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Creating a firm self-propagating function for advanced innovation-oriented projects: lessons from ERP

C. Watanabe [a,*], M. Hobo [b]

[a] *Department of Industrial Engineering and Management, Tokyo Institute of Technology, 2-12-1 Ookayama, Meguro-ku, Tokyo 152-8552, Japan*
[b] *ViryaNet Japan Ltd, 4-12-2 Shiba, Minato-ku, Tokyo 108-0014, Japan*

Abstract

Under the new paradigm of an information society, Japan is experiencing a vicious cycle between non-elastic institutions and insufficient utilization of the potential benefits of IT that impedes the structural change efforts of firms. In parallel with this, the advanced innovation-oriented projects of firms are undergoing a structural change.

However, a dramatic deployment of i-mode service (NTT DoCoMo's mobile Internet access service) in the late 1990s provides encouragement that, once the potential is exploited, Japan's institutional systems can effectively stimulate the self-propagating nature of IT through dynamic interaction with it. The advancement of enterprise resource planning (ERP) software in a co-evolutional way between convergence for vendor strength and divergence for satisfying diversified customer base demonstrates a similar expectation. This expectation relates to a business field in which the advanced innovation-oriented projects of firms under a new paradigm can be expected to develop in the process of embodying a self-propagating function.

Prompted by this demonstration, this paper on the basis of a comparative empirical analysis of the interaction between a software vendor (ERP firm) and ERP customers with different business models towards creating a self-propagating structure based on a co-evolutional process between internal motivation of the vendor and external expectations raised by customers, attempts to identify key conditions essential to creating a self-propagating structure for advanced innovation-oriented projects of firms.

Keywords: ERP; Advanced innovation-oriented project; IT; Self-propagating structure

1. Introduction

Under the new paradigm of an information society, while the advanced innovation-oriented projects of firms are undergoing a structural change, Japan's institutions do not function as efficiently as they did in the 1980s. As a result, Japan is experiencing a vicious cycle between non-elastic institutions and insufficient utilization of the potential benefits of IT that impedes the structural change efforts of firms.

While Japan is experiencing such a vicious cycle, a dramatic deployment of i-mode service (NTT DoCoMo's mobile Internet access service) in the late 1990s provides encouragement that potential elasticity of Japan's solid institutions towards unknown systems, especially with higher IT intensity, can be derived if some familiarity is stimulated, and once the potential is exploited, institutional elasticity effectively stimulates the self-propagating natures of IT through dynamic interaction with it during the course of its diffusion, thereby a co-evolutional structure is expected to construct. A dramatic advancement of enterprise resource planning (ERP) software in a co-evolutional way by satisfying trade-off issues between converging for vendor strength and divergence for satisfying diversified customer base demonstrates a similar expectation also in a business field that the advanced innovation-oriented projects of firms under a new paradigm can be expected to develop in the process of embodying a self-propagating function similar to IT's new functionality development mechanism (Yucean et al., 1999).

Prompted by this demonstration, this paper attempts to identify key factors contributed to creating an elaborate self-propagating structure in ERP software development and essential for creating a similar structure for

* Corresponding author. Tel.: +81-3-5734-2248; fax: +81-3-5734-2252.
E-mail address: chihiro@me.titech.ac.jp (C. Watanabe).

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advanced innovation-oriented projects of firms.

To date, a number of studies have revealed Japan's less elastic institutions impeding the advanced innovation-oriented projects of firms in the midst of the IT evolution (Dewan and Kraemer, 2000; OECD, 2001; Watanabe and Kondo, in press). In addition, not a few works analyzed development path of ERP software and the impacts of ERP. Based on the recognition of the significant impacts of ERP phenomenon on supply chain strategies, Yucean et al. (1999) sought to understand the impacts of ERP systems on supply chain performance by surveying 60 European firms. They pointed out that while ERP relies on the use of IT for creating radically different working methods to deliver significant improvements, it is a key catalyst for organizational change by adopting a new set of performance metrics by enabling routine data collection on those metrics. They postulated that the ERP industry is now a tightly knit 'ecosystem' of software vendors, middleware vendors, supply chain experts, specialty-software houses, and hardware vendors. Furthermore, they demonstrated that, since this ecosystem is rapidly evolving, it is important to understand the capabilities afforded by the current technology and identify the desirable features of ERP evolution. Sakakibara (1999) conducted a questionnaire survey on the state of the introduction and utilization of ERP software in Japan's leading firms and pointed out that the utilization of ERP software in Japan's leading firms is insufficient primarily due to the absence of a timely decision-making system.

While these studies demonstrate suggestive warning with respect to firms introduction and utilization of ERP software for their business strategy, none have identified the critical success factor in constructing a self-propagating structure essential for the advanced innovation-oriented projects of firms.

This paper attempts to identify key conditions essential to creating a self-propagating structure in ERP software deployment. An empirical analysis is conducted comparing the interaction between software vendors (ERP firms) and ERP customers with different business models. Based on this empirical analysis, secondary impacts of this process on the interaction between ERP customers and their customers (consumers) are explored. Through this analysis, suggestions for the co-evolution between customer satisfactions and sustaining producers' strength by constructing a virtuous cycle between converging their core competence and diverging non-core competence process are developed.

Section 2 provides an analytical framework by demonstrating the overlap between the theory of IT self-propagation and the role of ERP software deployment. Section 3 demonstrates a comparative empirical analysis. Section 4 extracts key conditions essential for creating a self-propagating structure by outlining interpretations of the results of the empirical analysis. Section 5 briefly summarizes the key findings of the analysis and presents policy implications.

2. Contrast of self-propagating structures between IT and ERP software deployment—an analytical framework

IT strongly possesses a self-propagating nature that closely interacts with individuals, organizations, and society during the course of its diffusion and new functionality is formed during the course of this institutional interaction (Watanabe et al., in press). This IT process provides a constructive suggestion in constructing firms' strategy for advanced innovation-oriented project under a new paradigm of an information society. Thus, firm's important strategy for effective utilization of the potential benefits of IT is to construct a co-evolutional interacting system between suppliers and customers.

The dramatic advancement of ERP software in a co-evolutional way between convergence for vendor's strength and divergence for satisfying diversified customers demonstrates a similar expectation also in a business field.

Contrary to traditional business management concept, the ERP concept is a co-evolutional interacting system based on global optimality. Its functional scope has been expanded from the optimization of a single function to the whole core production processes, entire supply chain (supply chain management (SCM) software), and to firms and customers interaction (customer relationship management (CRM) software) as illustrated in Fig. 1 (Watanabe and Hobo, in press). This dynamic system for global optimality has the potential to create a self-propagating trajectory similar to IT's new functionality development as illustrated in Fig. 2.

Through this trajectory, the software vendor and its customers satisfy both internal motivation of the vendor and its external expectation raised by the customers. The success of this process depends on the momentum that is gained when the vendor provides high-quality software that meets specific customer requirements and simultaneously creates global standards assimilating the best practice from leading firms as demonstrated in Fig. 3.

From the vendor perspective, constructing this self-propagating feed-back loop depends on an ability to provide high-quality software and the capacity to assimilate world's best practice through sophisticated filters as summarized in Table 1.

The dramatic advancement of ERP software can be largely attributed to the efforts of the ERP firms in creating this virtuous cycle. At the same time, this success depends on a creation of a self-propagating structure based on a co-evolutional interaction between this internal motivation of the ERP firm and its external expectations raised by customers in their desire for

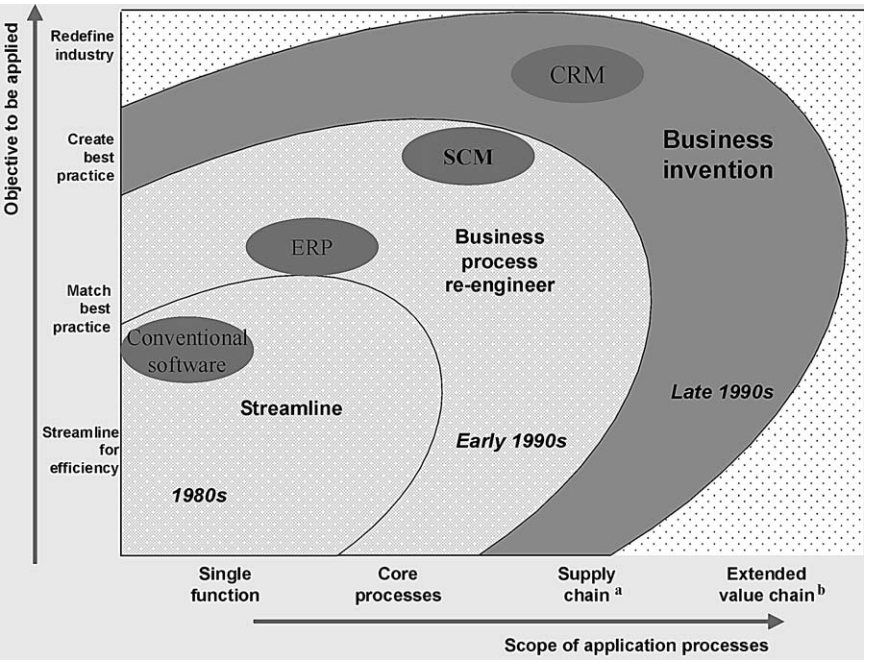


Fig. 1. Scheme of the direction of firm's strategic business and corresponding development trajectory of ERP. a) Total enterprise plus suppliers and customers. b) Linkage between enterprise and its suppliers and in turn their suppliers and customers. Source: Watanabe and Hobo (2002) [9].

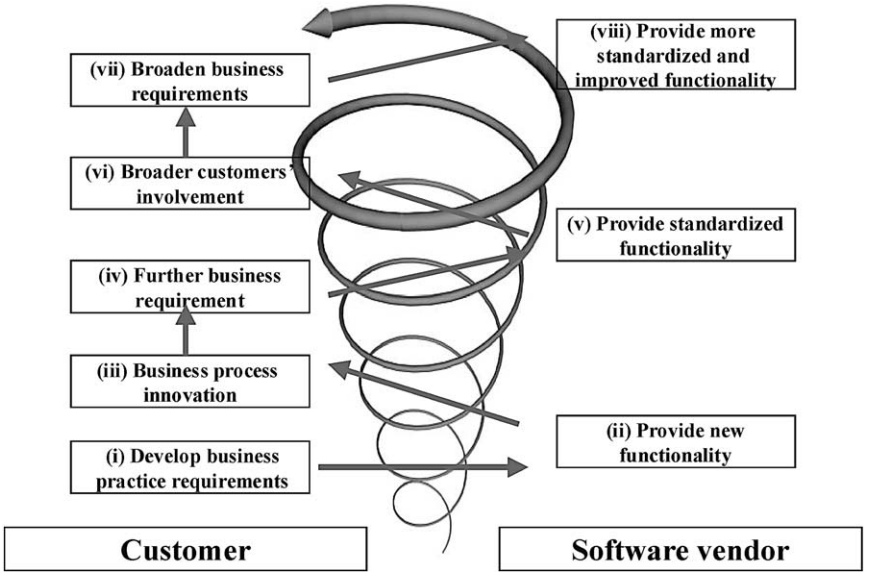


Fig. 2. Self-propagating sructure based on a co-evolutional tajectory between internal motivation of software vendor and its eternal epectation. (i) The customer develops business practice requirements (target business scenarios), (ii) In response to the requirements, the software vendor (SV), provides new functionality, (iii) Sparred by this new functionality provided by the SV, business process innovation emerges on customer side, (iv) Further business requirements emerge as business process innovation progresses, (v) Induced by broad business requirements, the SV provides standardized functionality, (vi) As the standardization proceeds, broader customer involvement is accelerated, (vii) Broader customer's involvement generates broader business requirements, and (viii) Broader business requirements stimulate the SV to provide more standardized and improved functionality. Source: Author's elaboration based on Watanabe et al. (2002) [9]

enterprise-wide optimization as summarized in Table 2.

The external expectations to ERP raised by customers do not necessarily correspond to the ERP firm's expectation, since ERP is the software to support enterprise's fundamental resource planning and business process execution, successive flow of such external expectations are essential for the ERP firm to construct an inner virtuous cycle, and if the ERP firm discontinues to construct this cycle, both the ERP firm and customer firm lose the opportunity to improve their business objects. Therefore, it is crucial to understand the complex process in which mutual benefit is managed.

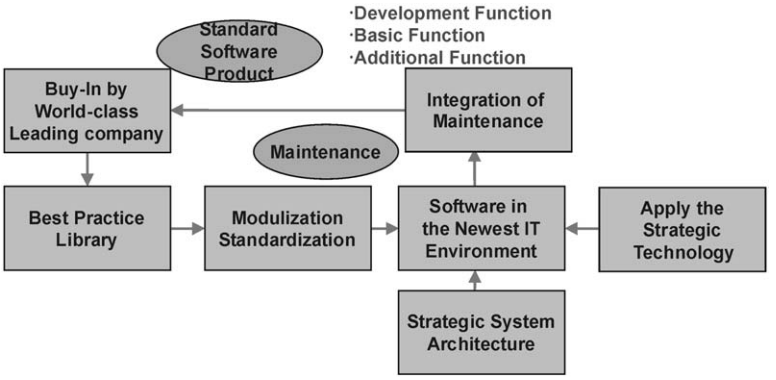


Fig. 3. Virtuous cycle between qualified product and assimilation of the best practice in ERP firm. Source: SAP Japan 1996 (1996) [6]

Table 1
Filtering world best practice for assimilation into software vendor

Practices	Actions
1 Government regulations	Mandatory standard by SAP
2 Best business practice	
Cross industry/cross country	Global standard by SAP through DRQ
Specific Industry	IS-XX (SAP or partner)
Specific country	SAP standard
3 Common market practice (cross industry)	If possible, SAP standard
4 Common industry practice (specific industry)	Customer/partner add-ons or SAP sub add-ons
5 Unique practice specific company)	BPR or customer add-ons (or customer add-ons based on SAP's user exits)

Source: SAP Japan 1996 (SAP, 2001).

Table 2
External expectations to ERP

Simplify the business process
Track the real-time status of the company
Enterprise-wide profit/cost management
Decrease the IT development and maintenance cost
Smooth data flow through the processes

Since advanced innovation-oriented projects of firms depend on this co-evolutional interaction, spurring and maintaining the resonance between inner virtuous cycle and co-evolutional interaction would be key conditions for advanced innovation-oriented projects of firms. This resonance is not limited to the interaction between the ERP firm and the ERP customer but also includes the consumer (ERP customer's customer) as the secondary cycle as illustrated in Fig. 4.

Based on this conceptual framework the succeeding parts of this paper focus on the specific identification of key conditions and initial success factors for spurring and maintaining these complex cycles.

3. Comparative empirical analysis

In order to demonstrate ERP's self-propagating structure postulated in the conceptual framework in the proceeding section and also to identify the key conditions essential for constructing this structure, a comparative empirical analysis of the interaction between the ERP firm and ERP customers with different business models is conducted. Cases of ERP projects are explored in the following Japanese firms:

(i) Mitsubishi Electric Corporation;
(ii) Marubeni Corporation;
(iii) Yodobashi Camera Corporation.

The first case is a typical model in applying ERP in production and logistic control in a Japanese manufacturing firm. It is also a pioneer Japanese ERP implementation. The second case is a typical model in applying

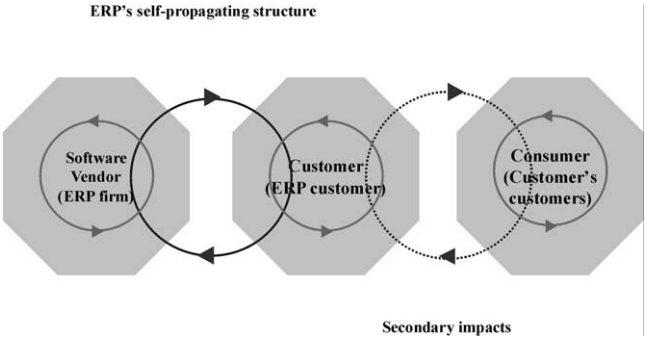


Fig. 4. ERP's self-propagating structure and its secondary impacts.

ERP in a general trading firm, and presents a unique business model in Japan. The last case is a typical model in applying ERP in a retail firm, and is also a typical case in implementing Industry Specific Solution for Retail Industry (IS-Retail) creating stronger links with customer (ERP customer's customers).

3.1. Mitsubishi electric corporation

Mitsubishi Electric Corporation (MELCO), established in 1921, is one of the largest manufacturing firms in Japan with 110,000 employees and more than 34 billion US$ annual revenue worldwide.

MELCO was the first large enterprise in Japan to use ERP throughout the enterprise including both logistics and accounting. Since Japan has strength in logistics, it was important for the ERP vendor to involve Japan's largest manufacturing firms with logistics application in order to legitimize itself in the marketplace.

MELCO has postulated the following three points as a corporate strategy:

(i) location independence over R&D, manufacturing and purchasing function;
(ii) agile product cycle; and
(iii) world-class efficiency.

In order to achieve these three strategies, MELCO was compelled to reconsider its traditional IT strategy. This was one of the main reasons to choose ERP as a tool to support these new business requirements enabling the firm to remain competitive, in an information society. MELCO's strategic IT objectives are summarized in Table 3.

Table 3 demonstrates MELCO's objective was to become a 'global' firm rather than remain 'Japanese centric multi-national' firm. In the past, when MELCO constructed its production facilities abroad, it depended on an exact copy of the Japanese site's infrastructure. However, globalization requires more agile response to market demand, and a streamlined business process with minimal costs and maximum speed to market. This new competitive market coupled with MELCO's strategic objectives compelled the company to become a truly global firm.

Table 3
Key paradigm shifts in the essential IT strategies in MELCO

Area	Old paradigm	New paradigm
Business process	Country unique	Global standard
Applications	Homegrown	SAP R/3
Software engineering	Process oriented waterfall	Object oriented rapid prototyping
Platform	370 + Mini	Client/server

Source: MELCO 1995 (MELCO, 1995).

While the corporate strategy clearly stated that changes were indispensable, detailed processes for the changes were still unclear. There was a huge discrepancy between conceptual expectation of changes in managers and end-users, since end-users believed that they have acquainted with their own best practice for manufacturing the goods. The end-users struggled to accept that standard software could support their unique manufacturing business processes. Even top managers, while they understood that they needed to change their strategy, could not explain to end-users how this change connected to the manufacturing application change. Top managers decided to deploy ERP (SAP R/3) throughout the enterprise, but they could not demonstrate to employees the outcome they expected. Instead, they gave this complicated tool to the employees and advised them that this was for them to implement in their current work. This was an enormous mistake, since end-users chase to simply compare their current 'as is' business processes with the proposed processes that they could not understand and played no role in defining. Therefore, there was no initiative to really re-engineer but instead to just lay this new tool ERP on top of old in-efficient processes. They could not even really benchmark the current processes with the standardized business process offered by ERP packages.

Since MELCO was the very first user in Japan for the ERP logistics application, only limited people in the firm realized the value of introductory ERP in enhancing their core business processes. Similarly, the functionality of ERP was not enough to satisfy MELCO's complicated production processes. Very few skilled consultants realized both the ERP functions or the customer's real business requirements in Japan. Therefore, this ERP implementation was a very ambitious challenge for both the vendor and MELCO.

Under these circumstances, this implementation faced extraordinary hurdles. Strong leadership was expected for the project and strong sponsorship by management was required. In order to complement the shortage of product skill sets on the Japanese side, the ERP firm's developers' involvement from the early stage was key to success of the MELCO project. This early involvement demonstrated two major benefits. First, while MELCO was able to get direct support from head quarter (HQ) developers, the ERP firm was able to encourage a high level of commitment at MELCO based on the firm's desire for a more agile and precise information flow. It was essential to establish the direct link between the project and HQ developers. Secondly, since this project started in the early stage of ERP introduction in Japan, direct support from developers also compensated for the local consultants lack of the skill, and moreover,

MELCO was given the great opportunity of on the job training.

The ERP firm's project team investigated MELCO's entire manufacturing processes. It then categorized them by characteristics into a several manufacturing types such as engineering to order (ETO), assemble to order (ATO) and make to stock (MTS) as summarized in Table 4, since the requirements for the manufacturing business processes differed from these characteristics. For example, in MTS production, sales projection and production control were very important. In contrast, in ATO production, a quick production line change was the key to delivering the finished goods to the market just after the order was offered. After the analysis, the project team established the implementation template (the set of parameters) according to these manufacturing types.

Negative factors cannot be overlooked. Since ERP was still unfamiliar in the market, customers took it as a simple replacement of the existing traditional IT system even though the concept was radically different. Since MELCO previously developed its own in-house application system, it has not evaluated its own system from an objective point of view. The old system focused on end-users without any broad vision of integration with other systems in the firm or deployment into other locations worldwide.

In the first phase, 21 projects over 17 functional areas were undertaken in parallel. Implementation areas were widely diffused from the simplest, with which only production planning, to the most complicated, with seven application modules, production planning, material management, project system, sales and distribution, finance, cost control, and asset management.

The MELCO project started at the beginning of 1995, and the last project out of the 21 projects went into production in the middle of 1998. While only one project was running in 1995, the total number increased to seven projects in 1996, and nine projects in 1997. However, it was difficult to multiply and use the know-how previously gained in each deployment even though the number of projects increased. Since each site's end-users interpreted their uniqueness in different ways, experiences observed in other cases were not supportive to other implementations. The complicated combinations of functionalities also increased the risk in missing the focus of each project. As demonstrated in Table 5, MELCO had to manage huge varieties of functionality combinations, releases, and production types in parallel. While the firm's general IT strategy was clearly indicated in Table 5, it was not necessarily interpreted in each respective project. Consequently, the business target and required outcome were not clear to the project members and end-users. This impeded the project members ability to encourage end-users to change, since they could not demonstrate to end-users what the new system would bring them as an outcome.

While ERP implementation stipulated a strategic move for MELCO, it required a great deal of time and capital. MELCO finally implemented 21 projects, these implementations took a long time. Having a clear focus on the expectation to the business outcome driven by IT deployment was the critical success factor particulary for MELCO. In addition, careful estimation of pros and cons in preparation for the end-users' resistance to change was another success factor. While it took a great deal of time this series of ERP projects went onto the right track, a close cooperative relationship was established between MELCO and the ERP firm in the latter part of the projects implementation. This cooperative relationship cannot be overlooked as a source of MELCO's success in its ERP implementation. Supported by this relationship both parties have learned each others mutual culture, decision-making process, manufacturing philosophy, and relationship with suppliers. Table 6 summarizes the evaluation of MELCO's project.

In Table 6 we note that one outcome of these project experiences was that MELCO learned a lot about ERP implementation. While these skill sets were stored in MELCO, more specifically in its IT department in the initial phase of the implementation, in 2001, MELCO established a new firm, Mitsubishi Electric Information Systems Corporation, with 2600 employees exclusively for coordinating these skill sets. Although this firm originated from in-house system development in MELCO

Table 4
Characteristics by manufacturing types in MELCO

	ETO	ATO	MTS
Product unit price	High	Medium	Low
Production time	Long	Short	Short
Production volume	Small	Large	Large
Product type	Custom	Standard	Standard
Number of parts	High	Low	Low
Production process	Complicated	Simple	Simple
Typical Products	Power supply system, picture information system, elevator	PC	Semiconductor, car parts, lamp

Source: MELCO 1995 (MELCO, 1995).

Table 5
Varieties of 21 MELCO SAP implementation projects (as of 1996)

	Project	Location	Product	Staff	Type	C/O planned	Version	No. of mods
1	Gunden	Koriyama	Picture information system	500	ETO	7/1996	3.0C	3
2-1	S-workflow	Seigyo	Water mill control plate	3500	ETO	7/1996	3.0C	1
2-2	S-inventory	↑	↑	↑	↑	10/1996	3.0C	1
2-3	S-manufacturing	↑	↑	↑	↑	4/1997	3.0C	2
2-4	S-sales	↑	↑	↑	↑	12/1995	2.2D	1
3-1	M-manufacturing	Nagoya	NC machine	3100	MTS	7/1996	3.0B	1
3-2	M-quality	↑	↑	↑	↑	Still plan	N/A	N/A
4	Inaden	Inazawa	Elevator	1500	ETO	10/1997	2.2D	6
5	ADI	Kumamoto	Semiconductor	1100		4/1996	2.2F	4
6	Seian	China			MTS	Still plan		7
7	Iden	Itami	Power supply system	2500				3
8	Taiwan	Taiwan					2.2E	3
9	Cyoden	Nagasaki	Power supply system	1800	ETO			3
10	MKS				Accounting	4/1997		4
11	SKS				Accounting	10/1997		3
12	A-tou	Kyoto	Audio	1100	ETO	4/1997	3.0C	3
13	Maruden	Marugame		1000	ETO	6/1997		3
14	Okaden	Fukuoka	Semiconductor		MTS	10/1997		2
15	Taden	Senda	Car parts		MTS			2
16	Osuramu	Osumaru	Lamp		MTS	10/1997		6
17	Takebashi	Takebashi		2000	Accounting	6/1997		3

and its group firms, its focus clearly shifted toward a solution package, implementation consultation, and support. This demonstrates that core competence of this firm, or MELCO's IT strategy has shifted from 'make' the own in-house software to 'buy and implement' the standard package. Since MELCO was the pioneer in implementing package software, it acquired a number of business opportunities in the market. Thus, MELCO demonstrated that its IT department, which was generally a typical cost consuming center in the firm, can be changed to a profit generating center in the firm.

This success in smart change can be attributed to the construction of the co-evolutional interacting system for broader optimality leading to a self-propagating trajectory as described in Fig. 2. MELCO's ERP implementation suggests that while it requires time and capital for constructing the co-evolutional system with ERP firm, a consistent, clear focus on the expectations and business outcomes driven by IT are critical for systemic success.

3.2. Marubeni corporation

Marubeni Corporation is the fifth largest general trader (Sogo Shosha) in Japan, with 130 operation sites worldwide and 4 billion US$ gross trading profit in 2001 (Marubeni Corporation, 2001). Because of its business nature, Marubeni has incorporated an open culture and westernized decision-making processes in its business model. Marubeni first started its ERP implementation in accounting area, especially the financial consolidation of its overseas subsidiaries. Since its business operation is developed worldwide, Marubeni has to manage all transactions such as posting, depreciation and taxation in accordance with respective local accounting rules in 130 operation sites. When it developed its standard system company-wide, in order to support all employees, the system had to also be multi-lingual. Therefore, IT development costs were enormous, if in-house development continued. Thus, it was very reasonable for Marubeni to consider introducing ERP software in order to reduce IT development cost and gain prompt financial consolidation effects. Financial consolidation has been implemented not only in Marubeni, but also in other general traders, because their business operations are spread globally with a variety of business segments. Mitsubishi Corporation and Itochu International Co. were also SAP R/3 users in Japan. Therefore, together with these general trading firms, Marubeni started identifying the requirements of general traders business practices. Since a general trader is a business practice unique to Japan, and Japanese firms had to raise, assess and prioritize the requirements in Japan, the ERP firm or Marubeni, had to take the initiative, to negotiate with HQ developers, as well as to coordinate the user group in Japan. As explained, since general traders are generally open in terms of culture and westernized behavior, and their English skill-base is good, it was not so difficult to communicate with HQ developers. However, since these requirements had to be planned to satisfy an industry-specific solution rather than the standard core functionality, general traders had to take an active role in

Table 6
Evaluation of MELCO's project

	Process	Critical success factors	Evaluation	Note
(i)	Raise business practice requirements	Customer's way of business is advanced (product quality)	Fair	For MELCO
		Customer's culture is open to the new way of business (business achievement)	Poor	
(ii)	Provide new functionality	Speed to deliver the first version of functionality (speed)	Fair	For SAP
		Certain level of quality of the product (product quality)	Good	
		Readiness and willingness in customer side to challenge the advanced way (business achievement)	Fair	For MELCO
(iii)	Business process innovation	Eagerness to change (business achievement)	Poor	For MELCO
		Management leadership	Good	
		Customer has clear business strategy (business achievement)	Poor	
(iv)	Further business requirements	Speed to deliver (speed)	Fair	For MELCO
		Coverage of the business scenarios (product quality)	Poor	
		Customer's capability for improvements (business achievement)	Fair	
		Active participation of customer	Good	
(v)	Provide standardized functionality	Speed to deliver (speed)	Fair	For SAP
		Quality of the product (product quality)	Fair	
		Coverage of the business scenarios (product quality)	Poor	
		ERP's capability for improvements (business achievement)	Fair	
(vi)	Broader customers' involvement	Power of the ERP firm to get many of good customers Quality of functionality	N/A[a]	For SAP
(vii)	Broader business requirement	Power of the ERP vendor to gather advanced requirements to support each customer project appropriately	N/A[a]	For SAP
(viii)	Provide more standardized and improved functionality	Continuous improvement function by the ERP firm (as the result) Provide series of release periodically Customers' continuous and active participation to these processes	N/A[a]	For SAP

[a] Steps (vi), (vii) and (viii) are general functionality improvement process, common to all pilot projects, not necessarily points of individual project evaluation.

identifying the scope, all of the business scenarios and integration with core functional modules. In addition, since the projects were started by customers' initiative, they ran the risk of the raising requirements based on current existing business scenarios, but not generating more desirable best practices. General traders now face a shift from the traditional agent function to a business incubation function. Using standard software encourages speed to market because of the integration with backend database. However the functionalities offered by IS-Global Trade [1] still remains as an agent function. Consequently, the 'common business practices' based development described in Table 2. It is of course good for the ERP firm to be ready for this market, but not optimal to demonstrate best business practices in that industry. Table 7 summarizes the evaluations of Marubeni's project.

Table 7 demonstrates, the Marubeni project was successful, with good communication and a fairly rapid solution delivery. Furthermore, both parties were satisfied with the outcomes. Similar to MELCO this can be attributed to a construction of the co-evolutional interacting system leading to a self-propagating trajectory as described in Fig. 2. However, if we focus on the functionality development, it still depends on traditional common practice to solve the current problems with ERP standard function, and nothing has been proposed to new and advanced way of business to other customers.

3.3. Yodobashi Camera corporation

Yodobashi Camera is the largest camera retailer and ranking 17th largest retailer in Japan. Yodobashi is famous for excellent IT deployment throughout their business. It started its business from small camera shop in

[1] One of the industry-specific solutions that SAP developed in response to the industry's identical requirements. This was released for general trading firms.

Table 7
Evaluation of Marubeni's project

	Process	Critical success factors	Evaluation	Note
(i)	Raise business practice requirements	Customer's way of business is advanced (product quality)	Fair	For Marubeni
		Customer's culture is open to the new way of business (business achievement)	Good	
(ii)	Provide new functionality	Speed to deliver the first version of functionality (speed)	Fair	For SAP
		Certain level of quality of the product (product quality)	Fair	For Marubeni
		Readiness and willingness in customer side to challenge the advanced way (business achievement)	Good	
(iii)	Business process innovation	Eagerness to change (business achievement)	Good	For Marubeni
		Management leadership	Good	
		Customer has clear business strategy (business achievement)	Good	
(iv)	Further business requirements	Speed to deliver (speed)	Good	For Marubeni
		Coverage of the business scenarios (product quality)	Good	
		Customer's capability for improvements (business achievement)	Fair	
		Active participation of customer	Good	
(v)	Provide standardized functionality	Speed to deliver (speed)	Good	For SAP
		Quality of the product (product quality)	Good	
		Coverage of the business scenarios (product quality)	Good	
		ERP's capability for improvements (business achievement)	Fair	
(vi)	Broader customers' involvement	Power of the ERP firm to get many of good customers	N/A[a]	For SAP
		Quality of functionality		
(vii)	Broader business requirement	Power of the ERP vendor to gather advanced requirements. to support each customer project appropriately	N/A[a]	For SAP
(viii)	Provide more standardized and improved functionality	Continuous improvement function by the ERP firm (as the result)	N/A[a]	For SAP
		Provide series of release periodically		
		Customers' continuous and active participation to these processes		

[a] Steps (vi), (vii) and (viii) are general functionality improvement process, common to all pilot projects, not necessarily points of individual project evaluation.

1960, and grew into a 4 billion US$ revenue firm in 2000 (Yodobashi Camera, 2001). They have 22 stores countrywide with 10,000 sq m space average.

Even in the very early stages of growth, Yodobashi was enthusiastic in using IT to support its management system. They implemented a Point of Sales (POS) system to track the real-time sales status by item in 1985, and after 4 years, started 'Yodobashi Gold Point Card,' their strategic tool to track customers demand. Items covered by their stores are now counted up to 500,000, and there are 12 million card-holders. Furthermore, of these card-holders, 100,000 were updated daily in 2001.

The decision to introduce ERP was made by one of the top manager who was responsible for corporate planning. He had a clear vision of the firm's future strategy. He intended to manage the firm by using information as a strategic tool. Therefore, he invested in IT infrastructure on a priority basis. Yodobashi first started ERP implementation in the human resource management and accounting areas in1995, as one of the earliest firms to deploy ERP in Japan. Since Yodobashi is a relatively young and rapidly growing firm, it did not have complicated legacy systems that it was dependent. Yodobashi's very sophisticated POS system since 1985 provided the customers' shopping history but the system itself was nothing complicated. Moreover, Yodobashi was accustomed to assimilating the new technology without serious resistance. Supported by the firm's strategy and culture, Yodobashi was able to take a drastic short cut in changing its IT infrastructure. It carefully selected the

members involved in the implementation project. Then, it employed a strategy including recruiting external resources into the project. While some internal employees who possessed knowledge at the firm's strategy and the ability to re-engineer the business processes were included as core member, other experts, such as IT consultants, specialists, and programmers, were recruited from outside as needed during the project timeframe.

This project management system in Yodobashi functioned well to shorten the project duration. This can be attributed to its success in smart communication with end-users about ERP. Communication with end-users often became a pitfall. As reviewed in the MELCO case, to make end-users realize the importance of this change was time-consuming and costly. Facing these tasks, Yodobashi tried to minimize the useless communication which often impedes agile management by appointing a responsible management director who managed the project directly as a project manager. At first, the ERP project in Yodobashi was for human-resource management and the accounting area. Starting the end of 1995, as one of the earliest ERP implementations, it successfully launched a new personnel assessment and evaluation system in 1997. For Yodobashi, this was not only a solution for today but also an advance preparation for the future. The project manager had clear insight into Yodobashi's business strategy and this was well synchronized with Yodobashi's IT deployment strategy. For this project, the integration of corporate data such as capitals and capacities was not the target but a prerequisite for the real target which was to control dynamic human resources management. The idea was to best leverage the firm's knowledge capital: its people.

In 1997, just after completing the ERP project, Yodobashi strategically decided to implement IS-Retail functionality within the SAP R/3 system. This was part of their grand design for IT infrastructure based on the corporate strategy. Using this new functionality with specific features for the retail industry, Yodobashi aimed at integrating their distribution. For the retail firm, in order to avoid losing sales opportunities, it is very important to carefully track the sales real-time situation. For example, in order to correspond to consumers demand to specific items or goods, it is indispensable for the retail firm to prepare those items or goods in a few hours prior to selling them to new consumers visiting the store. In order to undertake these tasks efficiently, a system which is able to accomplish the following is indispensable:

(i) to collect real-time sales data;
(ii) to analyze these huge amount of data;
(iii) to provide required items or goods in real-time.

The IS-Retail functionality was chosen as a qualified tool to satisfy requirement (ii). Furthermore, by utilizing data processed by IS-Retail functionality, requirement (iii) was also satisfied.

As started earlier, starting from POS implementation in 1983, Yodobashi enthusiastically and successfully introduced comprehensive IT projects. Table 8 summarizes the general evaluation of these IT projects.

Table 8 demonstrates that Yodobashi's IT projects were exceptional which drew the attention of the world biggest ERP vendor, SAP.[2] Thus, SAP, following its strategic approach, chose Yodobashi as a pilot customer from its global customer list to evaluate its software, before it released the standard version of IS-Retail. Yodobashi was expected to submit sufficient and reliable information on the industry's advanced and strategic requirements, and, test the early beta version[3] before releasing in the market as the standard. Thus, both SAP and Yodobashi constructed a mutually reinforcing exchange, again similar to the co-evolutional interacting system for global optimality leading to a self-propagating trajectory as described in Fig. 2. Both firms were able to then maximize co-evolutional benefits. Table 9 summarizes the general evaluation of Yodobashi's IS-Retail pilot project, demonstrating that this project was very successful. As explained before, Yodobashi always sustained its consistent business strategy which heavily incorporated IT deployment. This meant that the ERP firm which was satisfied with the deployment would be able to include Yodobashi as a benchmark both of a successful implementation of their new functionality, and as a successful ERP business case in general. This evidence enables the ERP firm to strengthen its market position.

For Yodobashi, since its internal resources for IT projects were limited, intensive support from the ERP firm was always welcomed. Therefore, situation was a 'win–win' for both firms. It was not so difficult to align these objectives and shared expectations could be easily managed because of the strong complementarities between these two firms.

Because of this, win–win situation, Yodobashi effectively developed a comprehensive global IT system which enabled it to increase its business activities. Fig. 5 demonstrates this parallel development by contrasting Yodobashi's IT development chronology and trends in the numbers of its stores. From Fig. 5 we note that the number of Yodobashi's stores has increased rapidly particularly from the latter part of the 1980s corresponding to its ERP deployment.

Starting from its central and sole store in 1975, Yodobashi's number of stores doubled in 1976, this size lasted

[2] When SAP search team visited Japan in 1997 aiming at exploring excellent candidate pilot customers, SAP was astonished to see Yodobashi's innovative way of business.

[3] Beta version is the software which deliver to the limited pilot customers before the official version for general use, for testing and inspecting the functionalities as well as fixing the bugs.

Table 8
Yodobashi's IT project evaluation

Project	Duration	Objective	Outcome	Evaluation	Note
POS	1983–1985	Track customers' shopping history	12M customer data accumulation	Good	In-house
ERP	1995–1997	Personnel management by business objective Highly motivated employee	Highest profit per employee in 2000	Good	Package
EC	1997–1998	Expand sales using Internet	$10M sales via website (target $100M in 2 years)	Good	Package+in-house
SCM	1997–1999	Analysis customers' buying behavior Real-time integration of customers' demand and supply plan	Integrated network with 400 suppliers 23% profit growth in 2000 on 20% of revenue growth	Good	Package

Table 9
Evaluation of Yodoashi's IS-retail pilot project

	Process	Critical success factors	Evaluation	Note
(i)	Raise business practice requirements	Customer's way of business is advanced (product quality)	Good	For Yodobashi
		Customer's culture is open to the new way of business (business achievement)	Good	
(ii)	Provide new functionality	Speed to deliver the first version of functionality (speed)	Good	For SAP
		Certain level of quality of the product (product quality)	Good	
		Readiness and willingness in customer side to challenge the advanced way (business achievement)	Good	For Yodobashi
(iii)	Business process innovation	Eagerness to change (business achievement)	Good	For Yodobashi
		Management leadership	Good	
		Customer has clear business strategy (business achievement)	Good	
(iv)	Further business requirements	Speed to deliver (speed)	Good	For Yodobashi
		Coverage of the business scenarios (product quality)	Good	
		Customer's capability for improvements (business achievement)	Good	
		Active participation of customer	Good	
(v)	Provide standardized functionality	Speed to deliver (speed)	Good	For SAP
		Quality of the product (product quality)	Fair	
		Coverage of the business scenarios (product quality)	Good	
		ERP's capability for improvements (business achievement)	Fair	
(vi)	Broader customers' involvement	Power of the ERP firm to get many of good customers	N/A[a]	For SAP
		Quality of functionality		
(vii)	Broader business requirement	Power of the ERP vendor	N/A[a]	For SAP
		to gather advanced requirements		
		to support each customer project appropriately		
(viii)	Provide more standardized and improved functionality	Continuous improvement function by the ERP firm (as the result)	N/A[a]	For SAP
		Provide series of release periodically		
		Customers' continuous and active participation to these processes		

[a] Steps (vi), (vii) and (viii) are general functionality improvement process, common to all pilot projects, not necessarily points of individual project evaluation.

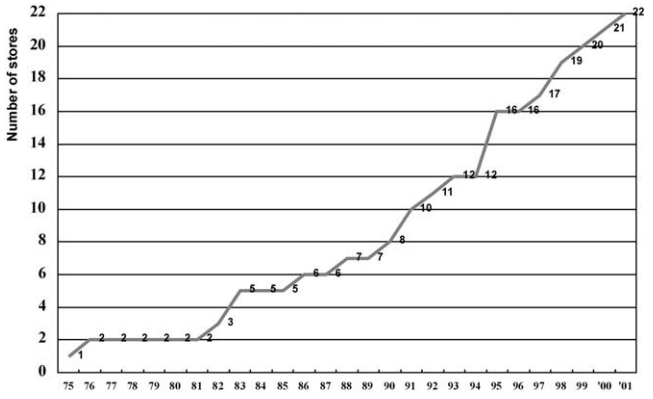


Fig. 5. Yodobashi's IT development and trends in the number of its stores (1975–2001). 1985 POS system started, 1986 Sales Order by online processing between manufacturers, 1989 Gold Point Card started, 1992 New Logistics System started, 1993 2 million Gold Point Card members, 1995 5 million Gold Point Card, 1997 New Human Resource Management system, 1999 SCM started.

6 years before the number increased to three in 1982, and jumped to five in 1983 where it stayed until 1985. This increase in its business activities was clearly very difficult for Yodobashi. It took more than 10 years before reaching five stores. It was exactly at this time that Yodobashi started to develop its comprehensive IT system. Fig. 5 demonstrates that corresponding to this effort, Yodobashi was able to maintain sustainable growth in its business activities. Compared to the earlier efforts, the number increased rapidly after the ERP system development, and doubled stores total to 10 in 1991, and again to 20 in 1999,with 22 in 2001. Fig. 6 traces this rapid increase in the number of stores in Yodobashi by applying this trajectory to a logistic growth function.

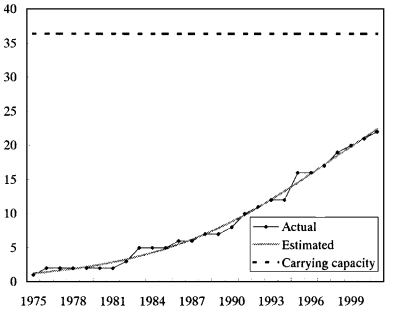
Fig. 6 compares this trajectory to simple logistic growth (SLG) and logistic growth within a dynamic carrying capacity (LGDCC). This comparison shows that the trajectory fits an SLG rather than LGDCC according to the Akaike Information Criterion (AIC) as well as *t*-values of a_K and b_K. The implication is that this trajectory develops towards a fixed (not dynamic) carrying capacity without substantial functionality development. Furthermore, this suggests that Yodobashi achieved such rapid and sustainable development by maintaining a consistent core competence in business activities, principally as the retailer of cameras. Given that it is generally not easy to achieve such a rapid development without developing new functionality, Yodobashi's accomplishment can be attributed to the co-evolutional interaction with the ERP firm.

4. Interpretation of the result of the empirical analysis

Three cases taken for comparative empirical analysis in Section 3 demonstrated successful SAP deployment.

Simple logistic growth (SLG)

K_K	a	b	adj. R^2	DW	AIC
36.351	32.678	0.147	0.991	1.86	57.39
(9.32)	(13.41)	(16.35)			



Logistic growth within a dynamic carrying capacity (LGDCC)

K_K	a	b	a_K	b_K	adj. R^2	DW	AIC
36.351	32.663	0.147	0.000	0.146	0.990	1.86	61.39
(9.56)	(4.54)	(17.14)	(0.00)	(0.26)			

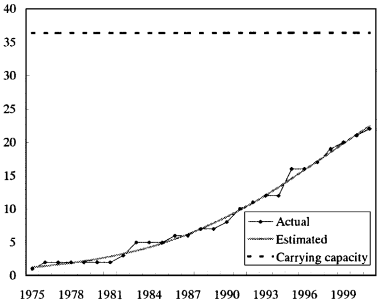


Fig. 6. Trends in the number of Yodobashi's stores and its carrying capacity.

All these firms made intensive and consistent efforts to optimize their resources by utilizing standardized ERP software. SAP considers these three cases as success stories and good references in its various occasions and publications. As demonstrated in Section 3 all succeeded in constructing a co-evolutional interacting system for global optimality leading to a self-propagating trajectory as shown in Fig. 2.

These successes can be attributed to the eight stepwise interactions shown in Fig. 2. While several critical success factors enabled these interactive processes to gain momentum, these processes differed in the cases. However, in all three cases the following factors were critical for success:

(i) quality of the functionality;
(ii) speed; and
(iii) customers' achievement of its business target.

When the ERP firm initiates the pilot projects for new functionality development, it envisages clear expected outcomes from the projects because:

(i) *Quality of the functionality*: the quality of functionalities is its core competence, the ERP firm wishes to get the highest standard in business requirements to cover the best business practice with new functionality.
(ii) *Speed*: the ERP firm wishes to use the pilot customer cases as a reference for the marketing, a fast and successful project cutover is key.
(iii) *Customers' achievement of its business target*: the ERP firm, in order to develop its own business, needs to demonstrate its customers' are growing and succeeding in the market, it strongly desires its customers business success.

At the same time, pilot customers themselves also have their own expected outcomes when participating in the pilot projects. These outcomes are not necessarily the same as the ERP firm. However, they are similar in direction since the success of each firm depends on the success of the other. The aligned customers' expectations are as follows.

(i) *Quality of the functionality*: customers wish the realization of their requirements as much as possible in the standard functionality.
(ii) *Speed*: customers wish to introduce new system earlier than their competitors.
(iii) *Customers' achievement of its business target*: visible business benefits, directly resulted from system introduction.

As described previously, while both parties' expectations are driven from different motivations, they aligned with each other along the same trajectory. They make every effort jointly, and sometimes independently, to complete the project successfully. Table 10 shows the evaluation of the three pilot projects in terms of the expectations described previously. Table 10 indicates that Yodobashi's project was extremely successful in this regard.

While all three customers continuously utilize ERP software and try to expand their application areas or numbers of production sites, Yodobashi maintains the clearest focus and the strongest leadership among them. Since the focal expectation of the IT project is an interpretation of the firm's IT strategy, every firm has a clear focus on the outcome of its project. Furthermore, as excellent IT strategy is always well integrated with the firm's business strategy, this integration enables Yodobashi to evaluate project outcomes by business contribution. In addition to these, Yodobashi's business nature and size functioned well in constructing a virtuous feedback cycle. Since it is a younger and smaller firm than MELCO and Marubeni, the impacts of ERP implementation project on the firm's business was very visible. Therefore, implementation efforts contributed directly to the firm's business improvement, leading to highly motivated business circumstance. Another identity of Yodobashi is strong leadership initiated by the manager responsible for the project. While all three projects appointed an executive manager as a project leader, this appointment remains only a formality in the MELCO and Marubeni projects, not necessarily an appointment of an active manager. In contrast, in Yodobashi, the corporate planning director actively worked for the project. He was thoroughly and solely responsible for the entire processes from the decision of ERP introduction to the implementation of the package best fit to Yodobashi's operation. This also demonstrated project members' and other employees' strong involvement in the project leading to the intensive support for the implementation.

Another remarkable difference between Yodobashi and the other two firms is that Yodobashi always pays attention to the firm's internal efficiency improvement and its service improvement to its customers (consumers). While MELCO demonstrated its location independence, agile production cycle and efficiency in its IT strategy, it did not translate these strategic actions actively into the customers domain. Marubeni's focus was also worldwide process standardization and efficiency improvement. This was internal rather than external. In contrast, Yodobashi's projects always connect its service to the customer. While its first ERP implementation started from human resources manage-

Table 10
Evaluation of the expectation to the management of the advanced innovation project

Evaluation points	MELCO	Marubeni	Yodobashi
Expectations of the ERP firm side			
1. To get the advanced and excellent business requirements to cover the best business practice with new functionality.	△	△	○
2. Fast and successful project cutover, to like to use the pilot customer case as the reference for marketing purpose	△	○	○
3. Pilot customers' business growth	○	△	○
Expectations of customers side			
1. Customer wants the realization their requirements as much as possible in the standard functionality	△	○	○
2. Customer wants to the quick introduction f new system especially in advance of competitors	△	○	○
3. Visible business benefit directly resulted from system introduction	△	△	○

ment, Yodobashi wished to implement a new employee evaluation system that directly connects its business target. In case of the IS-Retail project, Yodobashi wished to shorten the delivery time to minimize the time for providing its service to the customers. This is a critical success factor driving the project to superior outcome.

As highlighted before, the quality of the functionality, speed and customers' business achievement are particularly key points enabling both the ERP firm and ERP customers to follow the stepwise processes leading to a self-propagating trajectory through constructing a co-evolutional interacting system. All three projects examined demonstrated considerable achievement in these areas. However, Yodobashi's achievements with respect to these key points are conspicuous. This can be attributed to its business nature as a retailer and also partly to its business strategy. This achievement shows that the interaction between the ERP firm and its customers provides significant secondary impacts on the interaction between ERP customer and its customer (consumer), along the sell chain creating even more significant advanced innovation-oriented projects in a business field.

5. Conclusion

In light of the significance of the advanced innovation-oriented projects of firms while Japan is experiencing a vicious cycle between non-elastic institutions and insufficient utilization of the potential benefits of IT that impedes the structural change efforts of firms, this paper first focused on IT's self-propagating nature leading to creating new functionality during the course of interaction with institutions.

With an expectation of creating a similar self-propagating structure also in a business field, further focus of this paper moved to a dramatic advancement of ERP software in a co-evolutional way between convergence for the vendors strength and divergence for satisfying diversified customer expectations.

On the basis of the understanding that through multilayer virtuous cycle, resonance between inner virtuous cycle within the ERP firm and a co-evolutional interaction between internal motivation of the ERP firm and external expectation raised by customers would be the key to constructing a self-propagating structure, and that this resonance is not necessarily limited only an interaction between the ERP firm and ERP customers but also expected in an interaction between ERP customers and consumers as a secondary impacts of the initial interaction, a comparative empirical analysis on the interaction between the ERP firm and ERP customers with different business models was conducted.

The empirical analysis suggests as follows.

(i) The construction of a co-evolutional interacting system between the ERP firm and its customers leads to a self-propagating trajectory similar to IT's new functionality development and essential for the advanced innovation-oriented projects of firms.
(ii) In order to gain sufficient momentum for this system, it depends on specific stepwise interactive processes between the two actors.
(iii) While critical success factors for these interactive processes were not necessarily the same, all of these processes worked due to the following:

(a) quality of the functionality,
(b) speed,
(c) customers' achievement in its business target.

(iv) Importantly, the highest success was observed in the case in which the ERP customer always paid attention not only to its own internal efficiency improvement but also to its service improvement to its customers (consumers).
(v) In this highest success case, resonance is not only a necessary limited interaction between the ERP firm and ERP customer, but also in the interaction between this customer and consumers (its customers) as a secondary impacts of the initial interaction.

All these successful processes led to the following points as critical strategy for spurring and maintaining resonance:

(i) consistent sponsorship of management;
(ii) timely decision and agile exemption of the business;
(iii) delegation of firms with confident power.

Stimulated by these analysis focusing on an interaction between the ERP firm and ERP customer, further analysis should focus on the interaction between ERP customers and their consumers for identifying the general conditions essential for constructing a self-propagating structure for advanced innovation-oriented projects of firms.

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Chihiro Watanabe graduated from Tokyo University with a Bachelor's Degree in Engineering (urban planning) in 1968 and received his PhD (arts and sciences) in 1992, also from Tokyo University. He began his affiliation with the Ministry of International Trade and Industry (MITI) in 1968. He is a former Deputy Director-General of Technology Development in MITI. He is currently Professor of the Department of Industrial Engineering and Management, Tokyo Institute of Technology, and also Senior Advisor to a Director on Technology at the International Institute for Applied System Analysis (IIASA).

Masayo Hobo graduated from Kansai University with a Bachelor's Degree in Law in 1983. Afterwards, she received an MSIA Degree from the Carnegie Mellon University Graduate School of Industrial Administration in 1993. She worked for IBM Japan as management consultant, and SAP Japan and SAP AG as a Director of Advanced Solution Center. Currently she is a Representative Director of Viryanet Japan.