

An empirical investigation of the determinants of IS outsourcing in Japan

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Abstract: Two typical different patterns of Information Systems (IS) outsourcing are considered as the most effective approaches in supply chain management. They are conventional outsourcing and quasi-outsourcing. Generally the later is often adopted in large-scale organizations in Japan. In order to design an effective strategy, we should identify the factors which will give important impact on the performance of IS outsourcing. In this paper, we review the relevant literature of IS outsourcing, and propose four hypotheses. We test these four hypotheses by logistic regression analysis based on our original questionnaire survey from Japanese companies in order to find the relationship between the IS outsourcing and its determinants. And finally implications of this study are discussed. Therefore, this paper provides an empirical perspective to identify the determinants of conventional outsourcing versus quasi-outsourcing in Japan.

Keywords: IS outsourcing, outsourcing decision, logistic regression analysis

I. INTRODUCTION

Outsourcing of Information Systems (IS) is considered as one of the most important strategies in corporate management. Recently an increasing large number of companies outsource their information systems. In Japan, many companies try to keep their capital alliance with their external vendors or to dissolve the partnership with their subsidiaries by selling the whole stocks. On the other hand, some subsidiaries are internalized as a functional department of their parent company and/or their group businesses.

Generally, the outsourcing of information systems can be classified into two typical different patterns: conventional outsourcing and quasi-outsourcing. The former involves the transfer of the management and/or daily execution of an entire business function to an external service provider and so on. In addition, the later means to set up their own IS subsidiaries, which is defined as "a firm that is partially owned by the parent, but independently managed" (Ito [1]).

The main contribution of this paper is to provide an empirical perspective to identify the determinants of conventional outsourcing versus quasi-outsourcing in Japan. We propose four hypotheses of IS outsourcing after reviewing the relevant literature, and test these four hypotheses by logistic regression analysis based on our original questionnaire survey from Japanese companies in order to find the relationship between the IS outsourcing and the determinants of IS outsourcing. Finally, implications of this study are discussed.

This paper is organized as follows. In Section 2, we briefly review some previous literature of IS

outsourcing. After reviewing relevant literature on IS outsourcing, we propose four hypotheses about factors that influence IS sourcing strategy and test them based on our original survey in Section 3. Section 4 introduces research method. Implications of our results are discussed in Section 5. Finally, in Section 6 we conclude by a summary of this paper.

II. BACKGROUND

In the previous study of IS outsourcing, some research focused on identifying the determinant factors of the two patterns. For instance, Barthelemy and Geyer [2] show that the decision of conventional outsourcing versus quasi-outsourcing is strongly influenced by both internal and external determinants. They focused on testing five hypotheses, which was built based on Transaction Cost Economics (TCE) (Coase [3]). Aubert et al. [4] find IT operation activities, such as asset outsourcing and uncertainty will influence the level of their outsourcing relying on transaction costs and incomplete contracts theories. Other studies show that different effects and problems of IS outsourcing caused from the different patterns. However, many studies found different effects of IS outsourcing between conventional outsourcing and quasi-outsourcing. For instance, the issue is still under discussion whether the effects of "cost reduction" and "improvement of planning and development of IS skill" of these two patterns of outsourcing are different or not while the effect of "using new technology" of conventional outsourcing is higher than that of quasi-outsourcing is overall supported (Negoro and Tamura [5]).

IS sourcing strategy is considered broadly as the decisions of "make-or-buy" and of making of procurement resources such as functions, technology and personnel for IS activities in this paper. We propose the following four hypotheses on the determinants of conventional outsourcing versus quasi-outsourcing after reviewing the relevant literature on IS outsourcing, and test them using a binomial logistic regression analysis based on our original survey.

III. RESEARCH HYPOTHESES

1. Size of consignor

Since IS subsidiaries basically expect to receive a certain amount of orders from their parent company and/or group businesses which are their consignor, they can be setting up as a spin-off. Therefore, they can enjoy the economies of scale and their role can be switched from shared service to a profit center in the future. Hence, we propose the following hypothesis.

Hypothesis 1. *The larger the size of consignor is, the more quasi-outsourcing is selected.*

2. Category of industry of consignor

There is not enough discussion of whether or not a specific industry classification has a meaningful influence on a necessity of the companies' holding their IS subsidiaries and the IS outsourcing patterns. In general, as Barthelemy and Geyer [2] pointed out, industries such as bank, security, and insurance have "IT-intensive" characteristics so that these financial sectors tend to have quasi-outsourcing, compare to the other industries.

Hypothesis 2. *Industries belonging to financial sectors tend to select quasi-outsourcing.*

3. Asset specificity of IS activity

Asset specificity for IS outsourcing has two aspects; for business of consignor supported by the developed information systems and for technologies which external vendors utilize. If a business that the consignor outsources is unusual, external vendors have to be familiar with the business so that the asset specificity will occur on mainly human resources. If technology used by external vendors is specific, it will be hard to use the information systems for other purposes on the consignor. Investment to these unusual assets causes a

fundamental transformation. Therefore, the transaction costs would increase.

Hence, if it is necessary to reduce the risk of opportunism resulted in asset specificity and to restrict the increase of transaction costs, quasi-outsourcing would be selected. This is because the consignor can wield an influence on its IS subsidiaries depending on its investment ratio under the operation of quasi-outsourcing.

Hypothesis 3. *Firms having high asset specificity on IS activity tend to select quasi-outsourcing.*

4. Contribution of IS activity to the core business

According to the resource-based view (RBV) (Barney [6], Bharadwaj [7]), the company tends to select insourcing or quasi-outsourcing by the IS subsidiaries if the company's original resources and unique abilities and/or capabilities on IS activity are regarded as a core competence which can not be imitated and implemented by other companies easily or IS activity has a great contribution to the development of business based on the core competence. Hence, the following hypothesis can be proposed in general.

Hypothesis 4. *The greater IS activity that contributes the core business the company has, the more it tends to select quasi-outsourcing.*

IV. RESEARCH METHOD

1. Data collection

We conducted an original questionnaire survey by mailing to IT representatives from 700 corporations all over Japan chosen at random from July through September 2007 (Matsuno and Taoda [8]). However, industries such as communication, traffic, real estate and information service have not been used for this survey. 195 companies out of 700 sent us their responses back and 181 responses were valid. The valid response rate was 25.9%.

The practice rate of IS outsourcing was 58.0% and 32 companies adopted quasi-outsourcing while 66 companies adopted conventional outsourcing.

2. Construct operationalization

Dependent variable

The dependent variable of logistic regression model is encoded into "0-1" dummy variable depending on whether the 98 companies using IS outsourcing

adopt quasi-outsourcing or not. While there are various controlling share, from 100% to under 50%, of investment from consignor to its IS subsidiary on quasi-outsourcing, but only the fact of whether the consignor has a capital relation with the outsourcer or not was used as the criterion to judge on quasi-outsourcing here.

Independent variables

We briefly explain about independent variables, which is essential to test four hypotheses mentioned above.

First, scales to measure the size of consignor is required to test Hypothesis 1. In this case, that would be either market capital, number of employees, or amount of sales, and we chose market capital (logarithmic transformed) as the criterion in this study, without having any sub-scales.

To test Hypothesis 2, we decided to use a scale encoded into a dummy variable depending on the sample companies applicable to "finance/insurance" in the major classification of business type on the classification table determined by Securities Identification Code Committee in Japan.

To test Hypothesis 3 and 4, we use observed variables for each question item of our survey. These measurement data are the ordinal scale if they follow a strict level of measurement, but they are regarded as the interval scale expediently in this analysis. In addition, major questions were chosen to make sub-scales to compound an explanatory variable by referring to the findings obtained from previous studies. Therefore, the process of factor analysis was skipped, and instead of it, we examined the reliability of test scale (Cronbach's α) and confirmed the correlation coefficient between each question item, considering a great influence of a number of items on Cronbach's α .

The sum of each measurement data on the following two questions was used to test Hypothesis 3 ($\alpha = .43$, $r = .27$).

(1) Development method of mission critical systems (4-point Likert scale: "use packages only" =1, "use packages mainly, but partially use self-developments" =2, "use packages partially" =3, "use original self-developments wholly" =4).

(2) Familiarity of business knowledge of the company is required to develop and use information systems (6-point Likert scale: from "strongly disagree" =1 to "strongly agree" =6).

The measurement data of the following each 2-question items are used to test Hypothesis 4 (use 6-point

Likert scale for each item).

The sum of each measurement data of the following 2-question items were used as a scale to measure the contribution degree of IS activity for the development of core business groups ($\alpha = .57$, $r = .40$).

(1) The company's original information system has a big role for a development of both new products and technologies.

(2) Information systems are unified and integral with a performance of the company's core business groups.

In addition, the sum of each measurement data of the following 2-question items is used to examine the influence of burden of IS activity contributing to the core business groups ($\alpha = .82$, $r = .69$).

(1) Enormous investment for a development and use of information systems is required to perform core business groups.

(2) Specification change and maintenance/repair of information systems are often required to perform core business groups.

In this way, we have five independent variables to test these four hypotheses mentioned above in this study.

V. RESULTS AND DISCUSSION

Binomial logistic regression analysis was conducted by the forced entry method including all independent variables mentioned above with all of the 98 companies using IS outsourcing. Quasi-outsourcing is treated as dependent variable in this paper. Table 1 shows the results of the analysis.

Table 1. Results of the logistic regression analysis

Valuables	β	S.E.	<i>p</i> -value	odds ratio
Size of consignor	0.66	0.17	0.00	1.94
Category of industry of consignor	-0.20	0.94	0.84	0.82
Asset specificity of IS activity	0.43	0.20	0.04	1.54
Contribution of IS activity to the core business	0.05	0.16	0.74	1.05
Burden degree of IS activity for contribution to the core business	-0.40	0.16	0.01	0.67
Intercept	-7.18	2.18	0.00	
<i>N</i>	98			
χ^2 with 5 d.f.	29.86		0.00	
-2 log likelihood	93.96			
Error rate	21.4%			

We apply maximum likelihood method to estimate the partial regression coefficient, and use a property of Wald statistic amount's following to χ^2 distribution to test the estimation. Because of Hosmer-Lemeshow test, we got $\chi^2 = 5.42$, $df=8$, $p=.71$ as a conformity of predicted value and observed value, and the null hypothesis for a conformity of this model was not rejected.

First, partial regression coefficient on "size of consignor" is positive and it is clear that this has a significant influence on the selection of quasi-outsourcing. This result supports Hypothesis 1. Moreover, adjusted odds ratio is 1.94 times, which is the highest in the independent variables.

Second, "category of industry of consignor" has a negative partial regression coefficient, and this has a different result from Hypothesis 2. In addition, the test result is not meaningful. Therefore, Hypothesis 2 is not supported.

Third, "asset specificity of IS activity" has a significantly positive influence on the selection of quasi-outsourcing, and this result supports Hypothesis 3. It can be considered that selection of quasi-outsourcing is effective in restraining the transaction costs, which resulted in opportunistic behavior by external vendors.

We test Hypothesis 4 lastly. "Contribution of IS activity to the core business" and "burden degree of IS activity for contribution to the core business" are prepared as independent variables. The former variable does not have a meaningful influence on the selection of quasi-outsourcing even though it has a positive partial regression coefficient. On the other hand, the latter variable has a negative partial regression coefficient and a significant negative influence on the selection of quasi-outsourcing. For this reason, Hypothesis 4 should be discussed more carefully.

Based on the RBV, if there is an economic value being hard to be imitated which becomes a resource for IS activity and a source of competitive advantage, or IS activity has integrally unified contribution on the development of core business groups, quasi-outsourcing is more likely to be selected. However, from the result of our analysis, it is hard to say that the quasi-outsourcing is selected when huge amount of investment is required to develop and use the information systems, and also specification change and maintenance/repair of information systems are often required to accomplish their core business groups.

VI. CONCLUSION

In this study, we had a limited analysis based on the data of our survey, but we analyzed the determinants of IS outsourcing and examined a consistency with the major theories such as TCE and the RBV. However, there is still an issue of reliability of the sample data itself used for this analysis and a validity of sub-scales, which construct independent variables.

On recent phenomena, there are many cases that IS activities, assets and personnel which were outsourced in the past are insourced again, especially in finance and insurance industries in the U.S. Also in Japan, the role of IS subsidiaries is changing to work on new management issues such as internal control and information security and so on.

In the future, we will elaborate a method of statistical analysis, including introducing of methods other than logistic regression analysis, and have theoretical and empirical approaches about IS sourcing strategy, especially arrangement of IS subsidiaries belonging to companies which adopt quasi-outsourcing.

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