How Sourcing Knowledge is Acquired in Companies

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Abstract--**As companies increasingly have more horizontal specialization in their business structures, the number of items procured and amounts of money spent have been increasing, resulting in a larger impact by the procurement on corporate earnings. In the electronics industry, more and more companies are moving to the horizontal specialization structure. Among them, Apple which outsources not only its parts but also the production of its apparatus appears to be making skillful use of sourcing, to the point that its sourcing capability has been serving as one of the main drivers of its high performance. Apple is known to employ people from the same industry it purchases parts from to acquire their highly sophisticated knowledge. On the other hand, there are companies such as Japanese car manufacturers that accumulate sourcing knowledge internally.**

Surveys using questionnaires and interviews were conducted and analysis was made on how the Japanese manufacturing companies are acquiring knowledge necessary to perform effective sourcing activity. As a result, it was found that the acquisition method of procurement knowledge differs depending on the product architecture type. Building on this finding, a method for enhancing organizational knowledge to improve procurement work is proposed.

I. INTRODUCTION

Inoue [6] pointed out that procurement is impacting corporate earnings to a larger degree as companies are procuring more items and spending more money, following a move to more horizontally specialized business structures. He also advocated the "Sourcing Intelligence" model from this consideration. This model suggests that in order for the procurement function to have a large influence on corporate earnings, the knowledge of the procurement division should not be limited to procurement, but should cover other fields including technology and market.

This research aims to propose a method for enhancing the skills of procurement organization through studying and analyzing how they are acquiring the knowledge necessary to improve their performance.

II. LITERATURE REVIEW

A. Knowledge Management

Knowledge is categorized into explicit and tacit knowledge [9]. Procurement personnel acquire explicit knowledge through reading job manuals or specialized books on the general procurement framework. On the other hand, in many cases, most of the tacit knowledge required for work is mastered on the job. Learnings obtained from observing the way superiors or colleagues handle work or from own experience of performing actual work is accumulated as tacit knowledge. Nonaka and Takeuchi advocated the knowledge spiral SECI model [7], which states that explicit knowledge becomes tacit knowledge through internalization and further becomes explicit knowledge through dialog with others externally. Moreover, they noted that in order to promote the knowledge spiral, a cross-functional project team made up of members each with heterogeneity and allowed to have overlapping roles according to their operating processes should be created [12].

As for knowledge transfer between Team(s), Dixon classified them into five categories as shown in Table 1 [2]. She advocated that to select a suitable knowledge transfer category, it is necessary to specify the following three characteristics: characteristics of receiver of knowledge, characteristics of work that transfers knowledge, and characteristics of the knowledge that is transferred.

B. Product Architecture

The product architecture concept views product characteristics based on the interaction between the parts that constitute a product. Ulrich classified parts connected with and which interact intricately with various parts as Integral, and those combined per function into a module and simplified by reducing the number of parts that interact as Modular [14]. Fujimoto defined the product type by dividing these parts further into closed types with product specific parts or open types based on industry standard [3].

TABLE 1. FIVE CATEGORIES OF KNOWLEDGE TRANSFER

Category	Definition
Serial Transfer	The knowledge a team has learned from doing its task that can be transferred to the next time that team does that task in a different setting.
Near Transfer	The explicit knowledge a team has gained from doing a frequent and repeated task that the organization would like to replicate in other teams that are doing very similar work.
Far Transfer	The tacit knowledge a team has gained from doing a nonroutine task that the organization would like to make available to other teams that are doing similar work in another part of the organization.
Strategic Transfer	The collective knowledge of the organization needed to accomplish a strategic task that occurs infrequently but is of critical importance to the whole organization
Expert Transfer	The technical knowledge a team needs that is beyond the scope of its own knowledge but can be found in the special expertise of others in the organization.

C. Strategic Sourcing

Many researches have been conducted on strategic sourcing of hardware. They can be grouped into four categories from the upstream of Value Chain to the downstream: "Make or Buy [10] [13]," "Supplier Selection [1]," "Supplier Involvement in New Product Development (NPD) [4] [11]," and "Supply Chain Management (SCM) [5]."

Procurement section collaborates with related sections in each step of the value chain, playing different roles in each step. For example, when a decision is made based on own company's core competence whether to produce parts in-house or purchase them from outside [10], procurement works with R&D. During the development phase, procurement section is expected to contribute by collecting and analyzing information on suppliers or the industry [13].

III. PROCUREMENT KNOWLEDGE NEEDED TO INTERACT WITH RELATED SECTIONS

Procurement Division collaborates with various sections in the company with specific themes for each section (Figure 1). In interacting with R&D, technology capability, production capacity, and cost competitiveness of suppliers are evaluated, and the decision is made on whether to make or buy, or which suppliers to select. The theme changes to quality control of suppliers when interacting with Manufacturing Division, delivery date management with Production Control, adjustment of payment conditions to suppliers with Accounting, and contracts or laws and regulations with Legal Division.

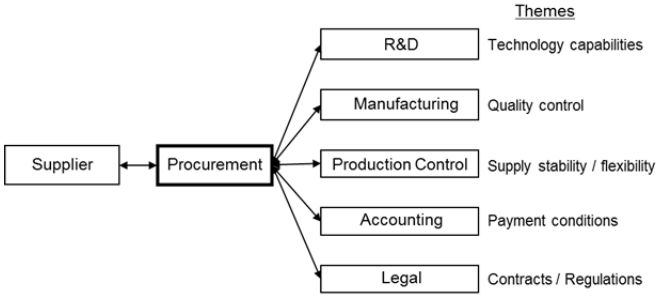

Figure 1: Procurement interaction scope

Here, consideration on how the knowledge transfer between Procurement and Development Division differs depending on the product architecture will be made.

With closed-integral type product, specification change takes place frequently. If one part is changed, other parts related to this part will be influenced; requiring schedule adjustments with other parts. Since understanding of technical background is a must for negotiating cost and delivery time with suppliers, interaction between Procurement and Development Division occurs frequently. At this time, technical knowledge of the Development Division as knowledge source team is transferred to the Procurement Division and translated into knowledge which can be understood by the Procurement Division.

Transferring people with knowledge of the Development Division to Procurement Division promotes far transfer defined by Dixon. The knowledge transfer rate in an organization can be sped up by having people within the Procurement Division who can translate. The same idea can be applied to even non-Development Divisions. If there are people who were transferred from manufacturing or production control, it will be as if a cross-functional team has been made in Procurement Division - knowledge spiral can be expected to occur across all procurement services, resulting in knowledge accumulation.

On the other hand, with an open-modular type product, since even the high value-added parts have standard specifications, the frequency of adjustment technically decreases. Thus, even if the inside of parts is unknown, i.e., it is a black box, as long as the interface has been decided, these parts can be used.

However, if technical interaction with suppliers decreases, opportunity to acquire information including cost structure will be lost, and price must be judged on the basis of the market price. Hence, knowledge must be acquired using a different method from that used for closed-integral type product. In other words, since knowledge specific to a black box does not ooze out to the outside, means for sourcing knowledge as-is from the outside should be considered.

From the above consideration, following two hypotheses were drawn as methods for raising the capability of Procurement Division.

Hypothesis 1: Necessary knowledge for closed-integral type product parts is accumulated through internal knowledge transfer.

Hypothesis 2: Knowledge of the open-modular type product parts that have been turned into a black box is sourced from the outside.

IV. RESEARCH METHODOLOGY

A. Data collection

Questionnaire survey was conducted in order to verify these hypotheses. Respondents were asked to select either one or multiple options for each question. It must be noted that since the verification of this questionnaire is still underway, the result should be treated as part of a preliminary investigation.

B. Research sample characteristics

Respondents were managers or those handling the day-to-day work of procurement. All of them belong to the "Co-buy" ("purchasing" in Japanese) Network Association which consists of members from across various companies who gather voluntarily to enhance their own skills through study meetings.

Among the 49 respondents, 38 from the manufacturing industries were selected for analysis purpose. Respondents' years of procurement service experience and the industries

their companies belong to are shown in Table 2 and Table 3.

TABLE 2: INDUSTRIES RESPONDENTS BELONG TO

	Number of respondents	Ratio
Electronics	8	21%
Automotive	5	13%
Consumer goods	2	15%
Industrial equipment	13	34%
Chemicals	4	11%
Pharmaceuticals	5	13%
Others	1	3%
Total	38	100%

TABLE 3: NUMBER OF YEARS IN PROCUREMENT SERVICE

	Number of respondents	Ratio
Less than 3 years	6	16%
3 -5 years	5	13%
5 – 10 years	9	24%
10 – 15 years	10	26%
More than 15 years	8	21%
Total	38	100%

V. RESEARCH RESULTS

A. Prior work experience

24% of the respondents had had procurement experience only before starting their current jobs (Table 4). Three quarters had experienced work other than procurement. Since some respondents had experienced more than three kinds of job families, the total exceeds 100%. 32% of the respondents had Sales & Marketing as prior experience, and made up the largest percentage. R&D was at 18%, manufacturing at 5%, and production control was at 11%. These amount to one third in total.

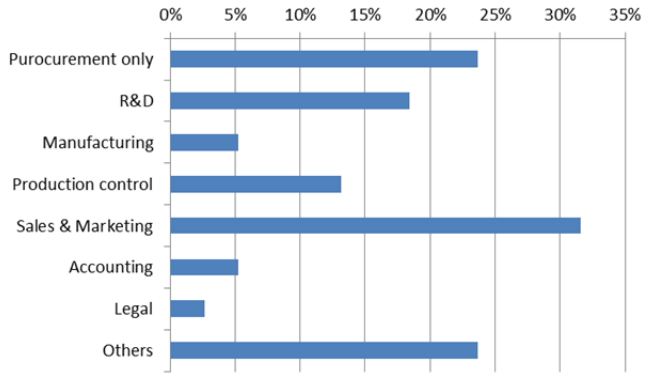

Figure 2: Prior work experience

B. Necessary knowledge for the current procurement work

Naturally, respondents replied that knowledge of the parts and services procured as well as knowledge of their overall market is required. Some respondents also felt knowledge about the technology of other in-house products and sales is required. However, the number of these respondents was roughly the same as those who chose accounting or business administration knowledge. Therefore, it appears that knowledge about the technology of other in-house products and sales is regarded as general commonsense knowledge not limited to procurement.

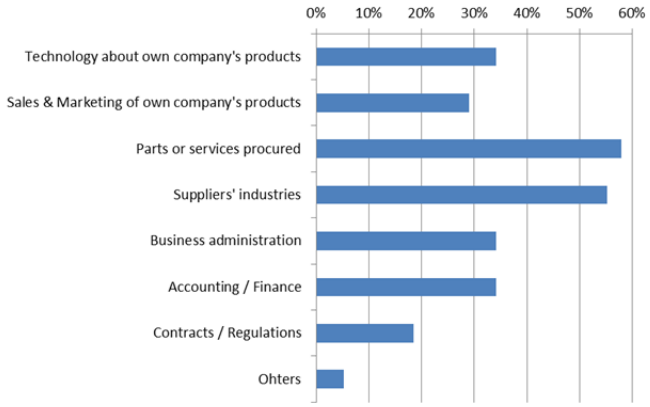

Figure 3: Necessary knowledge for the current procurement work

C. Means for acquiring necessary knowledge

The method which was selected the most with 100% of reply was acquisition of knowledge through daily work. This was followed by acquiring knowledge through participating in the "Co-buy" network association's study meetings. The study meeting, where employees from various companies gather serves as a place for information sharing on such areas as parts market and purchasing best practices. It appears to be used as the information source that cannot be obtained by just working inside the company. Moreover, it was found that knowledge acquisition from the Internet was at a level equivalent to knowledge acquisition from participating in external seminars or reading specialized books. This did not meet the expectation that because of the development in search engines, the Internet was utilized more for knowledge acquisition.

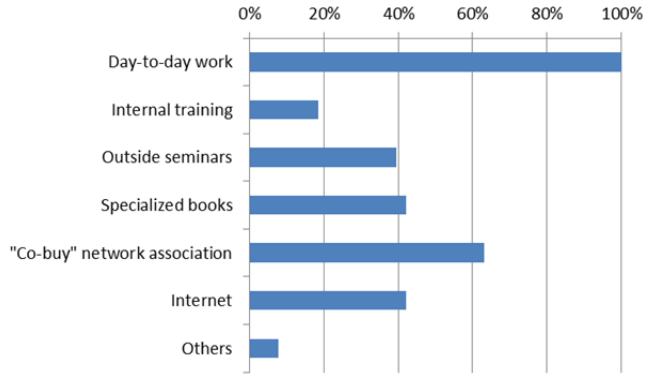

Figure 4: Means for acquiring necessary knowledge

D. Section with the most communication

There are many exchanges with R&D and manufacturing due probably to the fact that respondents were procurement personnel from manufacturing industries. However, it is interesting to note that Sales & Marketing which has no direct

point of contact with procurement came in 3rd from the top, chosen by 32% of all respondents. Half of them also had many exchanges with development and manufacturing. The other half had little involvement with development and manufacturing, and included those in charge of non-production-goods .

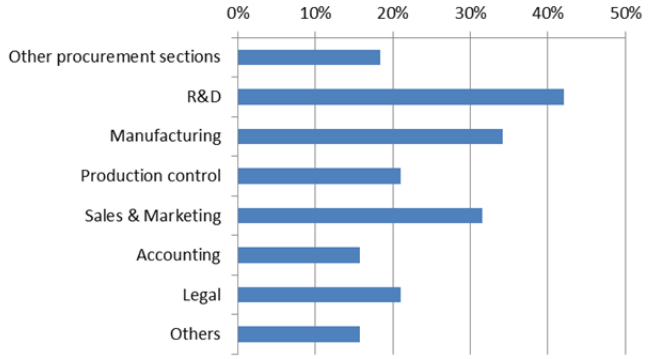

Figure 5: Section with the most communication

E. The most useful past work experience

Question to the people with non-procurement work experience in the past on what they considered to be the most useful past work experience revealed the following. People who had experienced R&D, Manufacturing and/or production control responded to a large degree that the experience had been useful for procurement work. For those who had experienced other types of work, this ratio was less than half. Those with experience in R&D, Manufacturing and/or production control were from electronics, industrial equipment, chemicals, or pharmaceuticals. Although whether these companies handle closed-integral type product or not has not been checked yet, at least, their product lineup showed no open-modular type product such as PC.

50% of people with experience in Sales & Marketing responded this experience had been useful. Further question revealed that for those remaining, Sales & Marketing experience had been useful in predicting actions of the suppliers' sales people, probably because it helps them during negotiations with suppliers. These results were very different from those with R&D, Manufacturing and/or production control experience.

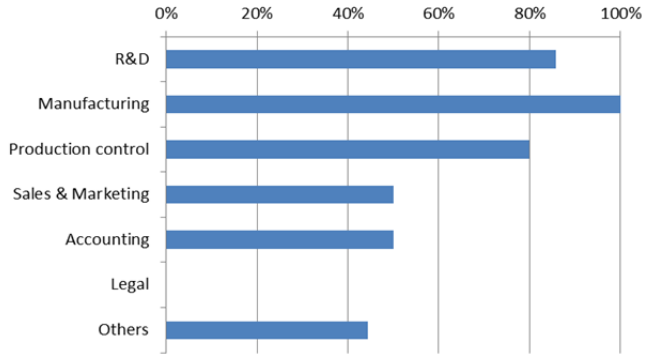

Figure 6: The most useful past work experience

Above signifies at the least that knowledge required for procurement in R&D and/or manufacturing is acquired from the job experience in related departments.

F. Ancillary interview

In this questionnaire survey, verification of whether the respondents are in charge of open-modular type product could not be obtained. However, a separate interview was conducted with a procurement personnel in charge of non-production-goods, such as office equipment and supplies (copy paper and PC in the non-production-goods category), which have no association with other products that are sourced. From the viewpoint that there is no need to interact with other parts that are used in the same product, there is a similarity with the standard parts of open-modular type product. As such, it was assumed that alternative information could be acquired.

The interviewee has been mainly handling procurement of non-production-goods for ten years. Also he has no experience outside of procurement.

His comment was as follows:

- The ordinary procurement knowledge can be learned through such organizations as ISM (Institute for Supply Management), which has structured knowledge.
- Even if one has no knowledge about the goods to be purchased, negotiation with suppliers can be conducted based on the specification and target cost decided by the users. and armed with procurement knowledge,.
- Although the number of non-production-goods items is big, association among the goods purchased is weak.

What can be suggested from this interview is that knowledge about procurement and knowledge about goods sourced is clearly distinguished. If goods to be sourced are already defined and target price and target specifications are also indicated, then procurement knowledge can be used to identify the best procurement method.

This thinking can be applied to the open-modular type product parts. This is because they only require confirmation on specification and quality standards, and have fewer matters to adjust than closed-integral type product parts. Thus, most of the procurement work for open-modular type product can be performed using explicit knowledge only.

G. Summary

The following points became clear from the results of this research:

- Those who have experienced development or production related sections find such experience useful in carrying out their current procurement work.
- Those who have only experienced procurement acquire knowledge through communication with development or production departments.

Although whether the companies which respondents belong to handle closed-integral type product is yet to be clarified, it has been confirmed that they do not make

open-modular type product like PC. This supports hypothesis 1.

On the other hand, direct result that verifies hypothesis 2 was not obtained. However, conditions which enable knowledge on goods sourced and knowledge on procurement to be handled distinctively were indicated from the non-production-goods sourcing method. These conditions are as follows;

1. The frequency of adjusting specifications, schedule, cost etc. is low.
2. Goods sourced can be treated independently of each goods.

VI. DISCUSSION

The frequent communication with Development or Production Division suggests the large number of conditions which must be adjusted, resulting in far transfer of knowledge. The transferred knowledge is then integrated with pre-existing knowledge in procurement, leading to new knowledge creation. Here assumption of a case where a specification change occurs for a certain part is made. The procurement personnel who receives notification from development adjusts the influence on overall schedule, cost, or other parts. When there is knowledge transfer from development, the procurement personnel will be able to expect what will happen next. For example, he or she will be able to prepare countermeasures for cases where the first trial is not successful, before being asked by development to do so. Since specification change of one part frequently affects others in closed-integral type product where many parts interact, having knowledge on the development side embedded at the procurement side enables quicker action. Even if there is knowledge on the part itself, how one understands association with other parts and how one decides what actions to take become organizational ability. The Japanese companies with less turnover than the West have heightened their integration capability by transferring employees to various job families.

The frequency of a certain part affecting other parts in open-modular type product is lower than that of closed-integral type product. Therefore, parts can be treated independently in open-modular type product. For example, if the interface of LCD panel is already decided, then the issue will be what to do with specification itself. When changing the specification of LCD panel from standard to customize, wider knowledge covering cost structure and/or a supply chain is needed in order to acquire advantageous purchasing conditions. Apple is achieving knowledge acquisition by scouting people previously engaged in development or production at South Korean or Taiwanese LCD makers as procurement personnel. These people are assigned roles as specialists of certain parts. Management with structured procurement knowledge exists separately. Such a division of roles can be established in procurement organization since there is little interaction among parts. In the case of open-modular type product, knowledge itself can be treated as a module, and operation can be proceeded.

In summary, procurement organization which handles closed-integral type product enhances its organizational capability by facilitating knowledge transfer from related sections and starting knowledge spiral. Job rotation is an effective method for this. On the other hand, procurement organization which handles open-modular type product consists of specialists with high technical knowledge and procurement management who make full use of the : specialist knowledge.

VII. CONCLUSION

A. Advocating two types of knowledge acquisition

This paper showed that the acquisition method of procurement knowledge differs depending on the product architecture type. In the case of closed-integral type product, organizational capability can be heightened by acquiring knowledge through far transfer of knowledge which occurs in communication with its related sections. Job rotation from sections which are knowledge source is an effective method for facilitating far transfer of knowledge. In the case of open-modular type product, organizational capability can be heightened by acquiring specialists of particular areas from outside to work under procurement management.

These results offer a suggestion to Japanese electronics companies that are said to be good with closed-integral type product on how they should change their procurement staff and procurement organizations when handling open-modular type product in the horizontal specialization business structure.

B. Limitations of this Research

Questionnaire survey conducted this time only addressed cases in Japan and since the number of respondents is limited to 38, respondents' profiles may have deviation. Moreover, verification on the extent to which the companies handle closed-integral type product is required. As to open-modular type product, verification on the similarity of the procurement method for non-production-goods and standard parts of open-modular type product has not been made.

C. Future Research Directions

This research considered the method for strengthening the capability of procurement organization by transferring the knowledge of procurement related sections to inside the procurement division. Studying the opposite case of knowledge transfer from procurement division to development or manufacturing and measuring its effects will provide the guideline to strengthening the overall organizational capability.

Furthermore, in the case of open-modular type product, how the procurement management is using the specialists' knowledge needs to be investigated. This is due to the fact that unless the procurement management have the ability to make full use of knowledge acquired from outside to compensate for insufficient internal knowledge, it will not be linked with

business competitiveness. This theme will be an interesting research subject for companies that belong to the industry which is moving towards the horizontal specialization.

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