Comparing IT Service Management between Japanese and US Firms by Econometric Approach

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Abstract: In this paper, the use of IT at firm level and its management practices are compared between Japanese and U.S. firms, based on an analysis using data of the "International Comparative Survey of Firms' IT Strategies". According to our principal component analysis for characterizing firm level pattern of enterprise computing, three factors, (1) overall IT use intensity, (2) mission critical or informational systems and (3) product or service orientation can be picked up. In general, Japanese firms have introduced more mission critical systems with product orientation as compared to US firms. It is also found that a firm with informational system show relatively better performance in IT management, and Japanese firms are not good at managing IT outsourcing as compared to US ones.

Key words: IT Service Management, IT Strategy, Japan, U.S.

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1. Introduction

Due to the declining birth rate and the aging population in Japan, productivity growth is the key force to sustain the long term economic growth rate. The effective use of IT systems by firms is reported to be an important factor to increase productivity of the macro economy. According to a macroeconomic comparison of IT and economic growth of Japan and the U.S., the results reveal that the level of IT investments in Japan is not far behind the level of the U.S. (Jorgenson and Motohashi, 2005). Despite the stagnant growth rate experienced by the Japanese economy since the 1990's, Japanese firms have invested heavily in IT due to the swift technological progress of IT and the rapid penetration of the broadband infrastructure.

However, it is said that the productivity effects of IT are limited compared with U.S. firms. According to a firm-level analysis on IT network use and productivity of Japanese and U.S. firms, the results report that the productivity effects of network use is twice the size in U.S. firms compared with Japanese counterparts (Atrostic et al., 2005). IT is an effective tool to modernize business processes at firms, but its effective use depends on how firm incorporates IT service management into its overall business strategy and management practices. In this sense, it is important to characterize a pattern of IT use in order to find possible factors behind under performance of Japanese firms on IT investment.

In this paper, the use of IT at firm level and its management practices are compared between Japanese and U.S. firms, based on an analysis using data of the "International Comparative Survey of Firms' IT Strategies". The next section reports the results of the comparative analysis of IT and management for Japanese and U.S. firms. Section 3 provides the results of regression analysis on the relationship between IT use and its management. Finally, Section 4 provides a summary of findings and some discussions.

2. Comparison of IT Use in Japan and US

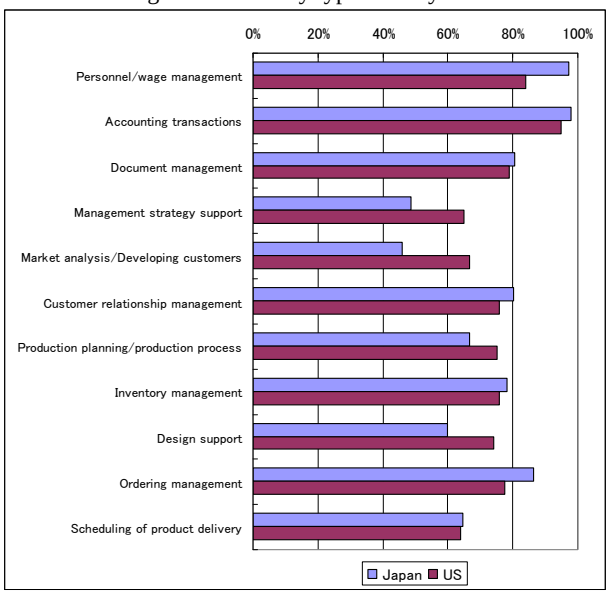
"International Comparative Survey of Firms' IT Strategies" has been conducted by RIETI (Research Institute of Economy, Trade and Industry) for listed companies in Japan, the United States, China and Korea. The focus of the survey is to reveal how IT is being used and its linkages with managerial strategies in relatively large firms. The topics of the survey are "Deployment of IT systems," "The relation between IT investments and management strategies," "Internal IT Organization," and "Outsourcing of IT systems." In this paper, the data on both Japanese firms (317 samples) and US ones (200 samples) are used (see Motohashi (2007) for details).

Figure 1 shows the share of firms which have introduced each of 11 types of IT system for Japan and the U.S. In both countries, a high deployment ratio can be found in "personnel/wage management", "accounting transactions", "document management" and "ordering management". As for two country comparison, U.S. firms have a higher deployment ratio in areas such as "management strategy support," "market analysis/building customer relations," "production planning," and "design support", whereas the ratio is lower in "personnel/wage management," as compared with Japanese firms.

A detailed survey regarding IT-use and the effects of IT investments by Japanese firms is conducted by the Japanese Ministry of Economy Trade and Industry's (METI's) ICT Workplace Survey. The results of this survey indicate that Japanese firms have been successful in increasing the effectiveness of its businesses by introducing accounting information systems or reducing inventory costs by implementing inventory management systems, but only a small portion of firms have been able to use IT to increase sales, for example by developing new customers (METI,

2005). In addition, comparing the IT investment patterns of Japanese and U.S. firms, U.S. firms have invested heavily in areas that strengthen the competitiveness of the firm such as systems that support decision-making and analyzes the environment that the firm is facing (JEITA, 2007). The results of the survey in this study are consistent with what has often been indicated above.

Figure 1: IT use by type of IT system



Referring back to the results regarding the differences in the types of areas that IT systems are deployed in Japanese and U.S. firms, the ratio of system deployment of Japanese firms is high in areas directed towards "Mission critical systems," or systems that increases efficiency of daily business operations such as management of ordering and systems for the back office divisions, whereas deployment is behind in "Informational systems" such as managerial strategy support, market analysis/developing new customers, design support/information management of technology. Mission critical systems are a typical type of system that rationalizes business processes. This type of IT-use has been implemented since the advent of general-purpose computers in the 1970's and is a classical way of IT-use by firms. On the other hand, recently there is great attention in using "Informational systems" to perform intricate analysis regarding management decision-making and market analysis using data collected by the "Mission critical systems." The idea of using informational systems to facilitate managerial strategies has been around since the 1970's, exemplified by concepts such as Management Information Systems (MIS) and Decision Support Systems (DSS), but it is in the 1990's that these systems became of practical use due to the sharp increase of memory and processing capability of computers. Data warehouses have been created in order to integrate information that has previously been dispersed around the firm, and data mining techniques have enabled firms to extract critical information from the data warehouse to facilitate corporate strategy. Since the 2000's, the concept of Business Intelligence (BI) has been put forward to offer a user-friendly environment and enable access to non IT specialists of the management and planning divisions of the firm.

We have conducted a principal component analysis of 11 types of IT use variables, in order to characterize firm level pattern of IT use. Table 1 shows the coefficients to the first three components. For these three components, about 58% of total variance can be explained.

Table 1: Principal Components Analysis

	1	**2**	3
Personnel/wage management	0.197	0.342	0.476
Accounting transactions	0.181	0.380	0.430
Document management	0.242	−0.169	0.256
Management strategy support	0.309	−0.449	0.077
Market analysis/Developing customers	0.310	−0.451	0.125
Customer relationship management	0.290	−0.200	0.370
Production planning/production process	0.345	0.053	−0.415
Inventory management	0.344	0.318	−0.316
Design support	0.319	−0.173	−0.228
Ordering management	0.347	0.334	−0.017
Scheduling of product delivery	0.368	0.144	−0.198

The first component has positive coefficients to all types of IT systems. Therefore, this factor shows an overall IT intensity of firm. In the second component, positive coefficients are loaded to "personnel/wage management", "accounting transactions" and "ordering system", while negative ones are found with "management strategy support" and "market analysis". Therefore, this component can be interpreted as a degree of mission critical feature of IT system (versus informational system). Finally, the third component can be interpreted as a degree of product oriented system (versus service oriented one), because all systems to deal with product (production management, inventory control, delivery etc) have positive coefficients.

In table 2, the scores of these three components are compared between Japanese and US firms. Japanese firms have lower score on IT intensity and higher ones for mission critical feature and product orientation as compared to US firms.

Table 2: Components comparison

	Japan	US
IT Intensity	−0.045	0.072
Mission Critical vs. Information	0.259	−0.411
Product Oriented vs Service	0.151	−0.239

3. Relationship between IT Use and Management

In this section, the relationship between IT use and IT management is investigated by regression analysis. As IT use variables, we use three principal components in the previous section, i.e., IT intensity, the degree of mission critical feature (vs informational) and the degree of product orientation (vs service). In terms of IT management factors, we incorporate two kinds of variables from the "International Comparative Survey of Firms' IT Strategies". The first one is a linkage between corporate strategy and IT strategy, and the second one is a management of IT outsourcing.

In order to achieve better performance from IT, it is important to align IT system architecture with business

strategy at corporate level, instead of deploying IT system depending on individual specific needs in an ad-hoc way. Therefore, whether IT strategy (3 to 5 year IT investment strategy at firm) is developed in line with corporate strategic plan, can be a good indicator for better IT management. In addition, management of IT outsourcing will provide another cut of the nature of IT management. A firm with better understanding of its business processes with clear strategic objectives of IT investment, may be able to achieve better performance from IT outsourcing project. In contrast, a firm without a clear idea about IT architecture at corporate level cannot make a good "make" or "buy" decision of IT services. Consequently, an outsourcing project by such firms will end up with unsatisfactory results.

Table 3 shows the regression results on IT strategy variables. A dependent variable reflects the linkage between IT strategy and corporate strategy. Since this is a categorical variable (higher value for better linkage), an Ordered Logit regression is conducted by using three types of IT use variables (principal components), a Japanese firm dummy and cross terms between them.

Table 3: Regression results on IT strategy

	(1)	(2)	(3)
IT Intensity	0.158	0.154	0.044
	(1.62)	(1.57)	(0.24)
Mission critical	−0.385	−0.353	−0.122
(vs Information)	(2.25)*	(2.00)*	(0.46)
Product	0.324	0.354	0.700
(vs Service)	(1.82)	(1.91)+	(2.30)*
JAPAN		0.275	0.446
		(0.68)	(0.98)
JP* IT system			0.044
			(0.19)
JP* M. Critical			−0.583
			(1.49)
JP* Product			−0.794
			(1.82)+
Observations	124	124	124

Absolute value of z statistics in parentheses
+ significant at 10%, * significant at 5%; ** significant at 1%

The model (1) suggests that in a firm dominated by mission critical systems, the linkage between IT and corporate strategy is relatively weak as compared to informational system firms. When we include Japan dummy (model (2)), a coefficient with product orientation becomes statistically significant at 10% level. In a full specification model (3), mission critical feature coefficient becomes not statistically significant, because Japanese firms with lower performance (negative coefficient to JP*M. Critical) are separated out in this specification. On the other hand, positive coefficient to product orientation system becomes greater, because lower performed Japanese firms (negative coefficient to JP*Product) are separated here again. It is interesting to see that the degree of product orientation works in an opposite way between Japanese and US firms.

In terms of IT outsourcing regressions, two kinds of outsourcing projects (firm-wide mission critical system and division specific system) are tested. Here, Multinomial Logit models are estimated to find whether firms "order after outsourcing activities are clearly defined" or "order before articulation of outsourcing specification" using "decide outsourcing contents upon consultation with counterpart" as the base category. The results are provided in Table 4.

Table 4: Regression results on outsourcing

	Firm-wide mission critical systems (e.g. financial accounting)		Business division specific systems (eg. SCM)	
	(1)	(2)	(3)	(4)
IT Intensity	−0.287	0.018	−0.317	−0.332
	(1.77)	(0.09)	(2.00)*	(1.64)
Mission critical	0.133	−0.285	0.337	0.281
(vs Information)	(0.54)	(0.81)	(1.57)	(0.96)
Product	−0.101	0.050	0.053	0.435
(vs Service)	(0.43)	(0.17)	(0.23)	(1.24)
JAPAN	−0.940	−1.384	−1.184	−0.785
	(2.83)**	(2.49)*	(3.14)**	(1.81)
JP* IT system	0.399	0.377	0.680	0.312
	(2.03)*	(1.19)	(2.96)**	(1.21)
JP* M. Critical	−0.507	0.841	−0.443	−0.316
	(1.67)	(1.71)	(1.40)	(0.83)
JP* Product	0.169	0.816	0.474	−0.213
	(0.56)	(1.61)	(1.23)	(0.47)
Constant	0.501	−0.663	0.370	−0.579
	(1.76)	(1.60)	(1.30)	(1.63)
Observations	322	322	318	318

Note: The base category is "Decide the outsourcing acitivity upon consultation with the outsourcing firm"
Model (1) and (3): Clarification of activity before outsourcing
model (2) and (4): Clarification of activity after outsourcing
Absolute value of z statistics in parentheses
* significant at 5%; ** significant at 1%

The Japan dummy for "clarification before outsourcing" is negative for both types of outsourcing project. Japanese firms are likely to decide outsourcing project via consultation with outsourcing partners as compared to US firms. This finding reflects that Japanese firms may not have clear IT architecture at firms. According to the "International Comparative Survey of Firms' IT Strategies", a large proportion of Japanese firms reported that "The system deployment did not proceed as stated in the contract and resulted in high cost". The likely reason for this is that the outsourcing activity starts before the terms of the contract are finalized and the terms of the agreed upon contract are ambiguous, as is shown in Table 4.

It is often stated that prepackaged software is not popular and custom software is used extensively in Japanese firms (Motohashi, 2005). Compared with the customization of prepackaged software, the production of custom software requires meeting the specific individual user needs. In this case, it becomes arduous to clearly state the terms of the contract ex ante due to the complexity of the terms of the outsourcing activity. Therefore, these differences in the terms of the contract may have affected the results which indicate the ambiguous responsibility between the outsourced and outsourcing firms.

However, it should be noted that Japanese firms with higher IT intensity manage IT outsourcing project relatively better (positive and statistically significant coefficients of

JP*IT intensity in model (1) and (3)). Therefore, it may be the case that Japanese firm needs more outsourcing experience for better management. In contrast, for US firms, which do not have a lot of custom made IT service project, it is easier to articulate the contents of outsourcing projects.

4. Conclusions

In this paper, the use of IT at firm level and its management practices are compared between Japanese and U.S. firms, based on an analysis using data of the "International Comparative Survey of Firms' IT Strategies".

According to our principal component analysis for characterizing firm level pattern of enterprise computing, three factors, (1) overall IT use intensity, (2) mission critical or informational systems and (3) product or service orientation can be picked up. In general, Japanese firms have introduced more mission critical systems with product orientation as compared to US firms. It is also found that a firm with informational system show relatively better performance in IT management, and Japanese firms are not good at managing IT outsourcing as compared to US ones.

The results indicate that there is a big difference in the method of IT service management between Japanese and U.S. firms. It should be noted that there is a substantial difference in economic institutions (tacit and implicit rules regarding the law and economic transactions) between these two countries. The Japanese system relies more on implicit information transaction, while US firms are more based on explicit decision rules and contracts (Aoki and Okuno, 1996). For example, the responsibilities of the IT division and the IT-user divisions are ambiguous in the Japanese firm system, which makes it difficult to achieve firm wide IT strategy. In addition, in Japanese firms, substantial interdivisional communication is needed to facilitate IT service management, and slow down of the decision-making process works counter-effectively for effective use of state of the art IT systems (Motohashi, 2006).

The reason that the use of "Informational systems" in Japanese firms is behind those of the U.S. could be associated with the active interdivisional communication seen in Japanese firms. Since information sharing is already active, the incentive to "visualize" the internal movements of the firm using IT is low. However, due to the increased intensity of global competition and the complexity of business domains, it is increasingly important to execute corporate decisions based on a wider information base. Due to these changes in the environment, the risk of using internal tacit information as the source for corporate decision-making is increasing. Therefore, it may be that Japanese firms have to incorporate some aspects of "Information distributed systems" regarding IT-use, in order to expedite the information flow of internal, explicit knowledge.

On the other hand, U.S. firms are increasingly using IT effectively as an information sharing tool of the firm. There may be an advantage for the U.S. firm system to effectively use IT, due to the swift technological process in this field.

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