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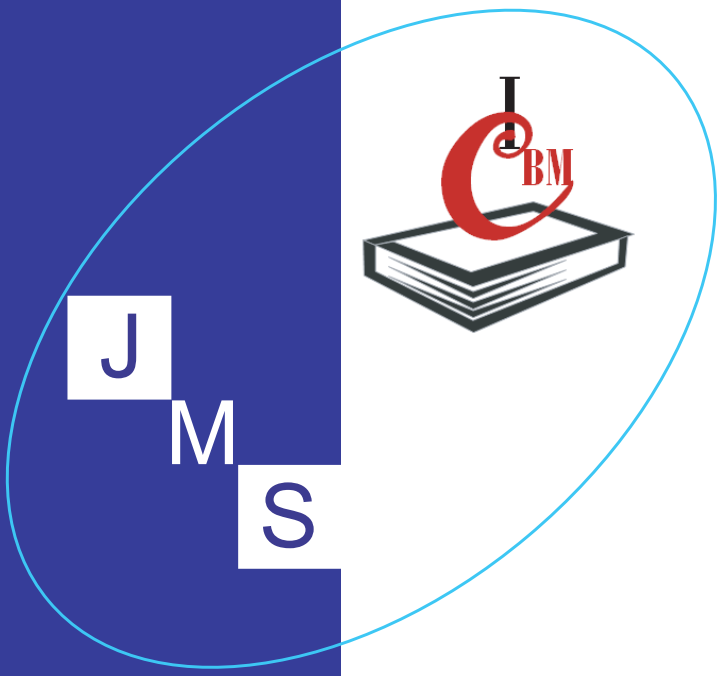

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Contents

[Refereed Paper]

Evaluation of Intangible Assets Using Regression Analysis

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Abstract: Assets without physical substance, other than financial assets, are called intangible assets. Since the 1990s, intangible assets have been an important determinant of corporate value. However, no established method is available for valuing intangible assets, and only some of them are recorded on the balance sheet. In other words, currently, the balance sheet does not accurately represent corporate value. One of the reasons may be that it takes a huge amount of time and effort to evaluate intangible assets. In this study, I evaluated intangible assets using multiple regression analysis in a wholly new approach to intangible asset evaluation. I obtained a regression equation using 27 stocks of the electric machinery industry, selected from the 225 stocks that make up the Nikkei Stock Average, with the intangible assets used as the dependent variable and total liabilities and net assets as independent variables. Although the intangible assets evaluated by this equation would certainly differ from the actual value, this prediction method does not require much time and effort. This allows the firm to discover buried intangible assets not recorded in the balance sheet.

Keywords: **Intangible asset valuation method, Multiple regression analysis, Balance sheet**

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1. Introduction

Companies have a variety of assets. They are roughly classified as tangible and intangible (with no physical traits but not financial) assets. According to various research studies worldwide, up until the 1980s, tangible assets were the main determinants of corporate value. However, since the 1990s, intangible assets have had a greater effect on corporate value (Ito Kunio, 2006). In other words, there has been a major shift from tangible to intangible assets as determinants of corporate value (Margaret M. Blair and Thomas A. Kochan, 2000). However, intangible assets are only partly recorded on balance sheets (Baruch Lev and Paul Zarowin, 1999)—the unrecorded value is three to four times the recorded value (Kevin G. Rivette and David Kline, 1999). There is also a report that Microsoft's market value in 2006 was about $250 billion, but its total assets on the balance sheet were less than 30% of that, about $70 billion (Jonathan H. and Stian W., 2018). In other words, balance sheets do not currently present an accurate picture of the asset value of a company.

Why do intangible assets normally remain unrecorded on balance sheets? There are two possible reasons: (A) no established method is available for intangible asset evaluation, or (B) it takes much time and effort to evaluate intangible assets. We look into both of these potential reasons.

(A) No established method is available for intangible asset evaluation

Of course, there are methods to evaluate intangible assets. The three main methods respectively follow a cost approach, a market approach, and an income approach (Tomoichiro, 2019). Moreover, research is under way to find more accurate assessment methods for intangible assets. However, each company may select a different evaluation method even when the asset type is the same because the intangible asset must be evaluated according to its actual condition. Furthermore, because the intangible asset valuation for accounting purposes is subject to review by an auditor, the evaluation method may also vary depending on the auditor, besides the appraiser and the evaluation amount. Therefore, despite advances in research on the three evaluation methods, they can hardly be regarded as established methods for evaluation of intangible assets.

(B) It takes much time and effort to evaluate intangible assets

Intangible asset evaluation involves a set of processes, executed in the following order: obtaining prior information on the target company, identifying intangible assets through interviews and other means, analyzing written materials and measuring intangible assets, preparing reports and the like, and reviews and follow-up by auditors (Tomoichiro HASEBE, 2019). Because these processes require considerable time and effort, it is impossible to deal with the countless intangible assets of all companies.

The two factors noted above are the main reasons that only some of the intangible assets are recorded on balance sheets. As such, developing an intangible asset valuation method that is not subject to revision by the appraiser and does not require immense time and effort is an imperative need. This study proposes a valuation method for intangible assets based on multivariate analysis that has a certain degree of accuracy and does not require much time and effort. The use of multivariate analysis, a mathematical approach, solves the problem of evaluator and auditor influence. Furthermore, the mathematical calculation involved does not require much time and effort, as with the conventional valuation method.

Although regression analysis cannot provide an accurate valuation of intangible assets, the predicted amount is recorded on the balance sheet with minimal time and effort. This allows the company to dig out and value intangible assets that have hitherto remained outside the balance sheet.

2. Intangible asset valuation using regression analysis

I propose a method to evaluate intangible assets based on multiple regression analysis, a type of multivariate analysis, using only numerical data in the financial statements (YOSHIOKA, 2019). Here we use intangible asset valuations of companies that have already been evaluated and recorded on balance sheets, as well as the amount of the account on the balance sheet. Multiple regression analysis is performed with the valuation of intangible assets as the dependent variable and the amount of the account title listed on the balance sheet as the independent variable. The specific intangible asset valuation method is as follows:

(1) The accounts listed on the balance sheet that are highly correlated with intangible asset valuations are selected.

For the accounts selected, a single regression is performed between the evaluated amount and the

amount recorded on the balance sheet.

(2) A regression equation is determined through multiple regression analysis.
Multiple regression analysis is performed between the accounts selected in (1) (independent variables) and the valuations of the company's intangible assets (dependent variable) recorded on the balance sheet, calculated with the regression equation.

(3) The accuracy of the calculated equation is evaluated.
The accuracy of the equation used for the intangible asset valuation in (2) is verified with the adjusted coefficient of determination and significance F.

Using the above procedure, we can construct an equation as in Figure 1 to predict the value of unrecorded intangible assets, using the evaluations of companies that have recorded their intangible assets on their balance sheets.

However, the coefficient a_i and constant a_0 will change depending on the type of intangible assets. In addition, since the value should be determined according to the size of the company and the industry type, the equation for evaluating intangible assets needs to be constructed by company size and industry type.

$$y = a_0 + \Sigma a_i x_i$$

y: predicted amount of intangible asset — a_i: coefficients

a_0: constant — x_i: amount of balance sheet account

Figure 1. Equation for intangible asset evaluation

3. Regression analysis of stocks that make up the Nikkei Stock Average (Nikkei 225)

In this section, we verify whether a regression equation can be constructed to evaluate intangible assets as described in Section 2. As mentioned at the end of the section, the regression equation needs to be constructed according to the size and industry type of the company. Therefore, regression analysis is performed using the balance sheets of 27 companies' stocks that make up the Nikkei stock average (Nikkei 225), which is one of the representative stock price indexes of the Japanese stock market, and 27 stocks in the electric machinery industry[1]. I selected our sample from the stocks that make up the Nikkei 225 because they represent large companies and are therefore more or less similar. Furthermore, we can assume, without further discussion, that large companies use more advanced intangible asset valuation methods than small and medium enterprises (SMEs). The reason the electric machinery industry was selected is that it has the largest number of brands among the 36 industry types so that the regression analysis would be relatively more accurate. The second column of Table 1 shows the values of intangible assets, including goodwill, of the 27 Nikkei 225 companies in the electric machinery industry. These values are obtained from the consolidated balance sheet of the latest annual securities report as of September 18, 2020.

The goal is to construct a regression equation with the amount of intangible assets as the dependent variable and each account in the balance sheet as the independent variable. However, performing multiple regression analysis on the accounts listed in the balance sheet is a unique attempt. Furthermore, regressing each account from the beginning for the purpose of evaluation is likely to cost too much. Therefore, regression analysis is performed with intangible assets as the dependent variable and total assets, total liabilities, and net assets as independent variables. First, I will attempt to verify from the statistics whether performing statistical analysis on the accounts in the balance sheet is a valid method. Of course, it is an approximate analysis, and precise results cannot be obtained since total assets include intangibles. However, the intangible asset valuation varies depending on the evaluator and the auditor. After all, the aim of regression analysis is not to calculate accurate values, but to mathematically compute predicted values with a certain degree of accuracy. Therefore, we will perform regression analysis, as a rough estimation method, using intangible assets as the dependent variable and total assets, total liabilities, and net assets as the independent variables, and validate the methodology. In addition, since regression analysis of accounts listed in the balance sheet is rare, a research paper on the results obtained is considered meaningful.

Figure 2 shows a scatter diagram and the correlation coefficients of (a) intangible assets and total assets, (b)

[1] Nikkei Inc., https://indexes.nikkei.co.jp/en/nkave/index/component?idx=nk225, September 18, 2020.

Table 1. Intangible assets, total assets, total liabilities, net assets 27 Nikkei 225 brands in the electric machinery industry

(Millions of yen)

	Intangible Assets (including goodwill)	Total Assets	Total Liabilities	Net Assets[a]
NISSHINBO HOLDINGS INC.	12,203	617,527	364,992	252,535
MINEBEA MITSUMI INC.	32,424	864,481	462,205	402,276
HITACHI, LTD.	1,115,721	9,930,081	5,663,342	4,266,739
MITSUBISHI ELECTRIC CORP.	146,323	4,409,771	1,870,912	2,538,859
FUJI ELECTRIC CO., LTD.	24,606	996,827	590,825	406,002
YASKAWA ELECTRIC CORP.	24,899	450,127	218,960	231,167
OMRON CORP.	62,052	758,124	225,535	532,589
GS YUASA CORP.	6,426	385,416	180,098	205,318
NEC CORP.	381,427	3,123,254	2,008,731	1,114,523
FUJITSU LTD.	143,922	3,187,445	1,839,010	1,348,435
OKI ELECTRIC IND. CO., LTD.	11,288	266,030	266,030	106,440
SEIKO EPSON CORP.	29,052	1,040,910	534,873	506,037
PANASONIC CORP.	620,611	6,218,518	4,062,650	2,155,868
SONY CORP.[b]	1,690,198	23,039,343	18,242,041	4,789,535
TDK CORP.	240,693	1,943,379	1,094,815	848,564
ALPS ALPINE CO., LTD.	28,259	625,542	269,926	355,615
YOKOGAWA ELECTRIC CORP.	22,766	489,679	198,206	291,472
ADVANTEST CORP.	51,025	355,777	124,325	231,452
DENSO CORP.	96,388	5,651,801	2,092,932	3,558,869
CASIO COMPUTER CO., LTD.	8,459	334,100	131,561	202,539
FANUC CORP.	10,219	1,512,499	149,634	1,362,865
KYOCERA CORP.	330,740	3,250,175	795,933	2,454,242
TAIYO YUDEN CO., LTD.	1,293	343,122	132,667	210,454
SCREEN HOLDINGS CO., LTD.	6,167	347,964	173,822	174,142
CANON INC.	1,246,582	4,768,351	1,876,433	2,891,918
RICOH CO., LTD.	231,898	2,867,645	1,008,527	231,898
TOKYO ELECTRON LTD.	10,921	1,278,495	829,692	10,921

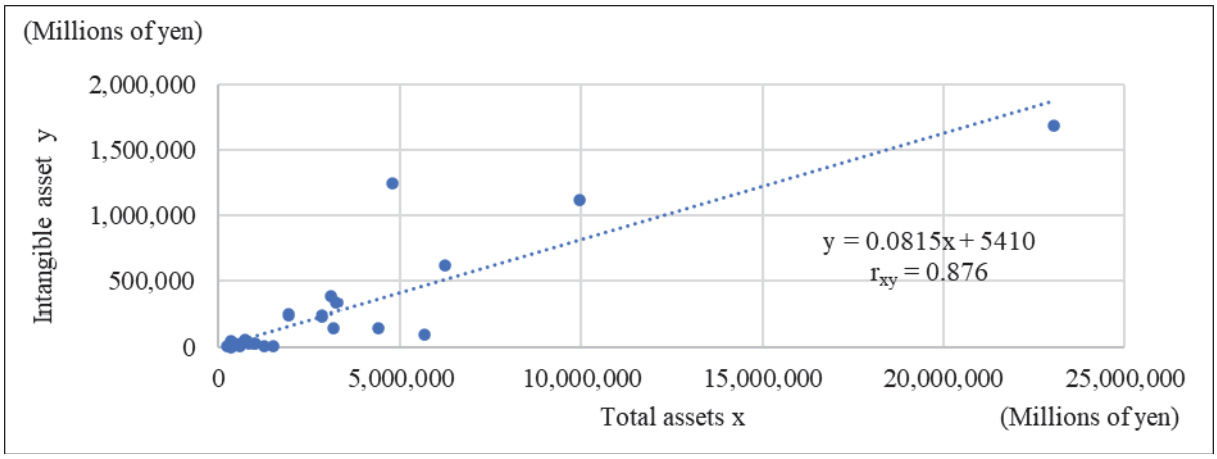
Source: EDINET, Financial Services Agency, https://disclosure.edinet-fsa.go.jp/, September 18, 2020.

[a] Capitals and net assets are collectively referred to as net assets.

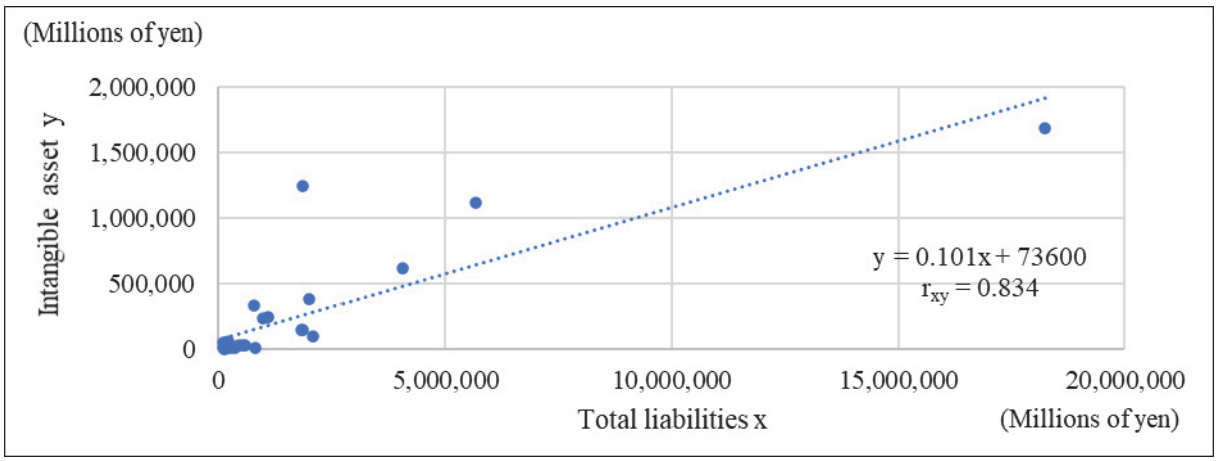
[b] Excludes redeemable noncontrolling interest.

intangible assets and total liabilities, and (c) intangible assets and net assets. Since the correlation with intangible assets is sufficiently high for total assets, total liabilities, and net assets, multiple regression analysis is performed with these three as independent variables.

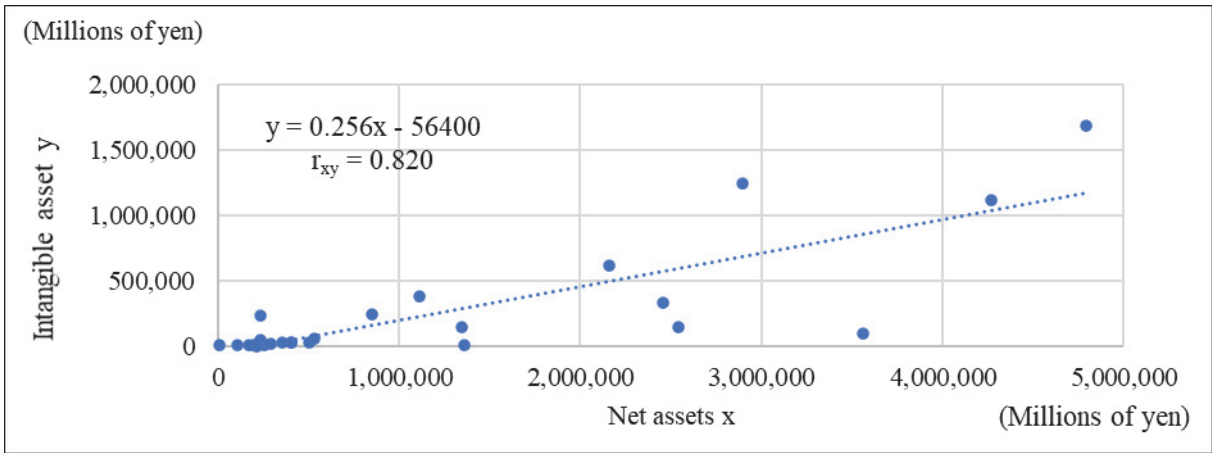
Table 2 shows the results of multiple regression analysis, performed with Microsoft Excel, at a significance level of 5%, using intangible assets as dependent variables and all independent variable candidates (total assets, total liabilities, and net assets) as independent variables. Here, the coefficient of total assets is a negative value, but the simple correlation between intangible assets and total assets in Figure 2 (a) is positive, which is a contradiction. This is probably due to multicollinearity between the independent variables. Table 3 shows a correlation matrix of total assets, total liabilities, and net assets, which are independent variable candidates, for a multicollinearity test. The result shows strong correlation between total assets, total liabilities, and net assets, indicating that multicollinearity exists. In particular, considering the strong correlation between total assets and total liabilities and between total assets and net assets, I excluded total assets from the list of independent variables candidates and performed multiple regression analysis with total liabilities and net assets as independent variables and intangible assets as dependent variables. The results are shown in



(a) Intangible assets and total assets



(b) Intangible assets and total liabilities



(c) Intangible assets and net assets

Figure 2. Scatter diagram and correlation coefficient of intangible assets, total assets, total liabilities, and net assets.

Table 4. This multiple regression analysis is considered meaningful because there is no multicollinearity, the adjusted R Square (adjusted coefficient of determination) is 0.76658, which is sufficiently large, and significance F is sufficiently small. The regression equation for calculating the amount of intangible assets, based on these results, is shown in Figure 3.

Table 5 shows the amount of intangible assets calculated using the regression equation. The amounts calculated for two companies are negative. This is probably due to the large P-value of the intercept, as shown in Table 4. Therefore, performing multiple regression analysis using

Table 2. Results of multiple regression analysis with intangible assets as dependent variables and total assets, total liabilities, and net assets as independent variables

Regression Statistics	
Multiple R	0.8858
R Square	0.7846
Adjusted R Square	0.7566
Standard Error	21340
Observations	27

ANOVA

	df	SS	MS	F	Significance F
Regression	3	3.816E+12	1.272E+12	27.93	7.585E-08
Residual	23	1.047E+12	4.554E+10		
Total	26	4.864E+12			

	Coefficients	Std Error	t stat	P-values	Lower 95%	Upper 95%
Intercept	-38014	59748	-0.6363	0.5309	-161610	85583
Total assets	-0.2171	2.076	-0.1046	0.9176	-4.512	4.078
Total liabilities	0.2782	2.076	0.1340	0.8946	-4.016	4.573
Net assets	0.3610	2.083	0.1733	0.8639	-3.949	4.671

Table 3. Correlation matrix of total assets, total liabilities and net assets

	Total assets	Total liabilities	Net assets
Total assets	1.0000	0.9811	0.8601
Total liabilities	0.9811	1.0000	0.7452
Net assets	0.8601	0.7452	1.0000

Table 4. Results of multiple regression analysis with intangible assets as dependent variables and total liabilities and net assets as independent variables

Regression Statistics	
Multiple R	0.8857
R Square	0.7845
Adjusted R Square	0.7666
Standard Error	208950
Observations	27

ANOVA

	df	SS	MS	F	Significance F
Regression	2	3.816E+12	1.908E+12	43.69	1.000E-08
Residual	24	1.048E+12	4.366E+10		
Total	26	4.864E+12			

	Coefficients	Std Error	t stat	P-values	Lower 95%	Upper 95%
Intercept	-36372	56446	-0.644	0.5255	-152870	80126
Total liabilities	0.0611	0.01727	3.537	0.001682	0.02544	0.0967
Net assets	0.1432	0.04569	3.134	0.004497	0.04892	0.2375

$$y = -36372 \times 10^6 + 0.061093x_1 + 0.14322x_2$$

y: value of intangible asset x_2: amount of net assets

x_1: amount of liabilities

Figure 3. Equation for intangible asset evaluation of 27 Nikkei 225 brands in the electric machinery industry

the account recorded on the balance sheet as the independent variable would be necessary for creating a more accurate regression equation. Furthermore, as shown in the column of the ratio of (a) to (b), 48% of the companies recorded (a) the amount of intangible assets on the balance sheet less than (b) the amount of intangible assets calculated by the regression equation, and 19% of the companies recorded (a) less than half of (b). The last column shows the ratio of (a) - (b) to total assets. These results could be an error, but a large negative amount may also suggest the presence of buried intangible assets not recorded on the company's balance sheet.

Table 5. Comparison between amounts of intangible assets as recorded on the balance sheet and as calculated by the regression equation (Millions of yen)

	(a) Amount of intangible assets recorded on the balance sheet	(b) Amount of intangible assets calculated by regression equation	Ratio of (a) to (b)	Ratio of (a) - (b) to total assets
NISSHINBO HOLDINGS INC.	12,203	22,095	55%	-1.60%
MINEBEA MITSUMI INC.	32,424	49,479	66%	-1.97%
HITACHI, LTD.	1,115,721	920,701	121%	1.96%
MITSUBISHI ELECTRIC CORP.	146,323	441,543	**33%**	-6.69%
FUJI ELECTRIC CO., LTD.	24,606	57,871	**43%**	-3.34%
YASKAWA ELECTRIC CORP.	24,899	10,113	246%	3.28%
OMRON CORP.	62,052	53,684	116%	1.10%
GS YUASA CORP.	6,426	4,036	159%	0.62%
NEC CORP.	381,427	245,969	155%	4.34%
FUJITSU LTD.	143,922	269,101	53%	-3.93%
OKI ELECTRIC IND. CO., LTD.	11,288	-4,875	-232%	6.08%
SEIKO EPSON CORP.	29,052	68,780	**42%**	-3.82%
PANASONIC CORP.	620,611	520,591	119%	1.61%
SONY CORP.	1,690,198	1,764,046	96%	-0.32%
TDK CORP.	240,693	152,045	158%	4.56%
ALPS ALPINE CO., LTD.	28,259	31,050	91%	-0.45%
YOKOGAWA ELECTRIC CORP.	22,766	17,482	130%	1.08%
ADVANTEST CORP.	51,025	4,372	1167%	13.11%
DENSO CORP.	96,388	601,193	**16%**	-8.93%
CASIO COMPUTER CO., LTD.	8,459	673	1257%	2.33%
FANUC CORP.	10,219	167,959	**6%**	-10.43%
KYOCERA CORP.	330,740	363,750	91%	-1.02%
TAIYO YUDEN CO., LTD.	1,293	1,874	69%	-0.17%
SCREEN HOLDINGS CO., LTD.	6,167	-812	-759%	2.01%
CANON INC.	1,246,582	492,445	253%	15.82%
RICOH CO., LTD.	231,898	58,454	397%	6.05%
TOKYO ELECTRON LTD.	10,921	15,880	69%	-0.39%

4. Summary

Since the equation for intangible asset valuation shown in the previous section is statistically calculated through multiple regression analysis, the value is certainly not accurate. However, an approximate amount is sufficient. This regression equation provides an estimated intangible asset valuation that is not subject to change by the evaluator and does not require much time and effort. This allows the firm to discover hidden intangible assets not recorded on the balance sheet.

In this study, we verified the valuation method for intangible assets using regression analysis, but we could not provide regression equations for practical use. Deriving such equations is our next priority. To do so, however, we would need to create a regression equation for each industry type and every company size, using the accounts in the balance sheet as independent variables. The intangible assets could then be evaluated collectively, but a regression equation will need to be established for each type, considering that companies have various types of intangible assets.

Acknowledgment

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[Refereed Paper]

The Intangibles on Indigenization of Target Costing in Supply-chain Development in Malaysia

: Case analysis of overseas advancement by parts suppliers

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Abstract: This study is intended to analyze suppliers that have advanced overseas through accompanying assemblers and main suppliers and elucidate the current state of transfer and development of human capital, organizational capital, and information capital by such firms, based on a field survey on indigenization of Target costing by Japanese manufactures operating in Malaysia. Specifically, based on interviews with Japanese firms operating in Malaysia, it will (1) reclassify the types of indigenization among Japanese firms operating in Malaysia and (2) consider the state of transfer and development of suppliers' intangibles (human capital, organizational capital, information capital) in overseas supply-chain development. This study has been able to identify design-in suppliers as a new type of indigenization of manufacturers advancing into Malaysia. In conclusion, it finds that while intangibles have not developed to a high degree among suppliers of the design-in type, they have been able to transfer human capital, information capital, and organizational capital from Japan at levels appropriate to their own roles vis-a-vis their main customers.

Keywords: **Target costing, Human capital, Information capital, Organizational capital, Supply chain management, Interorganizational management accounting**

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1. Introduction

This study describes the results of contextual analysis of indigenization of Target costing based on review of knowledge learned from a field survey (of nine companies, conducted March 2016 – March 2018) on indigenization of Target costing by Japanese manufacturers doing business in Malaysia. Specifically, based on interviews with Japanese firms operating in Malaysia, it (1) reclassifies the types of indigenization among Japanese firms operating in Malaysia and (2) considers the state of transfer and development of suppliers' intangibles (human capital, organizational capital, and information capital) in overseas supply-chain development.

2. Objectives of this study

Through now, Tasaka and Kozakai (2017; 2018) and Kozakai and Tasaka (2018; 2019) have elucidated the current state of indigenization of Target costing as well as transfer and development of intangibles, centered on information capital. However, while the forms of transfer and development of human capital (skills), organizational capital (organizational cultures, systems, etc.), and information capital (ability to utilize information systems) at assemblers and Tier 1 suppliers have been elucidated as important factors behind realizing indigenization of Target costing, the current states and methods of transfer and development of human capital and organizational capital have not necessarily been made clear from the perspective of supply-chain development overseas. One remaining issue in particular is the fact that little progress has been made on surveying concerning intangibles at firms in charge of manufacture of parts, as suppliers at an even lower level than Tier 1 suppliers. For this reason, it would be highly meaningful to focus on suppliers that have advanced overseas in the form of accompanying overseas supply-chain development centered on assemblers.

Since such issues remain to be studied, a need can be identified to study lower-level suppliers (specifically, relatively small- and medium-scale manufacturers in charge of parts manufacture), which play important roles in development and design activities encompassing the entire supply chain and in advancing Target costing practice. Specifically, there is a need to investigate the degrees to which human capital, organizational capital, and information capital have been transferred or developed at suppliers lower than the Tier 1 level in indigenization of development, design, and Target costing of assemblers that have advanced into Malaysia.

Accordingly, the objective of this study is to analyze, based on a field survey of Japanese manufacturers operating in Malaysia, suppliers accompanying assemblers and major suppliers overseas and elucidate the current states of transfer and development of human capital, organizational capital, and information capital among such firms. First, we will postulate the issues addressed in this study and make the objectives of the study clear. Second, we will review previous studies and describe the background of this study, making its research methodology clear. Third, we will consider the subject matter based on the results of surveying three suppliers (parts manufacturers). Fourth, we will examine the types of overseas transfer among these three suppliers and the state of their transfer and development of intangibles.

3. Review of previous studies, and research methodology

3.1 Previous studies

This section will review previous studies and then posit hypotheses on the meaning of globalization of Target costing, the meaning of indigenization, and types of indigenization in Malaysia. Target costing is "a method of strategic cost management to reduce costs and manage profits by building consensus among related sections, such as technology, production, sales, purchasing, and accounting sections, centered on the product planning and design stages" (Sakurai, 2015, p. 307).

(1) The background of research on Target costing

The number of studies that have addressed indigenization of Target costing is not very large, and such studies as do exist tend to concern suppliers in the auto industry (Itoh, 2004; Kitahara, 2011; Nakazawa, 2012; Ota, 2014). The study of Target costing in emerging markets in Tasaka (2014) considers a case of failure in deployment of Target costing through reducing the functions of a product developed and designed for developed markets to lower prices for emerging markets and the process through local sourcing of parts and analyzes corresponding strategic patterns.

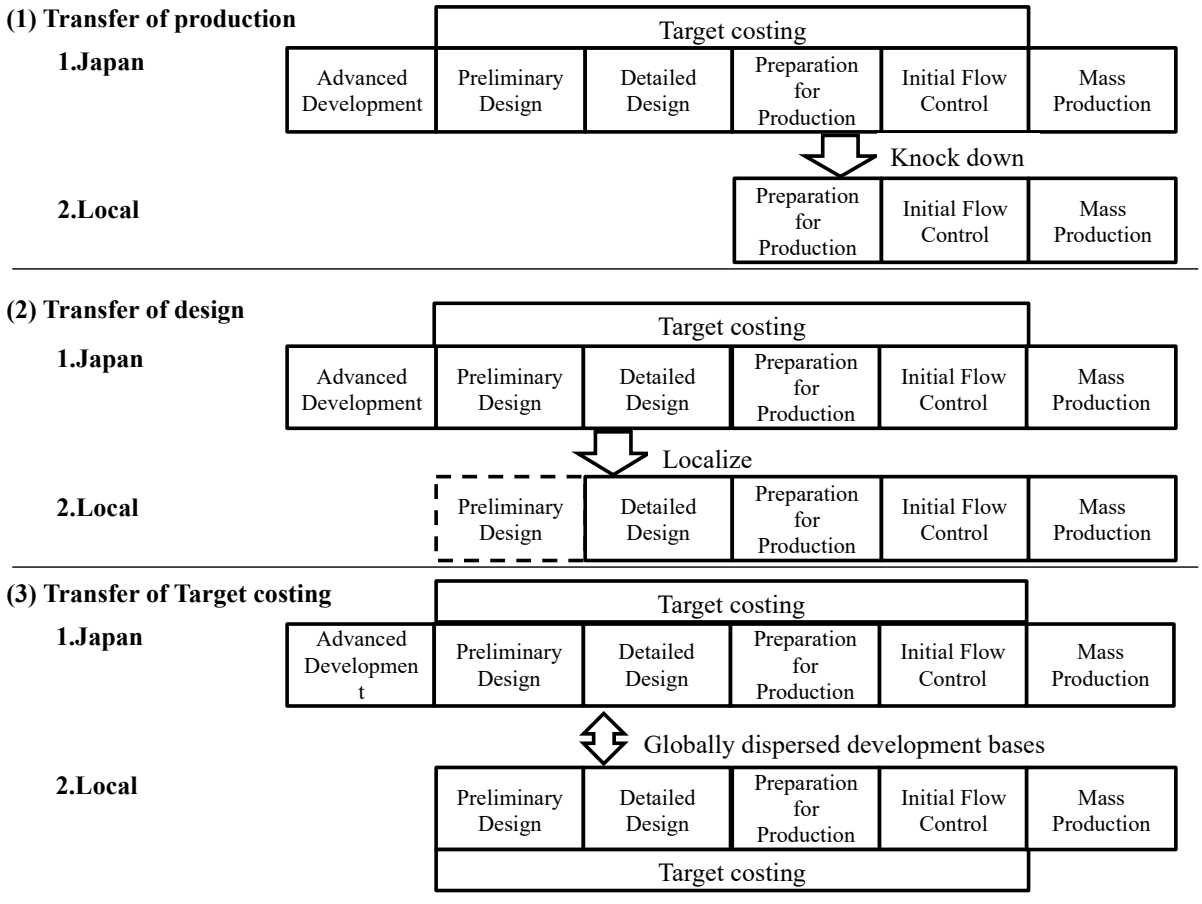
There are great expectations for Target costing as a means of cost cutting and strategic profit management. However, in transfer of Target costing overseas doubts remain as to whether or not it can be transferred as is. On this point, Tasaka (2014, 2016) discusses the kinds of points to note in order to deploy Target costing overseas successfully.

The research by the authors of this paper is important in that it elucidates the efforts of assemblers and suppliers in advancing indigenization of production, development, design, and Target costing as well as considering issues in

indigenization of Target costing by Japanese manufacturers related to management of intangibles. For example, on the subject of indigenization by Japanese manufacturers Ota (2014) points out that suppliers are quicker than assemblers to adapt to indigenization. However, Ota (2014) does not necessarily consider the issue of transfer of Target costing. On this point as well, there can be said to be a need for careful study focusing on the point of transfer and development of intangibles related to Target costing.

In addition to human capital, organizational capital, and information capital, intangibles also include factors such as brand, corporate reputation, and intellectual property. Intangibles are treated as the ultimate sources of sustained value creation (Kaplan and Norton, 2004, p. 7). Transfer of human capital, organizational capital, and information capital is strongly related to research on international transfer of Target costing practice. Organizational capital includes organizational culture and organizational abilities. The organizational abilities of a major assembler include supply-chain management abilities.

Interorganizational management accounting is a domain of managerial accounting that is related to supply-chain management. Interorganizational management accounting refers to "a domain of managerial accounting intended to collect and prepare accounting information to support interorganizational management and utilize it across organizational boundaries" (Kubota et. al., 2008). Interorganizational management accounting is a relatively new research domain. An important point is the fact that the method of analyzing cost drivers based on the dichotomy between structural drivers and executional drivers in strategic cost management, employed in an early study by Shank and Govindarajan (1993), has been used in later studies as well.



Source: Kozakai and Tasaka (2019, p. 24)

Figure 1. Types of indigenization in Malaysia

(2) Findings of previous studies

Tasaka (2016) identifies five types of indigenization of Target costing. In the early stages of their study, the authors were able to identify three types in Japanese firms operating in Malaysia: transfer of production, transfer of design, and transfer of Target costing. Accordingly, at first this study considered overseas transfer by Japanese manufacturers in Malaysia by grouping it into these three types (Tasaka and Kozakai, 2017; Tasaka

and Kozakai, 2018; Kozakai and Tasaka, 2018; 2019). The transfer of production type is one in which processes from preliminary design through detailed design take place in Japan and knockdown production takes place overseas at the parts level. The transfer of design type is one in which preliminary design takes place in Japan and detailed design and production take place overseas, or all three processes of preliminary design, detailed design, and production take place overseas. The transfer of Target costing type is one in which all processes from preliminary design through mass production take place locally, and even Target costing is indigenized.

The authors' research through now has contributed by contextualizing indigenization of Target costing and elucidating the contexts of information capital related to costs, based on a field survey of Japanese firms operating in Malaysia. As a result, it has been able to make clear the differences between Japanese assemblers and suppliers operating in Malaysia in their progress on information-capital development related to Target costing (Kozakai and Tasaka, 2019). First, they have confirmed that materials OEM suppliers, for which even Malaysian subsidiaries have high degrees of freedom in information systems, transfer their own individual Target costing systems. At the same time, they also have confirmed that suppliers are quicker to conduct indigenization. Second, they also confirmed that accumulation of IT-related human capital is lacking, and spreadsheet software was used in many cases. Overall, development of information capital tends to lag even if Target costing is indigenized.

However, the issue remains that the research described above merely posits hypotheses, due to the small number of surveys of Japanese firms operating in Malaysia. Furthermore, in many cases Japanese assemblers bring along suppliers with which they already have transaction histories when transferring operations overseas. That is, Japanese assemblers advance overseas while maintaining, to some degree, their existing supply chains. Taking this point into consideration, it also can be considered highly meaningful to survey firms in the future concerning aspects of supply-chain management, while also considering matters from an interorganizational management accounting perspective.

3.2 Overview of the field survey

In addition to a literature review, this study is based on three interview surveys conducted in Malaysia. The first of these (conducted in March 2016) involved interviews with two automotive assemblers and one automotive supplier, on the topics of cooperation with local suppliers, revisions to Target costing practice, standards in the home country and the local country regarding quality, cost, and delivery time (QCD), and the state of development and methods of use of information

Table 1. Overview of the surveys conducted while visiting Malaysia

	Companies	Dates	Interviewees
First interviews (March 15-16, 2016)	Company B (auto assembler)	March 15: 9:30 am - 12:00 noon	CFO
	Company A (auto assembler)	March 15: 2:00 - 4:30 pm	Local manager
	Company X (auto supplier)	March 16: 2:00 - 5:00 pm	Local manager
Second interviews (March 14-15, 2017)	Company Y (auto supplier)	March 14: 2:00 - 4:00 pm	Local manager
	Company C (home-electronics assembler)	March 15: 9:00 - 11:00 am	Operating Officer
	Company Z (auto supplier)	March 15: 1:00 - 3:30 pm	Advisor (responsible for Target costing)
Third interviews (March 6-7, 2018)	Company O (Copier parts supplier)	March 6: 10:00 am - 12:00 noon	Managing Director
	Company P (Spring Supplier)	March 6: 2:00 - 4:00 pm	Managing Director
	Company Q (Steel pipe processing supplier)	March 7: 9:40 - 11:40 am	Managing Director

systems.

The second interview survey (in March 2017) asked about differences among manufacturer types in indigenization of Target costing, differences between the home country and the local country regarding standards for matters such as quality, delivery time, and cost, and information management using cost tables and other means. As content concerning cost tables and IT, interview questions were added on subjects such as standardization of cost tables and methods of sharing them, information management, and coordination among various internal information systems, enabling the survey to be used in consideration of information capital. In addition, the companies surveyed consisted of two automotive suppliers along with one home-electronics assembler, to enable a survey of matters such as differences between the automotive and home-electronics industries. Furthermore, after the second survey an additional survey was conducted concerning questions that could not be asked in the first survey, by emailing the staff responsible at the companies surveyed.

The third interview survey (in March 2018) involved continuation of interviews on the same questions asked in the second survey in 2017. Survey subjects consisted of three suppliers from industries other than automotive and home electronics.

4. Additional surveys of Japanese firms active in Malaysia

Table 2 shows the results of the surveys of supplier firms among the companies surveyed in the three interview surveys described above. The results for Company O, Company P, and Company Q will be discussed in particular below.

4.1 The case of Company O

Company O is a supplier of parts used in office machines (mainly copiers). It advanced into Malaysia together with an assembler that was a major customer.

It is difficult for Company O to differentiate itself from competitors in terms of QCD. Under current conditions, it is able to maintain transaction relationships by securing the quality of its parts and responding swiftly to customer orders. There is little difference between its transaction relationships in Malaysia and those in Japan, and the delivery time requirements of its major customers remain unchanged. For this reason, its standards for QCD in management of design and manufacturing are the same as in Japan. However, there are major differences in specifications between the parts in which it trades in Malaysia and those in Japan.

Company O has advanced the indigenization process, and its Malaysian subsidiary handles development and production independently. It should be noted that information concerning development and production of parts is shared within the region and some information, such as know-how on development and production, is provided as feedback to Japan.

Since Company O manufactures relatively simple and small parts, it does not play a leading role in any Target costing practice. Company O's organizational ability to estimate parts costs is based more on experience than on past data. Many of its transactions employ the drawings-supplied method, although it also produces drawings together with customers in some cases.

The production system used by Company O is standardized globally, as are the items subject to cost management. However, each country has its own server, since the company sees no point to preparing a shared information system since no parts are completely identical between domestic and foreign markets. Although Company O's adoption of IT is not highly advanced overall, it is able to view data in real time in its production system and its accounting system. It uses spreadsheet software to process and analyze these data. While it does have an information systems section in Malaysia, two or three of its staff members also perform other duties concurrently.

4.2 The case of Company P

Company P is a supplier of spring parts. It advanced into Malaysia to secure orders from a main assembler customer that had a production facility in the country. Its main customers are Japanese and European firms, and it exports 65% of its production to customers outside of Malaysia.

All of Company P's transactions in Malaysia involve production of products specially ordered by customers. Company P engages in make-to-stock production. It maintains internal inventories to take over inventory adjustments for customers, delivering products in response to individual orders. In light of the importance of inventory adjustments, the level of detail of its production management is key.

It employs the same standards for QCD as in Japan. The parts in which it trades in Malaysia differ greatly in their specifications from those in Japan. Even so, since the process used in spring production and standard workflows are identical, the tasks that should be conducted for quality control are the same as in Japan. Since product properties related to delivery time and cost are similar to those in Japan, it keeps inventories for the same periods and manages the same cost items as in Japan.

Table 2. Comparison of suppliers

	Suppliers (parts makers)					
Company surveyed	X	Y	Z	O	P	Q
Industry	Automotive (independent)	Automotive (group)	Automotive (group)	Office machine (copier) parts	Springs	Tubing
Market share	High	High	High	-	-	-
QCD standards	Local adaptation	Transfer of home country standards	Transfer of home country standards	Transfer of home country standards	Transfer of home country standards	Local adaptation
Indigenization of design/development (start phase)	Development (planning) at regional acility	None	Local design (detailed design)	Local design (basic design) Advanced development conducted in China	Local design (Also participates in some advanced development by assembler)	Local design (basic design)
Indigenization of Target costing	Indigenization	None	None	None Parts cost estimates	None Parts cost estimates	None Parts cost estimates
Type of indigenization	Transfer of Target costing	Transfer of production	Transfer of design	Design-in	Design-in	Design-in
Marketing/sales information	Regional sharing	Exchange of information with home country	Exchange of information with home country	Regional sharing	Locally closed	Locally closed
System differences between home country/local market	Partially standardized for production and inventory	No local sourcing. Cost information managed using spreadsheets.	ERP system standardized. Others reused or sourced independently.	No local sourcing	No local sourcing	Local sourcing
Information systems section	Head office in charge. Some local outsourcing.	One local IT staff member (concurrent post)	Local IT section	Two or three local staff members (concurrent posts)	Head office in charge	One full-time local staff member
Differences in specifications with home country	Numerous (materials OEM)	Numerous (group assembly)	Differs for each part (group assembly)	Numerous (responding to needs of each country)	Numerous (responding to needs of each country)	Numerous (responding to needs of each country)
Cost management items	Common	Local formats	Both common formats and local formats used	Common	Common (high-precision estimates)	Local formats
Cost data management	Proprietary Target costing system	Spreadsheets	Spreadsheets	Sharing of formats	Spreadsheets	Spreadsheets
Drawings	Drawings Approved	Drawings Supplied	Partially Drawings Approved	Drawings Supplied	Drawings Supplied	Drawings Supplied

Company P has advanced indigenization of both parts development and production, and for the most part these are conducted by the Malaysian subsidiary independently. It appears that information such as know-how on development and production is not provided as feedback from Malaysia to Japan.

Since Company P is a manufacturer of relatively simple, small parts, it does not play a leading role in Target costing practice. In some cases, it participates in advanced development by the assembler.

Repeat orders account for a large part of its transactions. For drawings, it employs the drawings-supplied method. However, although drawings are supplied for finished and semifinished products, in 95-98% or more cases there are no detailed drawings for the springs themselves. While it makes only rough estimates of costs for each customer order, since most of the products it handles are ones ordered repeatedly by customers its costs estimates are highly precise.

Company P has a relatively advanced information system. Production planning, inventory management, and customer management are integrated in a single system, which can be used to monitor data in real time. A system for product traceability was under development (at the time of the survey).

Company P does not source information systems locally. The system was developed by a Japanese developer and then localized in accordance with the taxation systems of individual countries. A head-office section in Japan is in charge of matters related to IT, and no IT staff is assigned in Malaysia. With regard to cost data, materials such as reckoning tables and cost-verification tables are prepared using spreadsheet software, although these data are not shared with Japan.

4.3 The case of Company Q

Company Q is a supplier engaged in make-to-order production of steel tubing used in air-conditioners and other devices. It came to Malaysia together with a major customer, a large home-electronics manufacturer.

It carries out high-mix, low-volume production, since the lot sizes of orders from its main customer vary widely. It also experiences substantial variation in monthly production volumes, since its parts are used in seasonal products.

Specifications differ widely between the parts in which Company Q trades in Malaysia and those in Japan. Its standards for QCD are adapted to local conditions. Since the quality levels required by its main customer differ from those in Japan, its quality standards also differ from Japan. At the time of the interview, the view was expressed that, in fact, the standards employed in Japan were too strict. At the same time, requirements on major costs and delivery time are strict, and the supplier must pay a penalty if a delivery is made after the specified delivery time.

Indigenization of development and production has advanced at Company Q, and most of these tasks are conducted by the Malaysian subsidiary independently. Advanced development takes place in Japan. It appears that information such as know-how on development and production is not provided as feedback to Japan.

Company Q also does not employ Target costing practice in which it plays a leading role. In its high-mix, low-volume production, it receives orders based on the drawings-supplied method. While it manages cost-estimate items in great detail, some issues remain with regard to the precision of estimates. For example, it employs a method in which drawings are supplied to the production technology section and then materials costs are estimated based on factors such as the length and thickness of tubing.

Company Q says that it would like to use more advanced information systems in production management it has not been able to do so because of the difficulty of drafting production plans, since most of its processes are labor intensive. Its current accounting system was adopted three years ago (as of the time of the survey). It uses spreadsheet software in cost estimation. Apparently some information systems are sourced locally in Malaysia. It has one full-time IT staff member in Malaysia.

5. Implications

This section will consider the state of indigenization by Japanese manufacturers in Malaysia, focusing chiefly on the three companies Company O, Company P, and Company Q, which provide a glimpse of overseas development of assembler supply chains. Specifically, it will (1) reclassify the types of indigenization and (2) consider the state of transfer and development of intangibles related to overseas supply-chain development.

5.1 Reclassification of indigenization types in Malaysia

When surveying of the state of advancement of indigenization among Japanese firms operating in Malaysia began, the following three types of indigenization were chosen: (1) transfer of production, (2) transfer of design, and (3) transfer of Target costing (Tasaka and Kozakai, 2017; 2018; Kozakai and Tasaka, 2018; 2019). However, surveying and analysis of the parts suppliers Company O, Company P, and Company Q during the third survey in the field identified the (4) design-in

type.

This paper defines the design-in type as one that involves joint development in the form of the supplier dispatching development personnel to the assembler. Companies employing the design-in consist of both assemblers and Tier 1 and other suppliers as well as manufacturers that have advanced overseas, as parts of the supply chain. The subjects of the third interview survey—Company O, Company P, and Company Q—all belong to the design-in type. They advanced overseas as part of the supply chain together with assemblers and Tier 1 and other suppliers.

Further analysis showed that at Company P could be detected early signs, although incomplete, of reverse innovation in the form of transfer to Japan of local development technologies and other factors. The reverse innovation type refers to manufacturers that import to their home countries technologies and other factors developed at overseas facilities. The reverse innovation type also is included among the five types identified by Tasaka (2016).

These new discoveries from case studies have made it possible to group Japanese firms operating in Malaysia into five indigenization types. There is a need to propose a more detailed framework for transfer of Target costing overseas through continued progress on interview surveys in the field in the future. Doing so should make it possible to investigate the state of intangibles management in indigenization of Target costing.

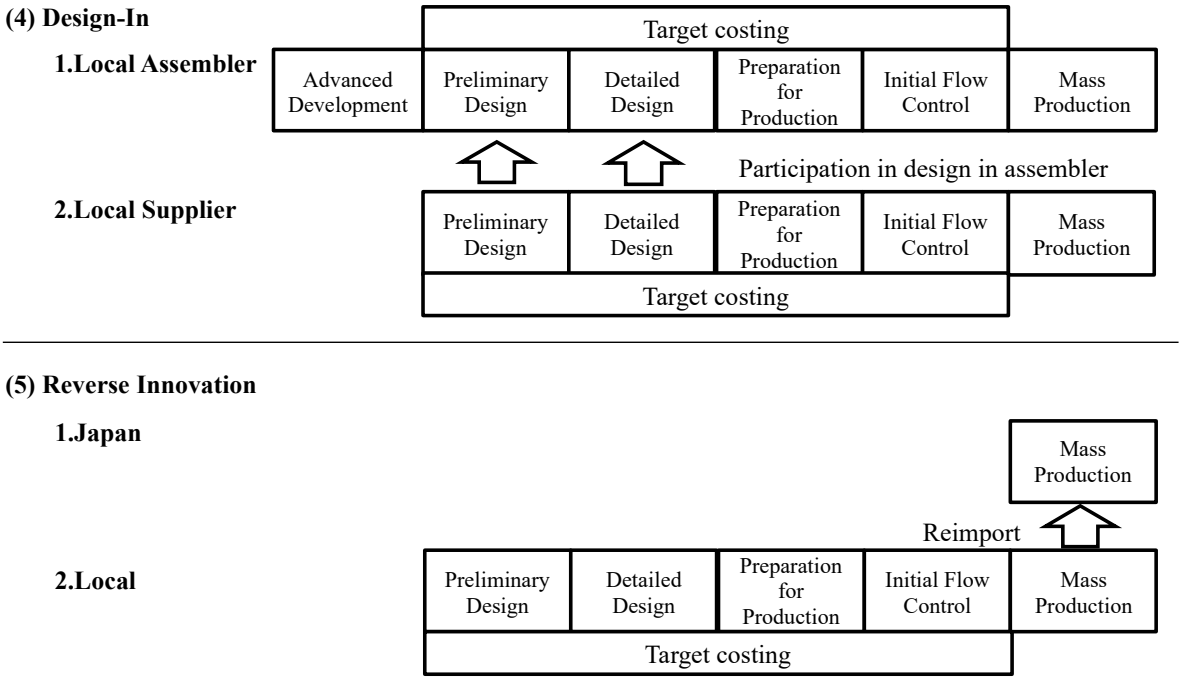


Figure 2. The design-in type and the reverse innovation type

5.2 Transfer and development of intangibles in overseas supply-chain development

This section will consider intangibles in transfer and development of Target costing by Japanese firms operating in Malaysia, from the perspective of overseas supply-chain development. The subjects under consideration in this paper are human capital, organizational capital, and information capital in connection with development and design activities and Target costing practice. These intangibles include ones developed throughout the entire supply chain, including not only assemblers but also suppliers such as Company O, Company P, and Company Q.

First, human capital related to development and design activities and Target costing practice refers to the skills and competencies needed for successful Target costing practice led by assemblers. Examples include cost-estimation skills to prepare cost tables and problem-solving skills to devise ways to cut costs through means such as value engineering.

Second, this study considers information capital as a concept that includes organizational abilities related to utilization of information related to Target costing and of information systems, as well as IT-related human capital. For example, organizational abilities or skills capable of utilizing IT and information systems for cost estimation in preparation of cost tables or for cost savings through value engineering would qualify as information capital.

Third, organizational capital related to development and design activities and Target costing practice includes Target costing practice know-how, internal organizational rules and practices, and organizational culture. For example, an organization's internal rules and procedures on deciding whether to adopt the method of top-down Target cost goals, the method of bottom-up responses, or the combination method in order to calculate Target costs would qualify as such organizational capital. It also would include organizational practices or culture with regard to whether Target costs are considered targets that must be achieved or merely ones that should be strived toward.

In addition, organizational capital also includes organizational abilities related to supply-chain management. These are intangibles developed by the assemblers and suppliers participating in a specific supply chain as a whole.

This paper will consider the three companies of Company O, Company P, and Company Q, which are design-in-type suppliers. A design-in-type supplier can be said to be a manufacturer that is able to maintain continual transactions because it can contribute to achievement of one or more of the three aspects of QCD through participation in Target costing practice led by an assembler. For this reason, it is likely to be meaningful in some way for design-in-type suppliers to consider the kinds of contributions to be enabled through transfer and development of intangibles, and how to conduct such transfer and development.

(1) The perspective of human capital

First, from analysis from the perspective of human capital, all three of the companies Company O, Company P, and Company Q can be considered to have transferred or developed human capital to enable them to contribute to assemblers and other customers. It is essential to be able to contribute to development and production of parts that can meet QCD requirements in the design and development activities and Target costing practice of assemblers and upstream suppliers who are design-in-type supplier customers. The fact that transactions continue can be considered to mean that the necessary human capital has been accumulated in the areas of both development and production.

In production, there appear to be some difficulties with regard to diverse views of work among local workers. Even so, all three companies are able to continue transactions even under current conditions because they satisfy customer requirements regarding quality (Q), cost (C), and delivery time (D). Accordingly, all three companies can be considered to have succeeded in transferring human capital from Japan and/or developing human capital through training local employees.

All three companies have transferred human capital appropriately from their home countries with regard to parts development and design. Consideration of the point of precision of cost estimates shows that while there is some variation among the companies, when seasonal factors are taken into consideration they can be considered to be at tolerable levels. One issue is future local human-resources development.

(2) The perspective of information capital

Second, analysis from the perspective of information capital shows that, in general, Company O, Company P, and Company Q can be considered to have developed information capital at appropriate levels for their own roles vis-a-vis their main customers, as design-in-type suppliers. Transfer and development of information capital have not advanced at Company O and Company Q, while Company P is focusing more on development of information capital compared to companies O and P. While none of the three companies has achieved a very high degree of information capital development, they have transferred it to a level that corresponds to the information capital of local assemblers. Previous research (Kozakai and Tasaka, 2018) has shown that in general the degrees of transfer of information capital related to Target costing are low. For this reason, design-in-type suppliers transacting with such assemblers and major suppliers do not need to develop advanced information capital.

When companies other than Company O, Company P, and Company Q were surveyed about differences between the home country and the local market concerning information systems, only Company C answered that it employed global standardization of information systems. Questioning the companies about systems and tools used in cost management including measures other than Target costing showed that linkage with other systems had not been advanced to much of a degree. With regard to obtaining cost data in local ERP systems, which Company C and Company Z did link cost data in ERP systems with cost management, each of the companies used spreadsheet software to analyze cost data (Kozakai and Tasaka, 2019). While Company X, a supplier with a globally standardized Target costing system, used it to estimate costs and to reduce costs in the design stage, this was the most advanced example of information capital development among the firms surveyed.

When Company O, Company P, and Company Q also were surveyed about systems and tools for cost management including means other than Target costing, Company P and Company Q reported using spreadsheet software for analysis

in management of cost data and no linkage to other systems in preparation of cost data. Only Company P linked this to production management, inventory management, and customer management. Accordingly, it can be concluded that while levels of information capital development are not high among design-in-type suppliers, they are adequate for their roles as parts of the supply chain.

(3) The perspective of organizational capital

Third, analysis from the perspective of organizational capital shows that all three of Company O, Company P, and Company Q can be considered to have transferred or developed organizational capital capable of contributing to their customers, such as assemblers. All three design-in-type companies did so mainly by transferring organizational capital from Japan to Malaysia.

All three of Company O, Company P, and Company Q receive drawings through the drawings-supplied method and participate in product development and design activities. This is a distinguishing feature of the design-in type. Since suppliers in the design-in type are in a position to support the development and design activities and Target costing practice of assemblers and other customers, it is rare for them actively to prepare drawings themselves.

However, some differences were apparent among the three design-in-type companies in their handling of standards for QCD. Since Company Q adapted such standards locally while Company O and Company P transferred standards from Japan, indigenization can be considered to have advanced slightly more at Company Q than at Company O and Company P. However, its standards on cost and delivery time are largely unchanged from those in Japan. Only its quality standards have been adapted to the standards of local customers, which are not as strict as those in Japan. Company Q is a tubing manufacturer that belongs to the group of a major home-electronics maker. The parts it produces are not themselves very complicated. In consideration of the above points, all three of the design-in suppliers can be considered to have transferred organizational capital to satisfy customer QCD requirements properly, and not to have developed new organizational capital locally to much of a degree.

Next, we will consider strategic cost management (Shank and Govindarajan, 1993) in the supply chain from the perspective of interorganizational management accounting. None of the nine Malaysian subsidiaries surveyed so far was implementing ABC/ABM. Unlike countries such as Singapore and Thailand, where regional facilities are located, most Japanese manufacturers advance into Malaysia on a secondary basis. For this reason, a tendency is apparent for transfer of intangibles overall to be slower among Japanese firms operating in Malaysia. In light of the fact that they do not employ the cost management method of ABC/ABM, the likelihood is low that analysis of structural and executional cost drivers has permeated among them. Accordingly, there would appear to be little likelihood that Japanese manufacturers operating in Malaysia employ methods such as value-chain analysis for supply-chain management.

On the other hand, with regard to sources of materials, generally both assemblers and suppliers pay very close attention to the three aspects of QCD among suppliers to which they outsource manufacture of parts. In consideration of this point, it could be highly meaningful in the future to conduct a survey on individual companies' supplier evaluation systems, to analyze how assemblers and Tier 1 suppliers choose suppliers.

6. Conclusions

This study's objective was to analyze three suppliers—Company O, Company P, and Company Q— that advanced overseas by accompanying assemblers and major suppliers and elucidate the current state of transfer and development of human capital, organizational capital, and information capital among such firms, through a field survey of Japanese manufacturers operating in Malaysia. The observations in this study were based on the results of three past interview surveys conducted in Malaysia.

This paper considered the types of international transfer and the states of transfer and development of intangibles at three suppliers. It found that while intangibles had not been developed to a high degree at design-in-type suppliers, they had transferred human capital, information capital, and organizational capital from Japan at levels appropriate for their own roles vis-a-vis their main customers.

This study has made two contributions: (1) identification of the design-in type of supplier and (2) elucidation of the state of transfer and development of intangibles by design-in-type suppliers. The need for further analysis of the supply chain as a whole from an interorganizational management accounting perspective can be considered to be an issue to address in the future.

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[Non-Refereed Paper]

Intellectual Property Management Through Fruit Tree Club System

: The Case Study of the Apple Cultivar "Cripps Pink"

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Abstract: I examine the intellectual property management of the fruit tree "club system," focusing on trademark rights utilization, through a case study of the apple cultivar "Cripps Pink," developed at a public experiment station in Australia. I find that, in addition to acquiring plant breeders' rights for the apple cultivar "Cripps Pink," the rights holder has also acquired the trademark "PINK LADY" in various countries. The club has also acquired variations on its original trademarks and increased the designated goods they cover as it has expanded its production and sales sites. Furthermore, I note that focusing on acquiring popularity for the trademark rather than the variety name is an effective strategy throughout the product lifecycle. Practicing this style of intellectual property management will enable the trademark to accumulate goodwill and maintain market power even after the plant breeders' rights have expired. Based on our results, I find that in addition to plant breeders' rights, the use of trademark rights is particularly important for fruit trees that take decades to reach their full economic potential.

Keywords: **Intellectual property management, Fruit tree club system**

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1. Introduction

Like industrial products, plant varieties are also considered intellectual property as they are produced through creative human activity. As such,it is important to properly "protect" this intellectual property, that is, newly developed plant varieties. Patent rights and plant breeders' rights are two means of protecting this type of intellectual property. In the case of patent rights, it can be difficult for breeds cultivated through traditional breeding methods, such as mating and selection, to meet patent requirements such as "novelty" and "inventive step." It is also difficult to patent plant varieties cultivated in different countries. For this reason, in many countries, cultivated plant varieties are protected by plant breeders' rights. Some countries have banded together to create an international framework for protecting novel plant varieties called the "Union for the Protection of New Varieties of Plants" (UPOV). UPOV member countries have developed the Seeds and Seeding Law, and new varieties that have been cultivated are protected under plant breeders' rights. Since plant breeders' rights do not require an "inventive step" for registration as patent rights do, it is relatively easy to acquire these rights than patent rights. Under the UPOV Convention, dual protection of fosterers' and patent rights was prohibited, but an amendment in 1991 eliminated this double protection prohibition provision. In many countries, such as Europe and the United States, the patent protection system co-exists breeder protection. In addition, plants produced through traditional breeding and crossbreeding methods are protected under breeders' rights, and plants produced as a result of genetic engineering are protected under patent rights.

Although the protected objects are different, it is also possible to protect the names of cultivated plant varieties with trademark rights. Although the duration of plant breeders' rights is 25 to 30 years, trademark rights can be permanently maintained by renewing the registration. For this reason, the combination of plant breeders' and trademark rights has become essential for protecting plant varieties as intellectual property.

Moreover, protecting intellectual property solely by securing these rights is not sufficient. Their value is only realized when the new plant variety is effectively used. These rights serve as "protection" for successful "utilization." "Utilization," in turn, expands the market, generates profits, and brings about new "creation." That is, proper protection of plant-related intellectual property is a critical component of the intellectual creation cycle.

Focusing on the "utilization" of intellectual property, such as licensing to third parties, the opportunity to collect royalties from a license based on plant breeders' rights is limited to one occasion, when seedlings transferred, unless otherwise specified in the contract. On the other hand, with trademark rights, as long as the harvest is sold with the licensed trademark attached to it, it is possible to obtain annual royalties as compensation for the license. In terms of their respective roles in "rotating" the intellectual creation cycle of plant varieties, trademark rights are essential to successful "utilization," while plant breeders' rights are considered "protection."

The fruit tree "club system" is an example of effectively rotating the intellectual creation cycle for plant varieties. Traditionally, a fruit tree breeder grants its cultivated varieties to a seedling contractor. Then, a producer purchases and grows the cultivated seedlings and sells the fruit produced. However, since breeders cannot control the production volume and quality, this type of production is likely to cause prices to fall because of overplanting, planting crops in areas unsuitable for cultivation, and distributing low quality fruits (the result of inadequate cultivation management). This leads to a reduction in the value of the cultivated varieties. For this reason, in the fruit tree club system was created. Here, the holder of the plant breeders' rights, who has cultivated a new variety, organizes a club consisting of sapling companies, producers, and other companies along the value chain. The breeder can then control quality and branding by limiting production, allowing only members of the club to grow seedlings and produce fruit, and only permitting fruit above a certain quality to be sold. In addition, the club system is a mechanism for plant breeders' and trademark rights holders to collect royalties from licensing. As a result, this system is attracting attention as a method of "utilizing" intellectual property.

In this paper, I analyze the fruit tree club system and examine its effects, particularly from the perspective of utilization of trademark rights, in order to obtain knowledge about "utilization" in terms of the intellectual property management of plant varieties.

2. Literature review

Regarding the fruit tree club system, there was a survey conducted by PIA Limited Liability Company (2009) in FY2008 and FY2009. There are also studies by Kanda et al. (2013). These surveys report on the status of breeder rights and trademark licensing of "Cripps Pink" in each country. In Japan, there has been no subsequent report on the "club system."

On the other hand, overseas, Brown and Maloney (2009) reported that there are more than 40 apple clubs around the

world, and there has been a rapid expansion of these club system initiatives (Brown & Maloney, 2009, 2013). In addition, they state that apples are better known to consumers by their brand names than by their breed names (Brown & Maloney, 2013). Rickard et al. also note that apples are one of the few agricultural products selected by consumers under the brand name (Rickard, Schmit, Gómez, & Lu, 2013).

Luby and Bedford (2015) assert that the reason for the popularity of the apple club system is that individual apple varieties are appealing to consumers and can be easily recognized by the appearance, texture, and taste of individual varieties; they also point out the importance of using plant breeders' and trademark rights. In addition, Winton reported that the apple cultivar "Cripps Pink," cultivated by a public experiment station in Australia, is the most successful club system in the world, accounting for 2.23% of the global apple production, excluding China (Winton, 2018).

This strategy has expanded beyond just apples. Indeed, Roe and Brokaw reported on an intellectual property strategy for avocados and mentioned the use of trademarks (Roe & Brokaw, 2007). In addition, Asioli et al. discuss the club system for a pear variety called "Angelys" (Asioli, Canavari, Malaguti, & Mignani, 2016), and Di Fonzo, Nardone, Fathinejad, and Russo (2019) introduce a kiwi fruit club approach in Italy. According to these reports, clubs have strong restraints on producers, but they provide favorable contract terms to encourage club participation. As a result, they are beneficial to producers. However, they point out that retailers' interest may be limited because they need to sell fruit at premium prices (Roe & Brokaw, 2007; Asioli et al., 2016; Di Fonzo et al., 2019).

As for the importance of trademarks in the club system, based on the results of interviews of food industry clusters in Hungary and Serbia, Kranjac, Sikimić, Vujaković, and Molnar (2015) argue that the agricultural and food sectors should employ protection and utilization of origin names and trademarks to gain an international competitive advantage. In addition, van Zoeren and Atucha (2016) reported that the apple cultivar "Honeycrisp," which was cultivated by the University of Minnesota, continues to monopolize marketing rights through its trademark rights, even after the plant patent expired. However, these papers did not conduct an in-depth investigation on the use of a specific trademark. Furthermore, no study has adopted a case of a particular club from the viewpoint of promoting the intellectual creation cycle that protects and utilizes plant varieties.

In the United States, some reports point to issues from the perspective of public good regarding the control of production volume by exclusively granting the varieties developed by public universities to some producers only. Alston and Plakias (2014) critically reported that exclusive licenses create distribution problems among producers, and Lehnert criticized the limiting of sapling production of the apple cultivar "SweeTango," which was developed by the University of Minnesota (Lehnert, 2010). Specifically, there are also critical opinions regarding club systems, specifically (Alston & Plakias, 2014; Lehnert, 2010).

Based on the above studies, I assume that the creation and licensing of overseas production sites and the resulting year-round supply of products not only leads to higher bargaining power for distributors but also monitoring by the licensees for illegal cultivation. Drawing from various databases, I investigate the use of intellectual property rights in the fruit tree club system, focusing on plant breeders' and trademark rights. The target of our analysis is the apple cultivar "Cripps Pink."

3. Survey method

I conducted an interview survey with the Japan Pink Lady Association, which is a business association that has become a master licensee of "Cripps Pink" in Japan, and grasped the current situation and issues of the club system of "Cripps Pink." Since the contents of intellectual property strategies and license agreements are often managed as trade secrets, the literature that have been published are extremely limited, and also the actual situation cannot be sufficiently grasped only by interview and questionnaire surveys. For this reason, I investigated the status of acquisition of plant breeder's rights and trademark rights using various databases.

The status of variety registration of "Cripps Pink" was confirmed by using the "Plant Variety Database" provided by the International Union for the Protection of New Varieties of Plants (UPOV). In addition, I used databases provided by countries/regions such as "PatFT" of the US Patent and Trademark Office (USPTO) and "CPVO varieties database" of the European Plant Variety Office (CPVO).

The registration status of trademarks related to "Cripps Pink" was confirmed using the "Global Brand Database" provided by the World Intellectual Property Organization (WIPO). I also used databases provided by countries/regions such as "Australian Trade Mark Search" of the Intellectual Property Protection Authority of Australia (IP Australia) and "TM view" of the European Union Intellectual Property Office (EUIPO).

4. Status of intellectual property rights of "Cripps Pink"

4.1 Plant breeders' rights

The apple cultivar "Cripps Pink" was developed in 1973 by the public experiment station of the Department of Agriculture and Food, Western Australia (DAFWA). It was created by crossing "Lady Williams" and "Golden Delicious," and commercial cultivation began in the late 1980s. Based on the hearing of Japan Pink Lady Association, DAFWA decided that "Cripps Pink" could be used free of charge by domestic producers because it was developed with state taxes, and variety registration was not done in Australia. However, there were rumors of a test cultivation by the French company Star Fruits in 1988. Therefore, beginning in 1990, DAFWA began applying for variety registration overseas. As a result, variety registration was conducted in 31 countries (27 countries of the European Union, the United States, Argentina, New Zealand, and South Africa). According to the Japan Pink Lady Association, DAFWA is the holder of the plant breeders' rights.

These applications were filed from 1990 to 1995. The dates of application and expiration are shown in Table 1. The registrations already expired in New Zealand and Argentina. The plant patent rights in the United States expired in 2010. The plant breeders' rights expired on June 8, 2019 in South Africa; they will expire in the EU on August 1, 2022. However, two new varieties—"Rosy Glow" and "Lady in Red"—were born from the "Cripps Pink." "Rosy Glow" was registered in Australia, New Zealand, the EU, and South Africa, and "Lady in Red" was registered in New Zealand, the United States, and South Africa. These varieties were registered around 2005, so the plant breeder's rights will continue to exist until around 2035.

Table 1. Application status of variety registration for apple cultivar "Cripps Pink"

Country / region name	Application date	Registration date	Expiration date	Remarks
New Zealand	April 12, 1990	July 30, 1993	July 30, 2016	
United State	October 18, 1990	June 9, 1992	October 18, 2010	In the United States, the protection period is 20 years from the application for protection by a plant patent.
South Africa	November 27, 1991	June 8, 1994	June 8, 2019	
Argentina	May 2, 1995	October 2, 1995	October 2, 2015	
EU	August 2,1995	June 15, 1999	August 1, 2022	Application for registration to the Community Plant Variety Office (CPVO)

Note: Created based on the "Plant Variety Database" (UPOV) and the "CPVO varieties database" (CPVO) (as of April 2019).

4.2 Trademark rights

The trademark related to "Cripps Pink" (hereinafter referred to as "Trademark 'PINK LADY'") was registered in France in 1992 and was subsequently registered in more than 70 countries, including countries in Europe, the southern hemisphere, and Asia. Trademark rights in these countries have not only been renewed and continue to exist, but new trademarks have also been filed and registered successively during the 2010s. The trademark holder is Apple and Pear Australia Limited (hereinafter referred to as "APAL").[1]

There are two types of trademarks related to "Cripps Pink": standard-character trademarks consisting only of the letters "PINK LADY" and composite trademarks that combine the letters "Pink Lady" and figures. There are several types of composite trademarks in which the color and shape of the figures are changed. These trademarks co-exist in each country because of renewals. The status of trademark registration shows that there were changes in trademark strategy in the 1990s, 2000s, and 2010s (Figure 1). Viewed in chronological order, in the 1990s, standard-character trademarks (word trademarks) were registered primarily in European countries, such as France and the United Kingdom. In the 2000s, in addition to expanding the word trademarks to Asian countries such as Indonesia, Japan, and Brunei, composite trademarks were registered in Australia as well as the EU. Furthermore, in the 2010s, composite trademarks

[1] The trademark rights are owned by DAFWA, but it was determined that trademark management was not a central task of the state government, so they were transferred free of charge to APAL in 1998.

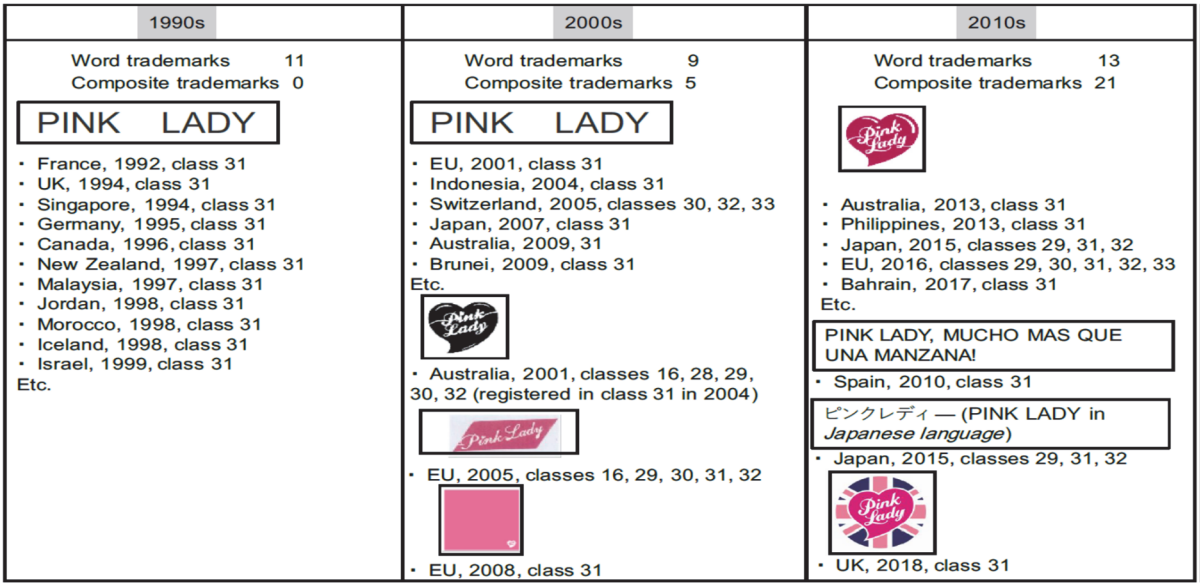

Figure 1. Registration status of "Pink Lady" trademark

were registered in which the text "PINK LADY" was combined with the language spoken in the country where application was filed, for example, "PINK LADY, MUCHO MAS QUE UNA MANZANA" in Spain, "ピンクレディー" (Pink Lady in Japanese) in Japan, a combination with the national flag in the United Kingdom, etc. In addition, these trademarks were for class 31 goods (fruits and trees) until the 1990s; however, since the 2000s, along with the expansion in cultivation and sales areas, the scope of protection was gradually expanded to include class 29 (processed foods), class 32 (drinks), and others.

In this way, APAL initially focused on the "protection" offered by trademarks, first registering word-based marks with a wide range of trademark rights in each country, using the name "PINK LADY" worldwide. As the cultivation and sales areas expanded in the 2000s, the scope of the trademark rights narrowed even in countries where the word marks had been registered. However, composite trademarks, with figures that aim to attract consumers with visual effects, were then registered, and the designated goods for the trademark expanded, strengthening the scope of protection. Furthermore, when the "PINK LADY" trademark gained popularity in the 2010s, the word marks, composite trademarks, language, and other components of the trademarks were changed to be specific to each country. Yet, the composite trademarks always contained the words "Pink Lady" as a trademark component, so a consistent branding strategy was developed.

Although trademark applications were filed in many countries/regions, the application using the Madrid system[2] was conducted in 2016. In addition, trademark applications with class 31 (fruit and trees) as the designated goods are often rejected in Australia because the name "PINK LADY" is recognized by consumers as a variety name.[3] It can also be pointed out that, by not using the Madrid system, it was possible to avoid the risk of central attacks[4] and to extend the appearance of trademarks and designated goods according to the country of application.

On the other hand, trademarks that have agricultural products as the designated goods are often mistaken for the original variety name. Even if a trademark is registered, if after that it becomes a generic name, the trademark rights will no longer be effective, and the unauthorized use of the registered trademark by third parties will not be eliminated. In addition, in the United States and the EU, when a trademark subsequently becomes a generic name, the trademark can be cancelled at the request of another person. Based on this,

[2] The Madrid system is an international trademark application system. Based on trademark application and registration in the home country, it is possible to submit applications to a number of Madrid system member countries in one procedure.

[3] Similar to Japan, the Australian trademark system examines on the basis of the existence of absolute and relative reasons for rejection. One of the reasons for absolute rejection is that the trademark does not have distinctiveness. The distinctiveness of "PINK LADY" is recognized as a result of being used, and the trademark registration for class 31 as designated goods was granted in 2004 for the composite trademark and 2009 for the word mark.

[4] In this system, if the basic application or basic registration of the home country is rejected or cancelled within five years from the date of international registration, the international registration will simultaneously expire.

efforts to prevent generic naming, such as not using trademarks that can be mistaken as breed names from before the trademark application, is important.

According to Winton, in 2017 about 600,000 tons of fruit sold was under the trademark "PINK LADY." (Winton, 2018). Furthermore, according to Warner, the license fee for trademark rights is approximately 77 euros per ton (Warner, 2012). She also reported that 60% of the royalties earned are used for new product development, trademark protection, and monitoring activities by master licensees in each country, and the remaining 40% is used for marketing. From this, APAL has earned approximately 46.2 million EUR in royalties per year because of trademark licensing; it is estimated that 27.72 million EUR were used for new product development, trademark protection, and monitoring activities by master licensees in each country, and the remaining 18.48 million EUR were spent on marketing. The royalties obtained from licensing trademark rights not only make it possible to perform marketing comparable to a major food company, but also helps to strengthen the "protection" of intellectual property through monitoring activities of master licensees in each country.

5. Intellectual property management of the fruit tree club system

The fruit tree club system is characterized by integrated protection, combining plant breeders' rights and trademark rights; production volume is controlled by using the plant breeders' rights, and the quality is controlled by using the trademark rights. However, it will soon be 30 years since the "Cripps Pink" variety was registered, and the plant breeders' rights continue to exist only in the EU. Yet, the trademark rights registrations have been continually renewed and new trademark applications have been filed one after another. In addition, "Rosy Glow" and "Lady in Red," which are varieties derived from "Cripps Pink," are also sold under the "PINK LADY" trademark (Brand evolution for Pink Lady, 2018).

The trademark "PINK LADY" has accumulated good will as a mark indicating high-quality apples, and it has been used continually for nearly 30 years, since the trademark application in 1992. Even after the plant breeders' rights for "Cripps Pink" expires, it is possible to license the cultivation of "Cripps Pink" to third parties by taking advantage of the good will of this trademark. "Rosy Glow" and "Lady In Red" can also be sold as the second and third types of "PINK LADY," so it will be possible to operate an intellectual property business that continuously earns royalties from those trademark rights. By accumulating brand power and making use of its power to attract customers, it can be a successful example of maintaining market power even after the plant breeders' rights have expired.

Since fruit trees take several decades from planting to the next breed renewal, there are many cases in which the plant breeders' rights expire while economic production is still taking place. As such, the period for royalty collection is shorter than the period in which the varieties will be of economic use. Therefore, with plant breeders' rights alone, there are limitations in terms of the potential compensation for licensing intellectual property. Thus, it is important to secure continuous royalty income through trademark rights.

Figure 2 shows the intellectual property management model of the fruit tree club system. It is organized from the viewpoint of the product life cycle, and the example if based on the case of "Cripps Pink."

First, from the introduction of a new variety to its growth period, it is important establish a foundation for production and sales by having integrated protections based on trademarks and plant breeders' rights. In particular, with regard to trademarks, it is best to apply for a word mark with strong rights. Next, from growth to maturity, production and sales areas should be expanded through the active licensing, thereby providing a year-round supply of fruit and expanding trademark registration into new countries. Registration requirements for trademarks do not include novelty (patent law) or non-transferability (seed and seedling law), so it is possible to gradually expand the countries where applications are filled according to expansions in production and sales areas.

Next, from the growth period to maturity, it is important to accumulate good will for the trademark through quality control of the fruit shipped. At the same time, it is important to carry out promotion activities to increase the popularity of the trademark. If the trademark becomes popular both domestically and abroad, it is highly likely that applications by third parties will be rejected if the mark is well known, even for countries where registrations have not been carried out.[5] However, during the period from the first trademark application until popularity is obtained, there is also the possibility that an unrelated third party will file an application to register the same trademark (misappropriated application). In the United States, applications for the trademark "PINK LADY" have been rejected because of the possibility of confusion with similar trademarks registered earlier. In the

[5] Article 6-2 of the Paris Convention stipulates the protection of well-known trademarks.

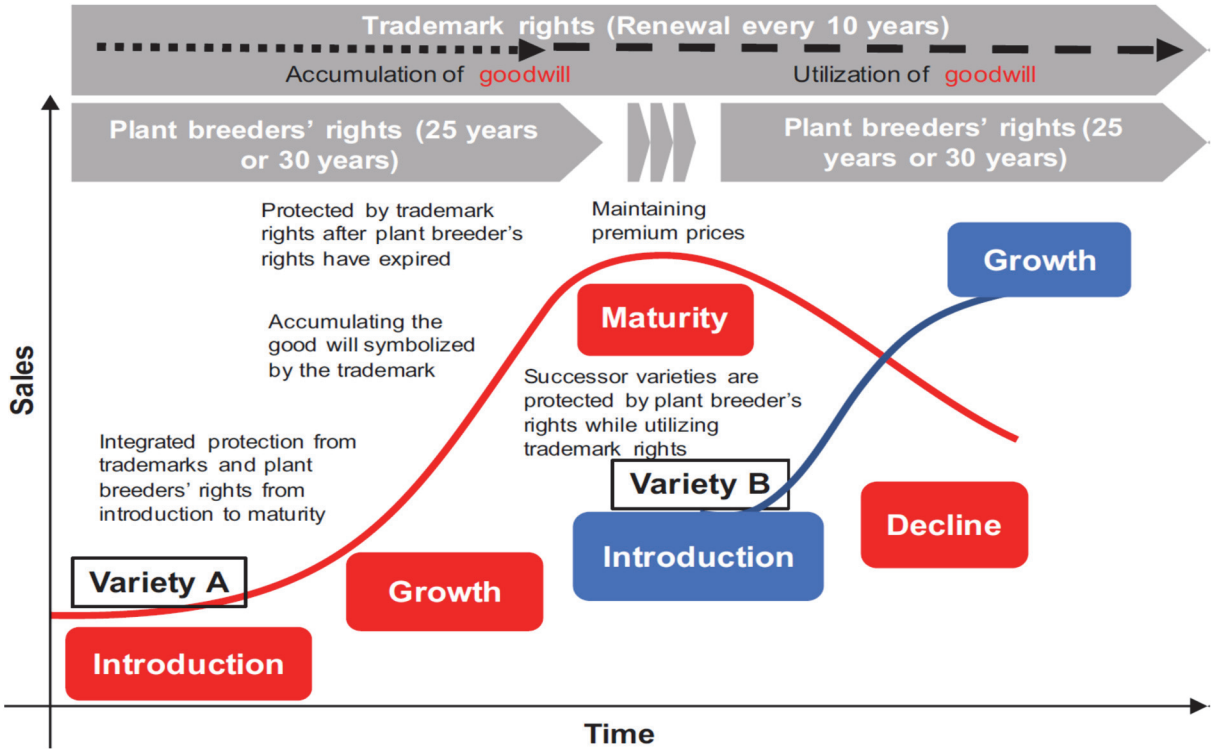

Figure 2. Intellectual property management of a fruit tree club system

case of high-quality fruit tree varieties, I think that it is necessary to consider trademark registration abroad even in the period from introduction to growth. In addition, for countries, such as Canada and the Philippines, that adopt usage-based registration for trademark registration, it is important to begin sales from an early stage to create trademark usage records. This is also important for China, which requires the actual use of a trademark to enforce the rights against alleged trademark infringers.

Then, by continuing to maintain trademark rights even after the plant breeders' rights have expired, the brand value of the variety is protected, and continued royalty income is secured. In addition, successor varieties can apply for new plant breeders' rights, and by selling them under the same brand, the premium price will be maintained.

The long-term use of trademarks and promotion will increase the brand value of the trademark over time, but the effect is considered to be effective not only in terms of "utilization," promoting license negotiations in an advantageous manner, but also in terms of "protection." Trademarks can prevent unauthorized cultivation in countries without plant breeders' rights. As with other intellectual property rights, such as patent rights, it is impossible to enforce plant breeders' rights without registering overseas. Therefore, in countries where no plant breeders' rights have been registered, such as Japan and Chile, or in countries where plant breeders' rights have expired, such as New Zealand, if a seedling of "Cripps Pink" is legally transferred, no license from the breeders' rights holder is necessary to sell the harvest under the name "Cripps Pink." However, if the trademark becomes more prominent than the variety name, the advantage of selling under the variety name of "Cripps Pink" will be limited. Also, in the case of plant breeders' rights, it is difficult to detect infringements, and it is difficult to prove identicalness between a registered variety and an alleged infringing variety, even if a suspected infringement is found. On the other hand, in the case of trademark rights, it is easy to detect infringements, and since trademark infringement lawsuits judge similarity based on appearance, there is no need for comparative cultivation, DNA testing, etc.

From this perspective, it is important not to use variety names for the components of trademarks. This is because the variety names are often used in many countries as generic names with no distinctiveness. Even if a composite trademark combining "Cripps Pink" with a figure is registered by an unauthorized party, the text "Cripps Pink" does not have distinctiveness. Therefore, it may not be possible to enforce the trademark rights. In addition, when a variety name is used as a component of a trademark and a successor variety is cultivated, it will be necessary to change the trademark that has accumulated good will over a long period of time to build the brand from scratch.

In this way, the use of trademarks for "protection," such as the enforcement of rights, as well as "utilization," such as

licensing, highlight the importance of having a strategy for registering trademarks for brand names that are different from the name of the variety. This also shows how important it is that the brand be recognized as high quality before the variety name is recognized as high quality.

Initiatives such as the club system naturally involve costs, from launching the club, setting up operations, submitting applications, as well as the registration and maintenance of trademarks. Also, in order to obtain royalties from trademark rights licenses, there is no incentive for licensees to use the trademark if the product cannot be sold at a high price. For this reason, it is essential that club operators carry out promotion. It would be impractical to implement this type of intellectual property management for all cultivated varieties. Varieties chosen should be of superior quality in taste and appearance, so consumers will be willing t to buy them at a premium price.

6. Conclusions

In this paper, I examined the effect of the club system for the intellectual property management of fruit trees, with emphasis on trademark rights utilization. Because fruit trees require several decades to mature, the relatively short length of plant breeders' rights may mean that they expire well before sales of the fruit reach the peak. For this reason, trademark rights allow the rights holder to continue receiving royalties on the sales for years to come. Thus, especially for fruit trees, it is important to secure both trademarks and plant breeders' rights to ensure continued income. I also note that, throughout the product lifecycle, it is critical that marketing must focus on building popularity for the trademark rather than the variety name.

In addition to the importance of using trademarks, our in-depth investigation of the "Cripps Pink" club system has yielded the following implications:

- The market size can be increased by expanding production areas through overseas licenses and acquiring plant breeders' rights in multiple countries. (Overseas licenses allow, for example, breeders from northern hemisphere countries to license to countries in the southern hemisphere that have different seasons, allowing for a year-round supply of fruit without competing with exports from their own country.)
- The establishment of a stable, year-round supply system may enable profitable sales for distribution and retail.
- Plants can be easily grown, and it is difficult to completely prevent the outflow of seedlings overseas and illegal cultivation by unauthorized third parties. In addition, even if protected by plant breeders' rights, the rights holder must enforce these rights by monitoring infringements and taking legal action. Overseas licenses can also lead to "protection" of intellectual property by having licensees take responsibility for infringement monitoring.

As mentioned earlier, it is reported that there are more than 40 apple clubs in the world, but not all of these clubs are thriving (Winton, 2018). In the future, it will be necessary to expand the investigation to other clubs in order to conduct a comparative analysis from the intellectual property management viewpoint. In addition, it is necessary to advance our understanding of this type of intellectual property management for items other than fruit trees.

In this study, I analyzed the case of the apple cultivar "Cripps Pink" from the intellectual property management viewpoint. However, an investigation into business strategy is outside the scope of this study. In the future, it will be necessary to conduct this analysis from the management perspective to evaluate the club system as a business.

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Editor's Notes

We are now issuing the tenth edition of the Journal of Management Science. Several articles in a variety of areas of study are submitted in the Journal of Management Science Vol. 10, for example Finance, Information Management, Tourism Management, and Business Administration.

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