price negotiation was handled by the development division, leaving little room for Procurement Division to change the supplier. In other words, there were many cases in which the development division selected the supplier for exclusive parts. It is important to note that development division took the initiative with suppliers during the development stage.

At the start of mass production, Procurement Division placed orders to suppliers per pre-determined lead time. Once mass production started, Procurement Division adjusted the parts orders to align with the changes in production schedule. If quality issue arose, Procurement Division acted as the contact window for suppliers.

3. Involvement of Procurement Division with standard parts purchased from suppliers

Procurement Division took the initiative. They selected and recommended suppliers for each standard part to engineers. Price negotiation was held periodically between the Procurement Division and supplier. Engineering division rarely participated in such negotiations. After this stage, the role of Procurement Division was the same as in the case of exclusive parts; it managed the schedule from trial production to mass production, orders and dealt with quality issues.

From above, it can be said that the role of procurement is mainly management for internally produced parts and

exclusive parts. Although for standard parts it takes the initiative, since it handles relatively low value parts, its impact on the management of the company is small.

These facts support hypothesis 1 which defines the role of procurement as support function with Vertical Integration Product.

C. Survey of the Role of Procurement in Horizontal Specialization Product

Typical product in Horizontal Specialization Product is PC. Company A has PC business group, thus procurement activities for PC business were surveyed.

Procurement Division is involved from the product planning phase for PC products. The price of such key parts of PC including LCD panels, HDD, and DRAM modules fluctuates depending on the market situation. As the price fluctuations of those key parts affect product line up, it is decided depending on the forecast of the price of key parts. In the product planning phase, Procurement Division provides information including price trends and supply demand situation and the moves of competitors to suppliers of key parts.

In the product engineering design concept phase in Figure 2, it closely discusses with the development division. At this stage, engineers were interested in the information regarding suppliers such as the development domains their resources are allocated on, their business relations with Company A's competitors and contractual relationship. Because they are concerned about whether the supplier will allocate its resources to meet the demands of Company A even when there is a minor change in specification of parts and introduction schedule. It is the fact that scrambling for supplier's resources connects product competitiveness.

Once in the production phase, Procurement Division coordinates more with sales division. In the case of PC, due to rapid market fluctuation, supply of HDD or memory modules suddenly becomes tight or loose with price change. This is because the compatibility of key parts can be freely changed with PC and thus if the demand for a certain HDD increases, the supply suddenly becomes tight and leads to increase in price. This makes it necessary for the Procurement Division to also catch the sales situation and to check for which parts is in high demand or in excessive situation. Meanwhile the sales division also decides at an early stage the sales plan of the model which uses parts that are likely to become tight and consider how to sell them accordingly. Since the lead time from receiving parts to assembling and dispatching is short for PC, the distance between procurement and sales appeared to be close.

The above fact supports hypothesis 2.

D. Findings

For Vertical Integration Product, the role of procurement was as follows:

For closed integral product with in-house exclusive parts,

procurement was hardly involved until the development stage. This was because added value was created through deep communication between internal end-equipment division and parts division. For closed integral product with outsourced exclusive parts, since the counterpart for integral architecture product is outside the company, procurement participated from prototype development stage and coordinated the suppliers and internal relevant persons. If the supplier's capability can be drawn out to the fullest, the added value that will be created is bound to increase. The involvement of procurement in New Product Development (NPD) was as pointed out in previous researches. However even here, the role of procurement was that of support, and not central. For closed modular product with in-house or outsourced exclusive parts, increase in purchasing modules with higher added values made it necessary to accurately evaluate supplier's performance including price, delivery and quality.

On the other hand, in the case of Horizontal Specialization Product, as the combination of key parts determines product features, selection of standard modules at the stage of product planning and product engineering concept designing was important. In addition, since the supply and demand of standard modules such as HDD and memory modules often fluctuate, the key to performance during production phase was to foresee the market situation, detect supplier's moves, and make preemptive moves in procurement accordingly. This means the role of procurement became an important factor of corporate strategy.

From the above facts, hypothesis 1 as support function and hypothesis 2 as strategic function are supported.

V. DISCUSSION

Analysis of Company A's case shows that the main role of Procurement in a series of processes from product planning to production shifts more upstream as the structure changes from a vertical integration type to horizontal specialization type (Figure 3). The business process of manufacturing begins from discussing product planning, and forecasting what kind of products will be accepted by the market. Various market information including users' tastes and economic conditions are collected, and Market Intelligence which analyzes them and offers future forecast is used. With open modular type product, cost trend of storage devices, such as Flash memory and HDD, becomes important, and lineup is developed considering differences in the mounted capacity. As the information brought by Procurement Division starts to affect product planning, close cooperation with marketing begins to be sought after. In vertical integration type, since parts were exclusive for the company, there was almost no cooperation between Procurement Division and Marketing division. It is only when open modular products became common that Procurement Division and Marketing division began to have an exchange.

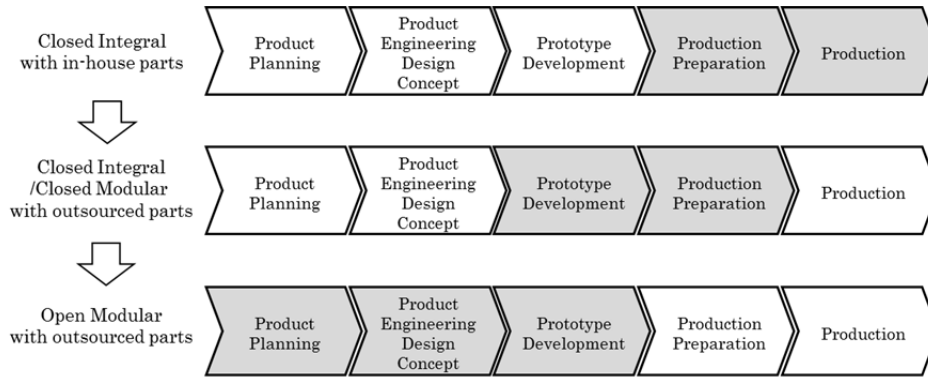


Figure 3. The Main Roles of Procurement Upstream with Product Architecture Migration

In the stage following product planning, discussions are made on what kind of technology to apply to realize the product functions and performance that would likely be accepted by users. Development Section evaluates external technical trend information and technology developed internally, and determines which technology to adopt. For integral product, the focus of discussion is on how to use internal technology, and whether to make or buy. Here also, analyzing technology information and turning it into intelligence to enable appropriate technology selection, in other words, Technology Intelligence, is sought after. For open modular type, selection of devices to combine becomes the key to development, making it necessary to grasp the trend of usable devices available in the market, and the technology trend of suppliers with such devices. Such information is easy for Procurement Division to access, and thus enables Procurement Division to become strongly involved with development.

As seen from the above, for Horizontal Specialization product, information on supply market and supplier has big influence on product development. This implies that advanced intelligence is also required for the Procurement field. This paper refers to this as Sourcing Intelligence and places it as the 3rd intelligence following Market Intelligence and Technology Intelligence. The term Sourcing is used here instead of Procurement as Sourcing has a nuance of searching while Procurement has a broader meaning and covers all the activities to obtain goods or services.

VI. SOURCING INTELLIGENCE MODEL

Figure 4 shows the relationship among Market Intelligence (MI), Technology Intelligence (TI), and Sourcing Intelligence (SI) as Venn diagram in migrating Vertical Integration to Horizontal Specialization.

So far, these intelligences have been discussed separately. However, importance of researching the overlapped portion has increased in the wake of economic globalization and horizontal division of labor in industry.

The overlap of TI and SI was the main topic of research on make or buy. As more researches on Japanese automakers were conducted in the 1980s, enhancing corporate competitiveness by involving suppliers from NPD and combing them with the company's own capability drew attention [4] [7]. The spreading of horizontal division of labor resulted in enlarging the impact of suppliers. In other words, the sourcing capability started to influence business.

With economic globalization, MI and SI begin to approach each other, and the overlap portion becomes larger. MI is required in order to understand users' needs, while SI is required to find the provider globally that meets the needs. Thanks to the progress of IT, today, the speed at which information flows back is markedly faster. It is now possible to efficiently bring in goods and services suitable for specific market needs from another market [13]. Enhancing the capability of SI indeed raises the possibility to win the speed competition.

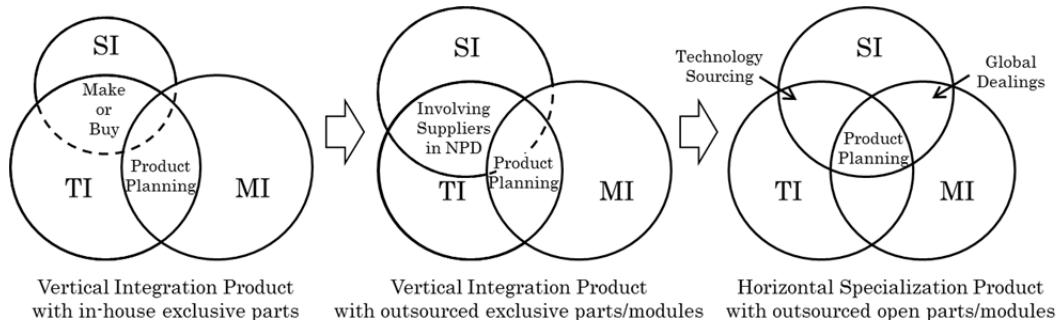


Figure 4. Relationship among Three Intelligences in Migrating VI to HS model

Thus far, product planning has benefited from the set intersection between TI and MI, where efforts are made to translate market needs into technology and to blend technology and marketing. However, in the PC industry, the heightened demand to shorten product cycle and swiftly launch new products into the market has also made it necessary to efficiently procure the optimal functional module from the supply market with the help of sourcing information. As a result of this change, product planning has shifted to the set intersection among TI, MI and SI (Figure 5).

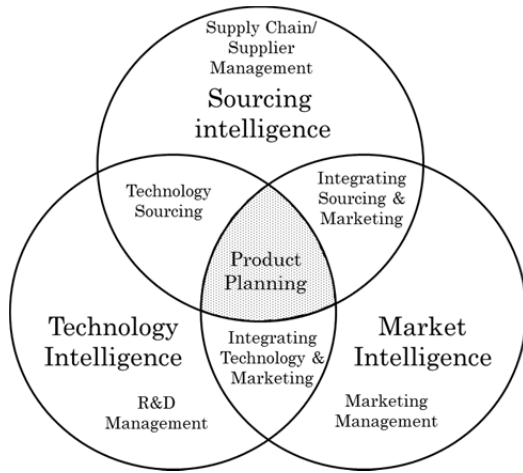


Figure 5. Relationship Three Intelligences in Horizontal Specialization

When Windows 95 was put on the market, FUJITSU placed a resident investigator in Silicon Valley whose mission was to monitor the development trend of the latest graphics chip. The information gained allowed FUJITSU to adopt new parts ahead of the competition and differentiate its products [11]. In another example where sourcing intelligence was utilized, DELL initiated a measure to change the configuration of PC to adjust excess and deficiency of parts according to the supply market situation it monitored [10].

VII. CONCLUSION

A. New Intelligence Model Advocate

This paper has shown that when handling a Horizontal Specialization product with open modular type product architecture, the role of Procurement shifts upstream in the business process, thereby having a bigger impact on corporate management. It also found that as Procurement shifted upstream, its role went beyond simply dealing with suppliers. It assumed an intelligence function, collecting and analyzing external technical information and market information, and discovering optimal suppliers and parts.

In light of this fact, this paper introduced Sourcing Intelligence as a new key concept to the existing concepts of MI and TI. It demonstrated that discussions on make or buy and supplier involvement in NPD, and global dealings which respectively require interaction of SI with TI and MI are

deeply related to sourcing. It showed that especially for Product Planning, harmonizing and unifying of these three intelligences will lead to technological differentiation of the hardware to be procured, resulting in increased competitive power.

B. Limitations of this Research

The hypothesis this research advocated was based on a survey of one electronics company.

Empirical study which actually evaluates effectiveness of the model proposed needs to be conducted in order to validate that the role of procurement is shifting upstream and that enhancement of sourcing intelligence capability increases corporate competitiveness. Study of other companies and other industries which handle Horizontal Specialization products will reveal the extent of the model's application.

C. Future Research Directions

To validate what forms the corporate competitiveness of companies with big market shares, surveys should be extended to include such fables companies as Apple Inc. The recent trend to outsource production to EMS indicates that, going forward, there is much room for further research on sourcing. Research into the effectiveness of SI has only just begun.

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