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Description	

Adverse Factors of Knowledge Integration in a Product Development Organization after M&A: A Case Study of a Precision Device Manufacturer

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Abstract--**This study discusses knowledge integration in a product development organization after M&A. The goal is to contribute to establishment of methodology that helps to accomplish the purpose of M&A.**

This study analyzes establishment of a new product development organization and its entry into a new market. This study indicates that knowledge integration is conducted in three phases: 1) Knowledge of the acquiring company and the acquired company is assessed. 2) Product development organization is reorganized based on the assessment. 3) Knowledge is created in the process of product development in the new organization.

This study indicates that one of the adverse factors against knowledge integration in product development organizations is difference of corporate cultures between the acquiring company and the acquired company. This problem will be resolved in mid-term and long-term, since new corporate culture will mature in the product development organization.

If the acquiring company persists on its existing knowledge, it is difficult to develop new products suitable for the new market. Thus another adverse factor against knowledge integration is persistence in the knowledge not necessary for the new market. In order to prevent this, abandonment of such knowledge is conducted during reorganization of the product development organization.

I. INTRODUCTION

The number of M&A (mergers and acquisitions) is increasing all over the world in recent years. M&A is conducted for a variety of purposes, e.g. enlargement of business scale, enhancement of existing businesses, entry into new businesses and acquisition of intellectual property. However, there are many failed cases in which the purposes have not been accomplished.

The goal of this study is to contribute to establishment of a methodology to help accomplish the purposes of an M&A, and to strengthen competitiveness of companies. This is the social significance of this study.

We proposed theoretical model to explain the knowledge integration in the product development organization after M&A [6]. In this study, problems of knowledge integration in the product development organization after M&A were investigated and analyzed. Adverse factors of knowledge integration are mainly discussed.

II. LITERATURE REVIEW

A. *Organizational Learning*

According to Matsuyuki and Matsuyuki, an organization has its own intelligence, and is an actor who learns the same as a person. When an organization learns from another heterogeneous organization, this activity is called "organizational learning" [7].

Matsuyuki and Matsuyuki proposed three major characteristics of organizational learning: 1) interaction between heterogeneous organizations, 2) occurrence of double loop learning and 3) destruction of inertia of learning.

1) Interaction between Heterogeneous Organizations

In general, the bigger the heterogeneity between organizations is, the bigger the outcome of organizational learning is. However, if the heterogeneity between organizations is too big, organizational learning may not work.

2) Occurrence of Double Loop Learning

When one organization encounters heterogeneous information and knowledge in organizational learning, the organization learns the inner model (e.g. norms, judgment criteria and organizational culture) of the other organization. By comparing this model with its own inner model, action to change its inner model may occur. This is called "double loop learning".

The concept of "double loop learning" was originally proposed by Argyris [1]. When the process enables the organization to carry on its present policies or achieve its objectives, the process is single loop learning. If underlying organization policies and objectives are questioned, it is double loop learning.

3) Destruction of Inertia of Learning

When validity of results of learning in the past has been proved several times, "inertia of learning" may be produced.

The inertia of learning inhibits recognition of the value of new knowledge, and decreases adaptability of an organization to a new environment. It is difficult for an organization to overcome inertia of learning by itself, but organizational learning enables the organization to do so.

The relationship between organizational learning and alliances is often discussed.

Heller and Fujimoto state three conditions to be met for cooperation to function effectively [5]. The alliance partners must 1) co-exist as separate learning organizations, 2) be able to evaluate accurately a partner's relative organizational strengths and weaknesses, and 3) have the motivation and ability to facilitate a partner's inter-firm learning.

Hamel suggests partners may have competitive, as well as collaborative aims regarding each other, and that "process" may be more important than "structure" in determining

learning outcomes [3].

B. Abandonment of Learning

If an organization persists in using old knowledge that is no longer necessary, this prevents acquisition of new necessary knowledge. It is important for an organization to abandon old invalid knowledge and replace it with new valid knowledge. Hedberg defines this activity as "abandonment of learning" [4].

An organization will have particular logic and interpretation of the world regarding management of organization and business. These were developed through experience in the core business and shared among top managers. Prahalad and Bettis call them "dominant logic" [8].

Under the environment of the increasing diversity caused by acquisitions or structural changes in the core business, abandonment of learning of dominant logic by top managers will be required for continuous success of organization.

C. Corporate Culture

Schein proposes a multi-layer model of corporate culture, and explains its effect on organizational learning [9][10].

According to Shein, corporate culture is defined as "A pattern of shared basic assumptions invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration that have worked well enough to be considered valid and therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems.

Shein divides corporate culture into three levels: 1) artifacts, 2) espoused values and 3) basic assumption and values as shown in Table 1.

According to Shein, there are three types of integration of corporate culture: 1) separation, 2) domination and 3) fusion as shown in Table 2.

III. STRATEGY OF STUDY

This study is a case study. An M&A conducted by Company A, a major Japanese precision device manufacturer, was researched.

The major research question of this study is "How is knowledge integration conducted in a product development organization after M&A?" In order to answer this question, this study dealt with the establishment of a new product development organization named Division C, and its entry into a new market. Adverse factors of knowledge integration were pursued as well.

Data was collected by referring to company documents and conducting interviews with related individuals. Collected data was analyzed qualitatively. Current problems of knowledge integration in the product development organization were investigated and analyzed.

IV. CASE STUDY OF COMPANY A

A. Organization and Market of MFP/LP

Organization of Company A is shown in Figure 1. Company A adopts division system. The main products of Company A are MFP/LP (Multi Functional Printer and Laser Printer). There are several segments in the market for MFP/LP. Company A has several divisions of MFP/LP, and each division has a target market segment of its own.

Among market segments of MFP/LP, three of them are related to this case; office market, host printing market and production printing market. Table 3 shows a comparison of them.

Division C is one of the divisions of MFP/LP targeting the production printing market. MFP/LP is required to provide features to realize a variety of customer requests. When MFP/LP replaces conventional printing machines used by customers, it is necessary for MFP/LP to realize features identical to those of conventional printing machines.

TABLE 1.   THREE LEVELS OF CORPORATE CULTURE

Level	Definition	Remarks
Artifacts	Visual organizational structures and processes	Easy to discern Difficult to understand
Espoused Values	Conscious strategies, goals and philosophies	
Basic Assumption and Values	Unconscious, taken for granted beliefs, perceptions, thoughts and feelings	Difficult to discern

TABLE 2.   THREE TYPES OF INTEGRATION OF CORPORATE CULTURE

| Type	Definition	Remarks
Separation	Corporate cultures coexist separated and independently each other.	Coordination is required.
Domination	One corporate culture becomes dominant and absorbs the others.	
Fusion	One new corporate culture is created by fusion of corporate cultures.	Insight to own corporate culture and dialog with the other corporation are required.
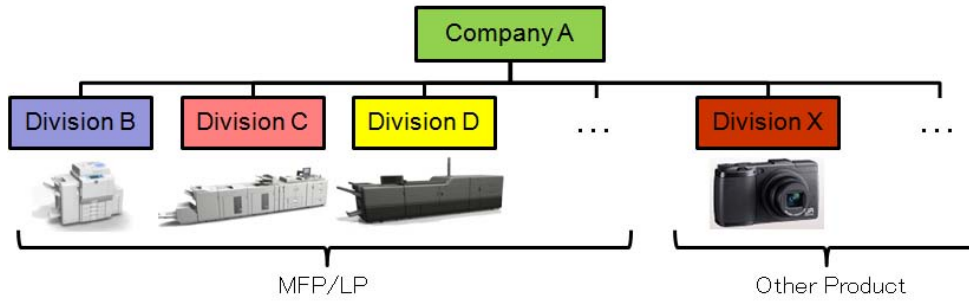
Figure 1.   Organization of Company A

TABLE 3.   THREE MARKET SEGMENTS OF MFP/LP

	Office Market	Host Printing Market	Production Printing Market
Usage	Handouts, Meeting Minutes	Invoices, Financial Statements	Flyers, Direct Mails, Catalogs
End User	Office Workers	Operators of Backbone Systems	Operators of Printing Systems
Decade of Establishment	1960s	1990s	2000s
Organization	Division B (Predecessor of Division C)	Division D (Former Printing Division of Company D)	Division C

B. Entry into Production Printing Market

When Company A entered into the production printing market, Division C was established by vertical integration of the organization in April 2007, as shown in Figure 2. Most members of Division C were transferred from Division B, which targeted the office market.

Company D is an American company and is one of the major technology companies in the world.

Company D provided high value-added printing solutions in the host printing market for many years. Company A judged this capability was the key for success in the production printing market. Thus Company A acquired Printing Division from Company D and reorganized it as Division D in June 2007.

C. Creation of Product Development Roadmap

When Division C was established in April 2007, there was one product platform No.1 developed for the office market, as shown in Table 4 and Figure 3.

When Company A acquired the Printing Division from Company D in June 2007, product platform No.2 for the host printing market was acquired at once.

TABLE 4.   PRODUCT PLATFORMS FOR PRODUCTION PRINTING MARKET

No.	Original Target	Developed Organization
1	Office Market	Division B
2	Host Printing Market	Division D
3	Production Printing Market	Division C and Division D

June 2007 : Acquisition of Printing Division from Company D and Establishment of Division D
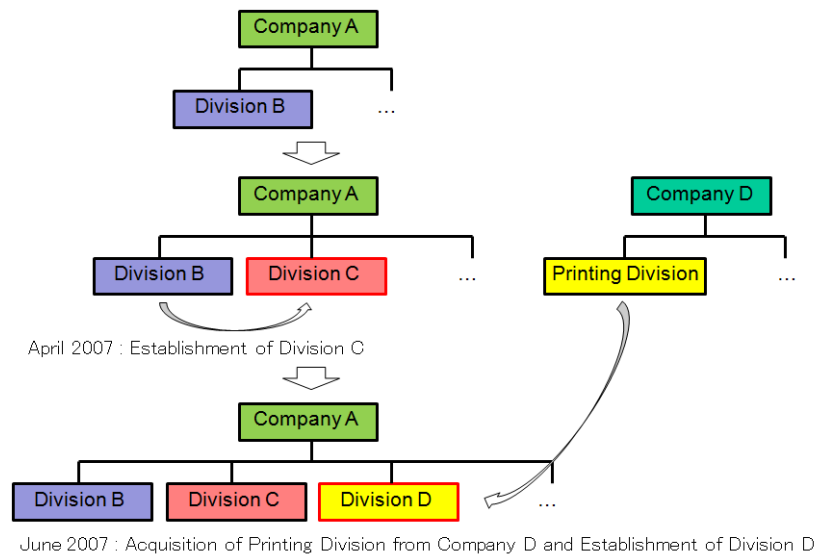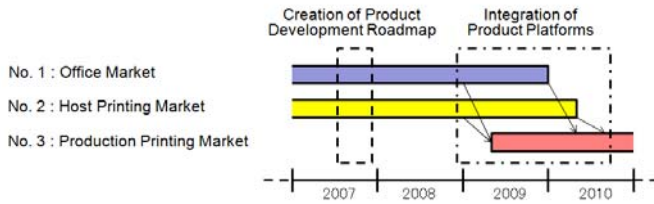
Figure 2.   Reorganization of Company A

Figure 3. Integration of Product Platforms for Production Printing Market

A product development roadmap was created for the purpose of efficient product development after M&A. Development resources were assigned to the selected area intensively based on this roadmap.

In the product development roadmap, integration of product platforms was planned. As a product platform for the production printing market in the future, it was determined to unify product platforms No.1 and No.2, and integrate them into product platform No.3.

In the process of creating a product development roadmap, target features and performance specifications were determined at first. Then elemental technologies and software modules necessary to realize them were identified. Status of their ownership was investigated in the product development organization of Division C. Finally, a development plan for elemental technologies and software modules that were necessary but not owned was determined.

In addition to the development plan, reorganization of the product development organization was planned. Optimization of assignment of development resources was the goal. It was decided to abandon knowledge that used to be necessary for either the office market or the host printing market, but which was unnecessary for the production printing market.

Joint product development of Division C and Division D was planned in the product development roadmap. Joint product development for the host printing market started from January 2008, and joint product development for the production printing market started from April 2009.

D. Integration of Product Development Process

Division D was to conduct most product development for the host printing market. Therefore the product development process of Division D, which was that of Company D, was adopted for this product development project.

However, both Division C and Division D were to conduct some joint product development for the production printing market. Occurrence of problems caused by differences in the product development processes between Division C and Division D was a concern.

In order to prevent problems, a working group was established to integrate product development processes of Division C and Division D in February 2008.

E. Joint Product Development for Production Printing Market

Project E was the first joint product development project for the production printing market conducted by Division C and Division D.

One of main development strategies of Project E was "to use existing development property of Division D". Investigation of the status of ownership of elemental technologies and software modules necessary for the production printing market showed that Division D had more necessary properties than Division C.

In addition, MFP/LPs of Printing Division of Company D used to be highly evaluated in the host printing market. The host printing market is more similar to the production printing market than to the office market.

V. DISCUSSIONS

A. Knowledge Acquisition in a New Market

Knowledge of Division C and Division D about the printing market is shown in Figure 4.

In order for Division C to develop products for the production printing market, knowledge of the production printing market was necessary. Since Division C already had knowledge about the office market, Division C had to acquire or inherit knowledge about the production printing market that was not included in its knowledge about the office market. Therefore Division C established a joint product development organization with Division D, which already had knowledge about the host printing market.

Knowledge transfer was conducted during reorganization of the product development organizations of Division C and Division D. Existing knowledge to manage the reorganization stored in Company A was transferred here.

In the joint product development organization, organizational learning between Division C and Division D was conducted. Division C acquired knowledge common to the production printing market and the host printing market from Division D.

Transfer of existing knowledge was conducted here. Acquisition of knowledge about a new market is one of the short-term results of M&A, as shown in this case.

Even after establishment of a joint product development organization, there was still a lack of knowledge about the production printing market. Such knowledge was acquired by creation in the process of joint product development by Division C and Division D.

In the joint product development organization, several product development projects were managed simultaneously or sequentially. Transfer of created knowledge was conducted continuously among the product development projects.

Knowledge integration was conducted by creation and transfer of new knowledge. Efficiency of acquisition of knowledge through joint development is one of the mid-term and long-term results of M&A, as shown in this case.
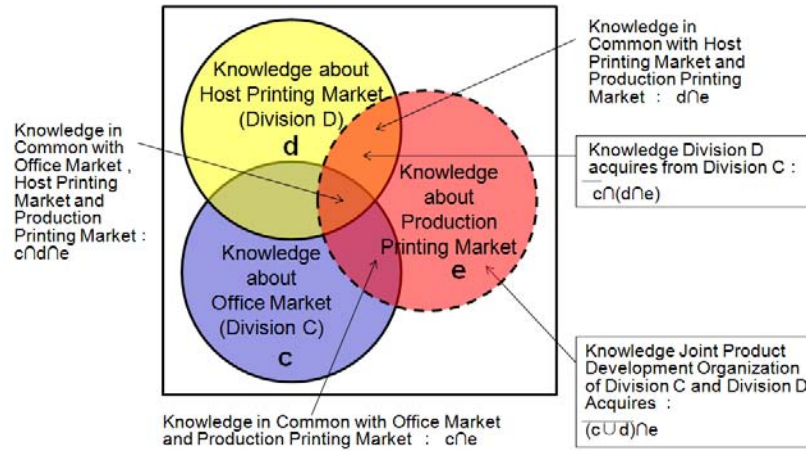
Figure 4.   Knowledge of Division C and Division D about the Printing Market

B. Corporate Culture and Knowledge Integration
1 Integration of Product Development Processes

Company A developed products for the office market and Company D did for the host printing market. The product development processes of Company A and Company D were established as they developed products for each target market.

In the activity of the working group to integrate the product development processes of Division C and Division D, several differences of product development processes were pointed out. Since Division C was established from Division B, which was part of Company A, Division C referred to the product development process of Company A. Division D continued the product development process of Company D.

Major differences were as follows:
1) Timing to decide to start a project
2) Criteria to decide to start a project
3) Criteria to apply problem fixes to machines in the field

Analysis implied that there was a difference of corporate cultures between Division C and Division D behind the differences in product development processes between Division C and Division D.

The difference of product development process 1) and 2) will be explained as follows:

Company A has corporate culture derived from hardware development. Since hardware development requires a relatively longer development period, it is necessary to decide whether to start a project or not at a relatively early stage, with relatively lower accuracy of information.

On the contrary, Company D has corporate culture derived from software development. Since software development requires a relatively shorter development period, it is acceptable to decide whether to start a project or not at a relatively later stage, with relatively higher accuracy of information.

The difference of product development process 3) will be explained as follows:

In establishment of the product development process, Company A targeted the office market, which is commodity-oriented. Regarding the office market, there are a large number of customers and machines used in the field. It is difficult to visit all the customers and apply fixes to problems to machines used in the field. Therefore it is common to apply fixes only when the symptoms of problems are critical.

On the contrary, in establishment of the product development process, Company D targeted the host printing market, which is customization-oriented. Regarding the host printing market, there are fewer customers and machines used in the field than in the office market. Therefore it is common to visit all the customers and apply fixes to problems to machines used in the field.

2. Product Development for New market

The completion of the functional specifications was delayed in Project E, the first joint product development project for the production printing market conducted by Division C and Division D.

Analysis implied that one of the reasons of delay is the difference of recognition about level of details of the functional specifications between Division C and Division D.

The recognition of Division D was that detailed description of the functional specifications was not necessary since specifications of modules of lower layer and modification of the functional specifications by customization were described in detail.

On the contrary, the recognition of Division C was that all the functions should be described in the functional specifications systematized and autonomously. Thus, the functional specifications written by Division D were just the list of function from the view of Division C.

Division D wrote functional specifications with level of details requested by Division C after all. However, the discussion on the level of details of the functional specifications took several months.

There was a conflict between the corporate cultures of Division C and Division D in the background of this problem. The corporate culture of Division C was statutory, but that of Division D was customary.

TABLE 5.   CORPORATE CULTURES OF DIVISION C AND DIVISION D

	Division C	Division D
Predecessor Organization	Division C of Company A	Printing Division of Company D
Target Market of Predecessor Organization	Office Market	Host Printing Market
Key Phrases to Express Corporate Culture	-Hardware Development -Commodity-Oriented -Statutory	-Software Development -Customization-Oriented -Customary

3. Summary

Difference of corporate cultures between Division C and Division D are summarized in Table 5.

One of the adverse factors against knowledge integration between Division C and Division D was difference of corporate culture.

C. Existing Knowledge and New Knowledge

In order for Division C to succeed in the production printing market, it is necessary for Division C to establish product development processes suitable for the production printing market.

The characteristics of the production printing market are software development and customization-oriented customary using the key phrases to express corporate culture in Table 5. Thus it can be said that the production printing market is more similar to the host printing market than to the office market.

Consider integration of product development processes of Division C and Division D. It is the key for success to handle differences of product development processes between Division C and Division D. If there is difference, it is appropriate to adopt the product development processes of Division D. Because it will increase the possibility to establish the product development processes suitable for the production printing market.

If Division C adheres to its product development process, the product development processes suitable for the production printing market will not be established. In order to prevent this, it was necessary for Division C to identify fairly the product development processes not suitable for the production printing market, from among the product development processes of Division C. It was also necessary to abandon such processes.

One of the adverse factors against knowledge integration between Division C and Division D was persistence of existing knowledge unnecessary for a new market.

VI. CONCLUSION

A. Adverse Factors against Knowledge Integration

The adverse factors against knowledge integration in product development organization after M&A are shown in Table 6.

One of the adverse factors is "difference of corporate culture".

As a company develops products for its target market, corporate culture suitable for its target market will be established. If target market of an acquiring company and that of an acquired company are different, there will be difference of corporate cultures as well. Such difference of corporate cultures will interfere knowledge integration in the joint product development organization established by an acquiring company and an acquired company.

It is difficult to dissolve this adverse factor in short-term. However, the joint product development organization would mature its corporate cultures as product development is conducted. The differences of corporate cultures would be reduced and the adverse factor would be dissolved in mid-term and long-term.

Another adverse factor is "persistence of existing knowledge unnecessary for a new market", since it prevents from searching new knowledge necessary for a new market and absorbing searched knowledge.

In order to dissolve this adverse factor, it is effective to establish an intentional process to abandon unnecessary existing knowledge for a new market. In the joint product development organization established by an acquiring company and an acquired company, it is important to assess the state of ownership of necessary knowledge and abandon unnecessary existing knowledge.

B. Theoretical Implications

Theoretical implications of this study are to provide a new viewpoint for future study in the area of M&A and knowledge management.

The special feature of this study is analysis of establishment of a new product development organization and its entry into a new market after M&A, from the standpoint of knowledge management.

The originality of this study is the clarification of the importance of knowledge abandonment during knowledge integration in the context of joint product development after M&A.

TABLE 6.   ADVERSE FACTOR AGAINST KNOWLEDGE INTEGRATION

Adverse Factor	Solution to Dissolve
Difference of Corporate Culture	To mature new corporate culture through continuous joint product development
Persistence of Existing Knowledge Unnecessary for a New Market	To establish an intentional process to abandon unnecessary existing knowledge

C. Future Research Directions

The case of this study is currently underway. Continuous investigation and analysis is necessary to enhance and improve the theoretical model using new facts and findings.

This study is based on a single case. It is necessary to verify the validity of the proposals for other products and other organizations.

ACKNOWLEDGMENT

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