Fall 8-28-2009

A STUDY ON CHARACTERISTICS OF SOFTWARE VENDORS IN JAPAN: FROM ENVIRONMENTAL THREATS AND RESOURCE-BASED VIEW

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Abstract

The objectives of this research are to describe competitive environment in software industry in Japan and to understand the differences of characteristics among maker-turned, user-turned and independent vendors. Based on management frameworks such as Porter's five forces and Barney's resource-based view, we developed the measurement model of environmental threats and competitive strengths/weaknesses. And we conducted factor analysis of the data collected from 100 major IT vendors in Japan. Then we extracted 8 threats factors, e.g., industry stagnation, recruiting bright people, ROI/quality requirement by clients, price cutting/quick delivery request by clients, new technology adoption. Also we identified 6 strengths/weaknesses factors, e.g., human capital, scale merit, expansive business, inimitability, stability. The regression tree analysis suggests that the maker-turned vendors tend to significantly expand business with well-resourced R&D, while the user-turned vendors seem to depend heavily on the demand of the parent companies. Therefore, some of them are thought to gain inimitable capabilities. On the other hand, many of the independent vendors supply people with the principal contractors as the temporary staffing without the specific strengths. However, some of independent vendors with the inimitable asset are thought to be the role model of the software vendors in Japan.

Keywords: software industry in Japan, environmental treats, resource-based view, statistical analysis.

INTRODUCTION

The IT vendors in Japan are facing drastic changes in their business environment, such as technology innovations, new entrants from China and India, as well as recent business stagnation. Also, the issues in the IT industry in Japan, such as the multilayer subcontractors and the business model depending on custom-made applications for domestic market orientation, have been pointed out over times (Cusumano, M. 2004). In order for the IT industry in Japan to meet these challenges and increasing client's expectations, e.g., quality, cost and delivery, and to understand key factors for medium- and long-term success, we designed the survey on software industry in Japan and conducted it with Ministry of Economy, Trade and Industry (METI) in 2005, 2006 and 2007.

Year of SEE survey	2005	2006	2007
questionnaires sent	230	537	1000
Valid responses (Maker-turned, User-turned, Independent)	55 (17,15,23)	78 (27,15,36)	100 (27,20,53)
Response rate (%)	24	15	10

Table 1. Surveys on Software Engineering Excellence (SEE).

In the survey, we developed a measurement tool called Software Engineering Excellence (SEE), which can evaluate the overall software engineering capabilities of IT vendors from the viewpoint of deliverables, project management, quality assurance, process improvement, research and development, human development, and contact with customers. Also, we introduced other indicators: business performance and competitive environment. Then, we found that the competitive environment complemented the relationship between SEE and the business performance of the software vendors.

In the SEE2006 survey, we modified the measurement model used in SEE 2005 and increased the number of surveyed Japanese IT vendors from 55 to 78 in order to more deeply investigate the impact of software engineering on business performance, as well as the competitive environment. In particular, in the study we focus on the relationships among factors of SEE, the competitive environment, and business performance as measured by operating profit ratio. By analyzing the data collected from 78 major IT vendors in Japan, we found that superior deliverables and business performance were correlated with the effort expended particularly on human resource development, quality assurance, research and development and process improvement.

In the SEE2007, we modified the measurement model and analyzed the data collected from 100 major IT vendors in Japan. Then, we repeatedly observed that the effort level on human resource development, quality assurance and project management made better performance of customer contact, research and development and process improvement of the IT vendors in Japan, just as we found the causal structure in the SEE2006.

However, the causal relationships differ significantly from type to type of the vendors: makers-turned vendors, user-turned vendors and independent vendors, where maker (user)-turned vendors are affiliate companies of computer makers (users) and independent vendors are not affiliate companies of either of computer makers or users respectively (Kadono et al. 2008). These findings motivated us to focus on the industry structure and the competitive environment as well as the characteristics of each type of vendors. Therefore, the objectives of this research are:

- To describe competitive environment in the IT industry in Japan.
- To understand the differences of characteristics among maker-turned vendors, user-turned vendors and independent vendors in the competitive environment.

To do so, we statistically analyse the data collected from 100 major IT vendors in SEE2007. In the following sections, we describe research method, survey on software industry in Japan, analysis result and discussion, and conclusion and future work.

RESEARCH METHOD

Our measurement model of the survey was originally developed through interviews with over 30 experts in the IT industry in Japan as well as in the U.S. and literary searches from the viewpoint of software engineering and management (Brynjolfsson, E. 2004; Fujimoto, T. 2003; Matsumoto, Y. 2005; Ministry of Economy, Trade and Industry. 2007; Porter, M. 1985; Barney, J. 2007).

Particularly in this paper, we investigate items from the viewpoint of the five forces model and resource based view of the firms in the IT industry in Japan.

First, we introduce the software industry structure in Japan in the five forces model in *Figure 1* (Porter, M. 1980). In the central box, there are three types of software vendors in Japan based on the origins of the companies: maker-turned, user-turned and independent vendors. While the buyers in right-sided box include IT user companies, the suppliers in the left-sided box include hardware vendors and temporary staffing as the variable cost. As new entrants in the upper box, the offshore IT vendors from China and India are emerging in Japanese market. Recently Japanese people expect to substitute the package software and the software as a service (SaaS) for the custom-made software in the box below. The policy makers, such as government and IT industry group, are considered as the sixth player who used to be active in the high-speed growth era of the Japanese economy.

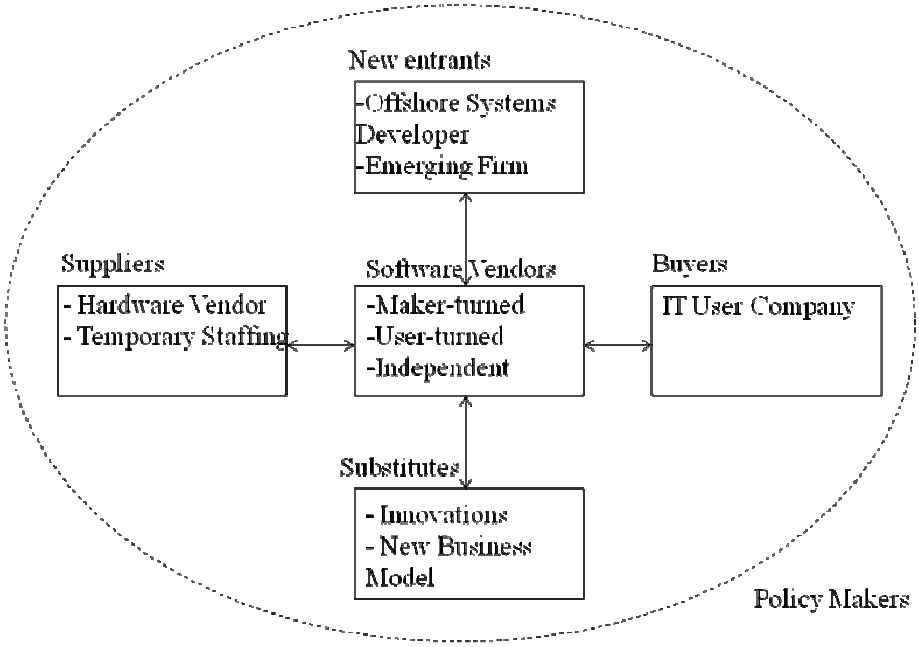


Figure 1. The Five Forces Model of Software Industry in Japan.

Based on the five forces model, we came up with questionnaires regarding environmental threats through the interviews with the experts in IT industry as well as literary searches. The questionnaires include the following environmental threats: T.1 new entrants, e.g., China, India, T.2 US/EU vendors , T.3 recruiting bright people, T.4 low-profitability industry, T.5 low-growth industry, T.6 mature oligopoly, T.7 package software, e.g., Enterprise Resource Planning (ERP), T.8 decline in IT demand, T.9 quick delivery request by clients, T.10 price cutting request by clients, T.11 quality requirement by clients, T.12 ROI requirement by clients, T.13 low IT literacy of clients, T.14 self-development by clients, T.15 shortage of subcontractors, T.16 new technology adoption, T.17 product differentiations,

T.18 switching vendors by clients, T.19 software engineering capability erosion, T.20 decreasing bright IT students, T.21 turnover problem, T.22 M&A, T.23 retirement of senior software engineers, T.24 stagnating IT innovations.
These question items are measured by the following four criteria, i.e., short-term threat, mid-long-term thread, not applicable, no threat.

Second, based on the resource-based view, we came up with questionnaires in terms of competitiveness, i.e., the strengths/weaknesses of the firms through the interviews with the experts in IT industry as well as literary searches. More precisely, we applied the Barney's VRIO frame work, i.e., the questions of value, rarity, imitability and organization (Barney, J. 2007), which involve the important management concepts, e.g., sustained competitive advantage, unique historical conditions, path dependence, causal ambiguity, social complexity, complementary resources and capability (Dierickx, I., and K.Cool. 1989).

As a result, the questionnaires include the following competitive strengths and weaknesses: C.1 state-of-the-art technology, C.2 mainframe technology, C.3 software product development, C.4 development capability on ERP, C.5 large scale systems development, C.6 know-how on specific function, C.7 specification description, C.8 inimitable products/services, C.9 scale of human resources, C.10 quality of human resources, C.11 high productivity of employees, C.12 challenge orientation, C.13 stability orientation, C.14 collaborators network, C.15 sales/services coverage, C.16 sales volume, C.17 system integration capability, C.18 business diversification, C.19 new acquisition of patent, C.20 brand equity, C.21 customer base, C.22 lump-sum contract capability, C.23 sales efficiency, C.24 customer satisfaction, C.25 well-resourced research and development, C.26 cost competitiveness, C.27 repeat order, C.28 stable revenue sources, C.29 market share of strong areas, C.30 proposal capability, C.31 new client development, C.32 new business/services development, C.33offshore systems development, C.34 offshore client development, C.35 financial characteristics , C.36 response capability to client's requests, C.37 management's leadership, C.38 government/ industry group contacts.

These question items are measured by the following four criteria, i.e., weak, not applicable, strong, sustainably strong.

Finally, we would statistically extract the characteristics of each type of vendors, i.e., maker-turned vendors, user-turned vendors and independent vendors, based on the above information on the environmental threats and the competitive strengths and weaknesses from the data collected from 100 major IT vendors in Japan in the following sections.

SURVEY ON SOFTWARE INDUSTRY IN JAPAN

For the research questions in the introduction, we conducted a survey on Software Engineering Excellence in 2007 (SEE2007). In this survey, we designed a questionnaire on the practice of software engineering and the competitive environmental of the company. This questionnaire was sent to the CEOs of 1000 major Japanese IT vendors with over 300 employees as well as the member firms of Japan Information Technology Services Industry Association (JISA) from December in 2007 through January in 2008. Responses were received from 117 companies and valid responses totaled 100 at SEE2007 (response rate of 10%), while valid responses numbered 55 (response rate of 23%) at SEE2005 and 78 (response rate of 15%) at SEE2006, respectively.

ANALYSIS RESULTS AND DISCUSSION

First, we conducted factor analysis of the items regarding the environmental threats based on five forces (Porter, 1980): T.1 through T.24 in *Table 2*. On the basis of the results, we significantly identified the following 8 factors. TF1: industry stagnation, TF2: recruiting bright people, TF3: ROI /quality requirement by clients, TF4: new entrants, TF5: price cutting/quick delivery request by clients,

TF6: Software Engineering capability erosion, TF7: stagnating IT innovations, TF8: new technology adoption.

	TF1	TF2	TF 3	TF 4	TF 5	TF 6	TF 7	TF 8
T.1 new entrants (China, India etc.)		-0.143		0.939		0.148	0.162	
T.2 US/EU vendors	0.323	0.138		0.527				0.132
T.3 recruiting bright people	0.16	0.645	0.126					
T.4 low-profitability industry	0.701			0.12	0.192	0.173	0.137	
T.5 low-growth industry	0.854	0.149	0.12					
T.6 mature oligopoly	0.405	0.323		0.183				
T.7 package software (ERP)	0.379	0.135		0.318		-0.188	-0.462	0.186
T.8 decline in IT demand	0.15	0.394		0.179	0.124	0.108		
T.9 quick delivery request by clients		0.255	0.33		0.554	0.104		-0.117
T.10 price cutting request by clients			0.194		0.954			0.163
T.11 quality requirement by clients			0.712		0.168	0.138		0.12
T.12 ROI requirement by clients		0.19	0.897		0.188			0.118
T.13 low IT literacy of clients		-0.233	0.122	-0.174	0.128	0.111	0.189	-0.17
T.14 self-development by clients	0.21	0.22	-0.136	0.118		0.159	0.205	
T.15 shortage of subcontractors		0.385		0.369	0.199	-0.226	0.389	
T.16 new technology adoption		0.207					0.243	0.936
T.17 product differentiations		0.451	0.228	0.138		0.238	-0.129	0.412
T.18 switching vendors by clients	0.128	0.402	0.162	-0.12	0.185	0.206	0.145	
T.19 SE capability erosion	0.107	0.183	0.129			0.944	0.172	
T.20 decreasing bright IT students	0.147	0.137	0.18	0.16		0.482	0.354	
T.21 turnover problem		0.496						
T.22 M&A	0.201		-0.135	0.202			0.432	
T.23 retirement of senior SEs						0.162	0.388	
T.24 stagnating IT innovations		0.109					0.484	

	TF1	TF2	TF 3	TF 4	TF 5	TF 6	TF 7	TF 8
SS loadings	1.874	1.804	1.758	1.604	1.498	1.496	1.354	1.256
Proportion Var	0.078	0.075	0.073	0.067	0.062	0.062	0.056	0.052
Cumulative Var	0.078	0.153	0.227	0.293	0.356	0.418	0.475	0.527

Test of the hypothesis that 8 factors are sufficient.
The chi square statistic is 116.53 on 112 degrees of freedom.
The p-value is 0.366

Table 2. Result of factor analysis on environmental threats. [+]

Second, we conducted factor analysis of the items regarding competitiveness, i.e., strengths and weaknesses: C.1 through C.38 in *Table 3*. Based on the results, we significantly identified the following 6 factors. CF1: human capital, CF2: scale merit, CF3: expansive business, CF4: new client/services development, CF5: inimitability, CF6: stability.

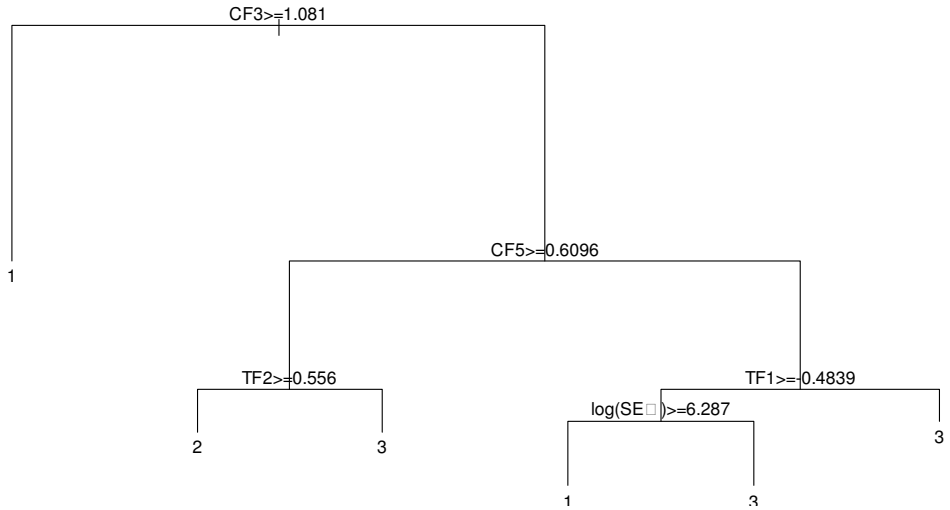
[+] Blanc in the table 2 denotes the number less than 0.1.

	CF1	CF 2	CF 3	CF 4	CF 5	CF 6
C.1 state-of-the-art technology	0.424	0.195	0.46	0.213	0.42	
C.2 mainframe technology	0.152	0.103	0.26	-0.118	0.249	0.328
C.3 SW product development	0.314	0.298	0.265	0.366	0.106	
C.4 development capability on ERP	0.351		0.396	0.151	0.159	
C.5 large scale systems development	0.425	0.265	0.414		0.37	0.152
C.6 know-how on specific function	0.229				0.626	0.185
C.7 specification description	0.565		0.212	0.115	0.234	0.169
C.8 inimitable products/services	0.189		0.3		0.573	
C.9 scale of human resources	0.32	0.719	0.317		0.107	
C.10 quality of human resources	0.654	0.357	0.307		0.128	0.1
C.11 high productivity of employees	0.502	0.115	0.235	0.329	0.162	0.304
C.12 challenge orientation	0.636	0.125		0.286	0.111	-0.115
C.13 stability orientation		0.241				0.563
C.14 collaborators network	0.329	0.503		0.151	0.173	0.202
C.15 sales/services coverage	0.237	0.465	0.127	0.539		0.155
C.16 sales volume	0.29	0.637	0.294	0.187	0.196	0.297
C.17 system integration capability		0.42	0.112	0.177	0.438	0.206
C.18 business diversification		0.402	0.32	0.127	0.179	0.154
C.19 new acquisition of patent	0.173	0.345	0.702	0.162	0.243	0.111
C.20 brand equity	0.151	0.608	0.204	0.181	0.25	
C.21 customer base	0.237	0.188	0.271	0.205	0.348	0.27
C.22 lump-sum contract capability	0.345	0.212		0.179	0.355	
C.23 sales efficiency	0.527	0.251		0.34		0.299
C.24 customer satisfaction	0.657	0.143	0.121	0.256		0.17
C.25 well-resourced R&D	0.262	0.348	0.557	0.305	0.298	0.115
C.26 cost competitiveness	0.196		0.136	0.581		0.405
C.27 repeat order	0.236			0.161	0.337	0.562
C.28 stable revenue sources				0.144	0.253	0.678
C.29 market share of strong areas		0.313			0.461	0.241
C.30 proposal capability	0.531	0.217	0.169	0.49	0.233	
C.31 new client development	0.327	0.252	0.152	0.767	0.209	
C.32 new business/services development	0.291	0.279	0.223	0.572	0.18	
C.33offshore systems development	0.275	0.351	0.633	0.134	-0.159	0.13
C.34 offshore client development	0.187	0.347	0.598	0.258		0.186
C.35 financial characteristics	0.403	0.114	0.297			0.376
C.36 response capability to client's requests	0.55	0.332	0.281	0.178	0.16	0.262
C.37 management's leadership	0.543	0.193	0.226	0.379		0.328
C.38 government/ industry group contacts	0.336	0.42	0.272	0.223	0.185	

	CF1	CF 2	CF 3	CF 4	CF 5	CF 6
SS loadings	5.019	3.824	3.437	3.102	2.633	2.475
Proportion Var	0.132	0.101	0.09	0.082	0.069	0.065
Cumulative Var	0.132	0.233	0.323	0.405	0.474	0.539

Test of the hypothesis that 6 factors are sufficient.
The chi square statistic is 517.01 on 490 degrees of freedom.
The p-value is 0.193

Table 3. *Result of factor analysis on competitiveness.* [+]



1) root 78 40 3 (0.29487179 0.21794872 0.48717949)
  2) CF3>=1.08058 13 2 1 (0.84615385 0.15384615 0.00000000) *
  3) CF3< 1.08058 65 27 3 (0.18461538 0.23076923 0.58461538)
    6) CF5>=0.60963 20 9 2 (0.20000000 0.55000000 0.25000000)
      12) TF2>=0.5559618 8 0 2 (0.00000000 1.00000000 0.00000000) *
      13) TF2< 0.5559618 12 7 3 (0.33333333 0.25000000 0.41666667) *
    7) CF5< 0.60963 45 12 3 (0.17777778 0.08888889 0.73333333)
      14) TF1>=-0.483853 28 12 3 (0.28571429 0.14285714 0.57142857)
        28) log(SE#)>=6.286658 9 3 1 (0.66666667 0.00000000 0.33333333) *
        29) log(SE#)< 6.286658 19 6 3 (0.10526316 0.21052632 0.68421053) *
      15) TF1< -0.483853 17 0 3 (0.00000000 0.00000000 1.00000000) *

Figure 2. *Result of recursive partition analysis.* [+]

Finally, in order to extract the characteristics of each type of vendor, i.e., 1: maker-turned vendors, 2: user-turned vendors, 3: independent vendors, we fit a tree based model by rpart (Recursive Partition) in R with Zini criteria, using competitiveness factors (CFs), threat factors (TFs), and the number of software engineers (log (SE#)). Here, the number of software engineers is one of the key parameters through the researches. Based on the result of the analysis in *Figure 2*, we found the characteristics of each type of vendor as follows.

[+] Blanc in the table 3 denotes the number less than 0.1.

[+] *denotes terminal node.
For example, in 2), the left most terminal node includes 13 nodes with CF3>=1.08058, 11 of which are maker-turned (1) and 2 of which are either user-turned (2) or independent vendors (3). More precisely, maker-turned vendors (1) makes up 84.615385%, user-turned vendor (2) makes up15.384615%, and independent vendor (3) makes up 0.00000000%.

- We identified 5 factors to effectively explain the differences among types of vendors as follows: CF3 expansive business, CF5 inimitability, TF1 industry stagnation, TF2 recruiting bright people, and the number of software engineers (log (SE#)).
- Maker-turned vendors significantly tend to expand business (CF3>=1.081), e.g., C.19 new acquisition of patent, C.25 well-resourced R&D, C.33offshore systems development, C.34 offshore client development.
- User-turned vendors significantly tend to be less expansive (CF3<1.081), inimitable (CF5>=0.6096), e.g., C.6 know-how on specific function, C.8 inimitable products/services. However, it does not identify recruiting bright people as a threat (TF2>=0.556).
- Another type of maker-turned vendors tends to be less expansive (CF3<1.081) and less inimitable (CF5<0.6096). However, it does not identify industry stagnation (TF1>=0.4839), e.g., T.4 low-profitability IT industry, T.5 low-growth industry, as a threat. And it tends to be a large firm (log(SE#)>=6.287, i.e., SE#>=538).
- Independent vendors tend not to satisfy with the above conditions. i.e.,
  - less expansive (CF3<1.081), inimitable (CF5>=0.6096), and threat of recruiting bright people (TF2<0.556)
  - less expansive (CF3<1.081), less inimitable (CF5<0.6096), no threat of industry stagnation (TF1>=0.4839), and relatively small sized (log(SE#)<6.287, i.e., SE#<538).
  - less expansive (CF3<1.081), less inimitable (CF5<0.6096), and threat of industry stagnation (TF1<0.4839).

We consider the implication of the above results as follows.

Regarding the maker-turned vendors, some of them are leading the IT industry in Japan by pursuing state-of-the art technology as well as new patent acquisition on the basis of well-resourced research and development. Simultaneously they are trying to develop client and systems abroad, although offshore systems and clients development are relatively limited in Japanese IT vendors in general (Ministry of Economy, Trade and Industry, 2007). Others of them are relatively less expansive and less inimitable despite of relatively large number of software engineers (>=538). They need to utilize human resources more effectively, e.g., capability building, effective posting.

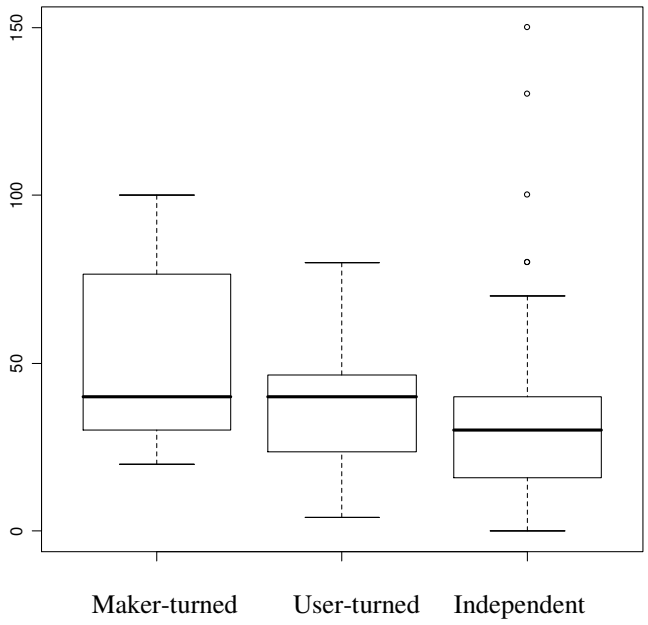


Figure 3. Boxplot of training hours for software engineers by types of vendors (hours).

In terms of the user-turned vendors, some of them seem to depend heavily on the demand of the parent companies. Therefore, they do not need to be expansive and careful about recruiting people. All they need to do is to focus on the business of the parent companies. As a result, they are thought to gain inimitable skills, e.g., know-how on specific function, inimitable products/services.

Independent vendors are wide variety. Many of them supply people with the principal contractors as the temporary staffing (*Figure 1*). However, their revenue base could be fragile particularly in the recent business depression. Therefore, they might not be able to afford to train people sufficiently, as shown in *Figure 3*. The role model of the independent vendors should be the first type of the independent vendors in *Figure 2*, i.e., inimitable (CF5>=0.6096), or the second type of them in *Figure 2*, i.e., no threat of industry stagnation (TF1>=0.4839), even if they are relatively small sized (log(SE#)<6.287, i.e., SE#<538).

CONCLUSION AND FUTURE WORK

The objectives of this research are to describe competitive environment in the software industry in Japan and to understand the differences of characteristics among maker-turned vendors, user-turned vendors and independent vendors in the competitive environment. To do so, we statistically analyse the data collected from 100 major IT vendors in SEE2007.

On the basis of management frameworks such as Porter's five forces and Barney's resource-based view, we developed the measurement model of environmental threats and competitiveness, e.g., strengths and weaknesses. And we conducted factor analysis of data collected from 100 major IT vendors in Japan. Then we extracted 8 threats factors: industry stagnation, recruiting bright people, ROI /quality requirement by clients, new entrants, price cutting/quick delivery request by clients, software engineering capability erosion, stagnating IT innovations, and new technology adoption. Also we identified 6 competitive strengths/weaknesses factors: human capital, scale merit, expansive business, new client/services development, inimitability, and stability.

The regression tree analysis of threats, strengths/weaknesses and the number of software engineers suggests that the maker-turned vendors significantly tend to expand business, e.g., new acquisition of patent, well-resourced R&D, offshore systems development, offshore client development, while the user-turned vendors seem to depend heavily on the demand of the parent companies. Therefore, some of them are thought to gain inimitable capabilities, e.g., know-how on specific function, inimitable products/services. On the other hand, many of the independent vendors supply people with the principal contractors as the temporary staffing without specific strengths. However, some of independent vendors with inimitable asset and no threat of industry stagnation seem to be the role model of the software vendors in Japan.

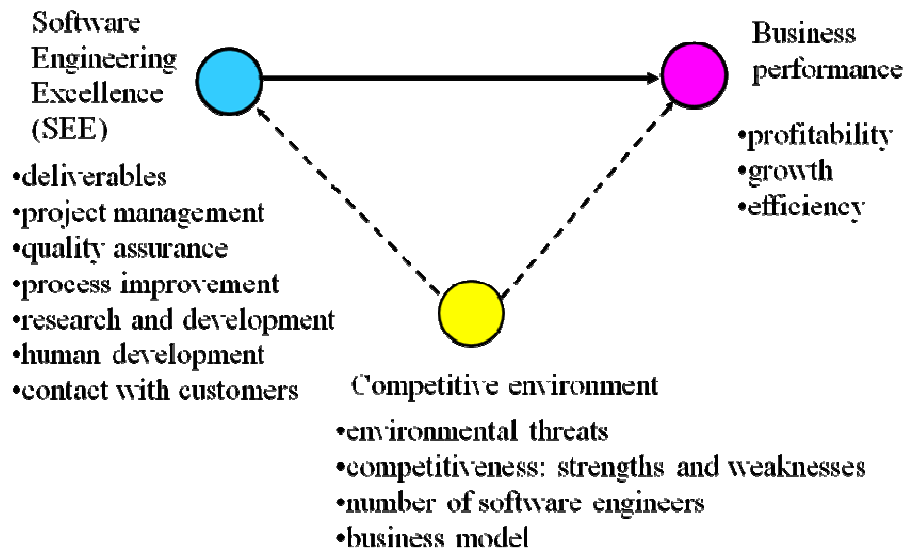


Figure 4. Structural model of the future study

To expand this paper, we need to connect the relevant IS literature furthermore. In addition, from the viewpoint of competitive environment, we should investigate how vendors can make use of their unique strengths and protect themselves from revealed weakness.

Although we focus on the competitive environment in this paper, the analysis of the relationship between software engineering capability (SEE), business performance, and competitive environment (*Figure 4*) remains to be solved in the future based on the previous researches (Kadono et al. 2008).

Also, to better understand the reality and issues facing the IT industry in the medium- and long-term, we suggest that future studies as follows.

- further refinement of the measurement model and analysis,
- data collection over a wider range of IT vendors,
- global benchmarking , e.g., China, India and the U.S., and,
- time series analysis.

Acknowledgements

The authors gratefully acknowledge the valuable suggestions and support of the Ministry of Economy, Trade and Industry (METI), and Software Engineering Center, Information-Technology Promotion Agency, Japan (SEC/IPA), Japan Information Technology Services Industry Associativon (JISA), and Management Science Institute Inc. (MSI). This research is partially supported by the grants-in-aid for scientific research of Japan Society for the Promotion of Science (B: 20310090).

References

Jay B. Barney (2007), Gaining and Sustaining Competitive Advantage, *Pearson Prentice Hall*.

Brynjolfsson, E. (2004). Intangible Asset, *Diamond Press* .

Carnegie Mellon University. (2008). Software Engineering Institute, http://www.sei.cmu.edu/cmmi/.

Cusumano, M. (2004). The Business of Software, *Free Press*.

Dierickx, I., and K.Cool. (1989). "Asset Stock Accumulation and Sustainability of Competitive Advantage," *Management Science*, Winter: 1504-1511.

Fujimoto, T. (2003). *Nouryoku Kouchiku Kyousou, Chuohkouronshinsya.*

Kadono, Y. (2004). Evolution of IT Management Creating Business Value, *Nikkagiren*.

Kadono, Y., Tsubaki H., Tsuruho S. (2008). "A Study on Reality and Issues on Management of Enterprise Software Engineering in Japan: Causal Relationships by Maker/User-turned Vendors and Independent Vendors," *Proc., the 9th Asia Pacific Industrial Engineering and Management Systems Conference*, Indonesia: 1234-1243.

Porter, M. (1980). Competitive Strategy. New York: *Free Press.*

Matsumoto, Y. (2005). Application of SWEBOK to Software Development, *Ohmsha* .

Ministry of Economy, Trade and Industry. (2008). *Report on Software Industry* .