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E-Business Process Modeling Issues: From the Viewpoint of Inter-organizational Process Efficiency and Information Sharing

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Abstract

E-business process modeling is an important factor in developing schemes of e-business. In order to develop schemes of e-business in or among firms, they have to reform their business process and information systems, considering changes that enable the companies to achieve new value. In this paper, the authors overview related works on developing e-business schemes, consider issues concerning e-business process modeling issues especially for Japanese companies bearing in mind their management style, and propose the idea of a modeling tool for supporting inter-organizational process flow adjustment.

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Keywords: e-business process; business process modeling; process knowledge repository

1. Introduction

For more than a decade, the word “e-business” has been an important topic both in business and IT. There are various definitions of the word “e-business.” The term “e-business” was popularized as a slogan for a conscious strategy launched by IBM. The day before IBM’s e-business ad campaign appeared on Oct. 7, 1997, the Wall Street Journal said that Louis Gerstner, IBM’s CEO, wanted “to position IBM as a cutting-edge company and shake off for good its image as a stodgy, if reliable, supplier of computers to giant corporations [1].” E-business enables organizations to reduce costs, increase demand, and create new business models [2]. In order to develop schemes of e-business in or among firms, they have to restructure their business process and information systems, considering changes that enable the companies to attain new value. In this paper, the authors overview related works on developing e-business schemes, deliberate issues in e-business process modeling especially for Japanese companies considering their management style, and propose the idea of a modeling tool for supporting inter-organizational process flow adjustment.
2. Literature Review

Related works on developing e-business schemes can be classified as into certain categories as follows:

- **E-business implementation management**
  
  To realize the successful development of e-business schemes, implementation management is an important issue. Jansen et al. pointed out the difference between business process modeling and e-business process modeling [3], and mentioned that it is important not to forget the lessons learned from business process engineering, and in addition mentioning project management risks. Chauang and Shaw proposed a roadmap for e-business implementation [4]. Bendoly and Schoenherr analyzed the implementation process of ERP systems from the viewpoint of implications for B2B systems [5].

- **E-business investment**
  
  Like other implementations of new technologies, investment performance is an important concern in management. Koholi et al. studied the payoff of IT investment in e-business environments [6], and Amit and Zott considered value creation of e-business [7]. Certain metrics will help in analyzing the success of their e-business investments. Riggins and Mitra proposed a framework providing a methodology for mapping e-business applications within the proposed frameworks, which then can be used to generate three different types of metrics that should be considered in evaluating e-business strategic initiatives [8].

- **E-business process modeling (modeling methods, ontology for modeling, and modeling knowledge management)**
  
  E-business process modeling is important in the sense that process modeling is the process of developing schemes of e-business. Dufresne and Martin investigated how well various process models support e-business [9]. Kim and Ramkaran analyzed best practices in e-business process management extending a re-engineering framework [10]. Basu and Kumar pointed out workflow management issues in e-business [11].
  
  Osterwalder and Pigneur constructed and outlined an ontology (rigorous framework) for e-business models based on an extensive literature review, and insist that the understanding and use of e-business models is essential in an increasingly dynamic and uncertain business environment [12].
  
  Modeling knowledge management for modeling e-business is important in the sense that it would help ensure the feasibility of new processes. Xirogianni and Glykas proposed a method of intelligent modeling of e-business maturity [13].

- **E-business technology acceptance**
  
  A basic technology acceptance model (TAM) was proposed by Davis, which is a model of how users come to accept and use a technology [14]. The model suggests that a number of factors influence their decision about how and when they will use it when users are presented with a new technology. Bhattacherjee applied this model to e-commerce [15]. Zhe et al. focused on an empirical study on e-business adoption [16, 17, 18].

- **E-business strategy framework**
  
  As for e-business strategy, Li and Chang proposed a holistic framework of e-business strategy [19].

- **E-business execution knowledge management system**
  
  The knowledge management system for e-business can be classified into knowledge management for e-business process modeling and knowledge management system for e-business execution. As for the e-business execution system, Malhotra considered knowledge management for e-business performance [20].

In this paper, the authors focus on e-business process modeling issues and knowledge management for modeling, especially for Japanese firms or companies, or global companies that have subsidiaries in Japan. E-business process modeling is based on business process modeling methods. Related works on business process modeling can be classified into hierarchical business process modeling methods (e.g., IDEF [21] and the SCOR model [22]) and non-hierarchical business process modeling methods (e.g., the Sanno-dai Shiki flowchart [23] and the Japan Management Association (JMA) flowchart [24]) [25]. Non-hierarchical modeling methods such
as the Sanno-dai Shiki flowchart, the JMA flowchart, and the NOMA flowchart are major business process modeling methods because they enable people to trace flows from the starting point to the end point with a finger, and it is easy to share information when discussing it face to face, and they are thus suitable for a bottom-up-style organization. By this feature, Japanese companies can realize effective bottom-up-based business process improvement.

However, it is sometimes difficult to maintain business processes effectively because they are not usually managed as structured components, and this causes difficulty in standardization of the business process. Some Japanese companies have used widely spread business flowcharts (not containing hierarchical layers) on sheets of A0 size, for drawing up their business processes. For some Japanese companies, it is difficult to think about top-down layered business processes, and this situation sometimes makes it difficult to develop e-business process modeling schemes. Corresponding to this issue, the authors propose a modeling tool to support inter-organizational the interorganizational process flow adjustment described in the following chapters.


3.1. Characteristics of Traditional Business Process Improvement in Japan

When discussing the history of business process improvement in Japan, it is necessary to consider what has been referred to as “Japanese-style management.” The “lifetime employment system” and “labor participation in management” are two of the major characteristics of Japanese-style management. Quality circle (QC) activities have been conducted under these conditions, and they contribute to improving the quality of Japanese products. Not only to improve the quality of products, each employee observes the business process, and keeps making improvements where possible.

Business process improvement used to be undertaken in a bottom-up rather than a top-down style. Soui-Kufuu (a Japanese word) is one of the main keywords when discussing business process improvement in Japan. It means creative originality and ingenuity. Each motivated and skilled employee in a production line or back-office keeps improving the business process in their own way to make it more efficient. The accumulation of Soui-Kufuu results have become a kind of intellectual property. These are the reasons that the non-hierarchical business process modeling method has been preferred. By using this kind of chart, employees can share process flow information with each other. Also, recognition of ingenuity can be considered as one of the reasons that they tend to prefer custom-made software.

3.2. Impact of Environmental Change

As mentioned in the previous section, traditional (but after the 1950′s) Japanese-style management and Japanese-style business process modeling methods worked well and proved their effectiveness. However, the environment that Japanese companies are facing has changed drastically. For example, a decrease in sales due to shrinking of the domestic market requires companies to make efforts to reduce costs in order to maintain profits. Some companies have had to transfer production overseas in order to reduce labor costs. Because of this change in the environment, companies have had to adapt in ways such as the following:

- change business processes to realize enhancement in cost efficiency
- change business processes to realize integrated business processes corresponding to corporate marriage or enterprise integration within domestic or global
- improve information system operation efficiency (using packaged software is one option)
- improve system maintenance efficiency
- enhance information systems to enable analysis of business data to support management decision-making
- show agility in responding to environmental changes
Taking account of these issues, in the next chapter the authors propose a modeling tool to support inter-organizational process flow adjustment.

4. Modeling Tool for Supporting Inter-organizational Process Flow Adjustment

Considering the issues described above, the authors propose a business process modeling method that is hierarchically layered but in which it is possible to trace flow from the starting point to the end point using a finger, at a detailed level, as well as an inter-organizational (including group firms) adjustment activity. Our proposed tool is not exclusive to us alone, but it makes the existing tool more effective, especially in the case of inter-organizational process flow adjustment. It contains a business process knowledge management function with three knowledge categories.

4.1. Requirements for the Tool

The requirement for the modeling tool to support inter-organizational process flow adjustment can be described as follows;

- Each employee can recognize and accept the process flow of the main business processes: the process of the part of the business for which they are responsible, and the process of other sections are connected by a detailed process layer, and employees can discuss the process while tracing it with a finger. By these functions employees (end users) and information system staff can communicate easily and help the adjustment process effectively.
- Process components (hierarchical groups) can be easily seen: this function helps to maintain business process efficiency and also helps in standardizing business processes.
- The effect and influence of business process change can be seen by sections (from the management view and the employees’ view): by this function, relocation of human resources can be optimized from the viewpoint of overall process optimization.

4.2. Overview of the Tool

The overview function and specification of the modeling tool for supporting inter-organizational process flow adjustment can be described as follows:

- By opening up the higher layer process of the hierarchy, the lower layer process is revealed: by this function, the business process can be seen from the management perspective, and system maintenance efficiency will be improved.
- The lower layer process (production line and back-office level used by end users) is connected and available to look through by scrolling and scaling the chart on the screen: by this function, end users can discuss the process while tracing it with a finger.
- Detailed information, such as that used in traditional Japanese business process modeling methods, can be retained: by this function, business process improvement/re-engineering project failure caused by misunderstanding of To-be business process by end users will be solved.

The image of this tool is described in Figure 1 and 2.
4.3. Business Process Knowledge Management Function

In order to maintain the business process effectively in an environment of rapid change, a continuous improvement (Kaizen, originally a Japanese word) scheme would work well. Kaizen is a method that has been used in the Japanese automobile industry for a long time, but is now used in many companies over the world. It was developed in order to adjust to environmental change [27]. Jun et al. defined the concept of process knowledge and classified it into three types: process template knowledge, process instance knowledge, and process-related knowledge [28]:

- Process template knowledge: The process template plus analysis and simulation information derived from the template design phase. It also includes the history of the evolution of the template.
- Process instance knowledge: A set of process instance information along with process performance measurement according to the evaluation criteria of a given enterprise. It also contains information about environmental, resource, results, and so on.
- Process-related knowledge: A knowledge set created and used within a business process. General explicit knowledge of traditional knowledge management is summarized from the point of the process perspective.

The data items of “process instance knowledge” are usually stored in databases such as business process repositories. However, other knowledge groups, especially “process-related knowledge” (Table 1), would be effective for continuous improvement, because use of a template leads to standardization of business processes, and data items of “process-related knowledge” such as “expert’s know-how (post analysis report, problems and solutions, knowledge about customers and competitors, reasons for decisions taken in business
cases, and discussion protocols)” are important keys to improvement. Therefore, the authors will incorporate these data items into the prototype system of business process modeling tools.

<table>
<thead>
<tr>
<th>Structural Elements</th>
<th>Detail Elements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Knowledge Elements</td>
<td>Expert’s Know-how</td>
<td>Post analysis report, problems and solutions, knowledge about customers and competitors, reasons for decisions taken in business cases, protocols about discussions, reports about business cases, etc.</td>
</tr>
<tr>
<td></td>
<td>Expert</td>
<td>Information about experts for certain activities (e-mail, phone number, office, etc.)</td>
</tr>
<tr>
<td>Elements Required for Using Knowledge in Processes</td>
<td>Information from Users (Know-how)</td>
<td>Materials referred by performers during activity execution time and reports about activity execution made by performers after activity execution</td>
</tr>
<tr>
<td></td>
<td>Used Information, Execution Report</td>
<td>Evaluation criteria, evaluation result of the process-related knowledge</td>
</tr>
</tbody>
</table>

Table 1. Components of process-related knowledge [28]

4.4. Feedback from Potential Users and Future Research

The authors asked the opinions on the concept of our recommended modeling tools of potential users (employees in information system sections, and end users engaged in business process improvement projects, with several companies). Most of them gave positive feedback, because the tool offers both a sense of ease of connection of the process to end users and high level process viewpoint. However, some potential users were anxious about user interfaces, because some of them are used to using flow charts of blanket size (sometimes A0 size). For ease of use, ability to trace the line of the process with one’s finger is required, so the authors will consider this point when developing our prototype system. There were positive comments about sharing experts’ know-how linked with business processes, especially from business planning people. However, a detailed survey of many experts is required.

There are some tools offering a knowledge base for business process improvement from the viewpoint of the bottom layer of employees [30] [31]. Behind these tools lies the concept of promoting improvement triggered by Kizuki (findings) in employees’ daily work. The tools that the authors are proposing can be coupled with these tools. By this coupling, it will be possible to adjust the policy of top management to the findings of actual work.

E. Abo described partnership patterns between companies as a “chain mechanism.” He named certain coupling patterns, defined by H. R. Maturana (Fig. 3).

- Integrated Coupling: This is the type of coupling whereby the autopoiesis of element systems belongs to high level system. In other words, the autopoiesis of an element system does not work by itself, but by the autopoiesis of higher level systems.
- Network Coupling: Element systems are integrated, but this coupling does not work as autopoiesis. Element systems form a rough network.
- Mezzanine Coupling: Element systems form higher-level systems. Higher systems are units of autopoiesis, and element systems are also units of autopoiesis.

Inter-organizational adjustment type classification considering the chain mechanism of companies as well as industries (considering culture) is the next challenge for the authors.
5. Conclusion

The authors have discussed e-business process modeling, regarding traditional business process modeling methods and Japanese-style management. It is a fact that traditional Japanese-style management used to be successful; however, the environment that companies are facing is changing, and the requirements for e-business process improvement or re-engineering are also changing, so that the business process modeling method in turn needs to be enhanced, while maintaining the favorable characteristics of traditional methods. In this paper, the authors have proposed a modeling tool supporting inter-organizational process flow adjustment with a business process knowledge management function. This tool would respond to the requirements of both management and employees and help the inter-organization adjustment process of business process modeling. This tool also supports continuous improvement (Kaizen) of business processes by knowledge management functions. As a result, e-business implementation issues and other issues affecting some Japanese companies or subsidiaries of global companies in Japan mentioned in this paper would move toward being resolved. The tool can be a bridge to structural modeling for some Japanese, support the utilization of accumulated know-how, and achieve new value of the hierarchical modeling method (e.g., IDEF, ARIS [26], and DEMO [29]) at the same time. Though there are successful cases of drastic change with top down approach such as [32] [33], there are still many cases that companies are struggling against gaps mentioned in this paper. Though, it might be the tool for supporting a transitional condition for the some parts, the tool the authors propose in this paper might support some Japanese firms in a deadlock condition. For future research, the authors are planning to determine the detailed specifications of the tool and have it evaluated by various users such as management and end users.

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