Consideration of IT Investment Effect from the Viewpoint of Organizational Environment of Firms

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Abstract

In this paper, the authors discuss the information technology (IT) investment effect from the viewpoint of organizational environmental factors affecting firms. From the statistical data, Japan tends to spend much more on improving business operational efficiency compared to Western firms; however, the results do not seem to be effective enough. There are particular characteristics of the organizational environment of Japanese firms that may have a bearing on this. They include management style, employment style, skill distribution of employees, culture, and so on, and the effects of these characteristics are discussed in this paper, and some of the solutions for dealing with this issue are presented.

Keywords: information technology (IT) investment, investment effect, organizational environmental factors

1. Introduction

The importance of information technology (IT), especially for enterprise information systems is increasing because their role in supporting the achievement of business effectiveness is also increasing. Therefore, the best methods of effective IT investment have been investigated. The
relationship between investment in infrastructure and improvement of productivity has been discussed for many years. Most studies have mentioned that investment in firms should bring effectiveness sooner or later. However, the opinion that “Despite the enormous IT investment that has been made, productivity improvement cannot be affirmed statistically (so-called Thoreau paradox, or productivity paradox)” has been widely discussed (Brynjolfsson, 1992). There used to be several presumed reasons for this situation, such as shortage of IT investment, technical problem of statics that it is difficult to figure out the amount of IT implementations, and the time lag for achieving effectiveness. At present, the productivity paradox problem can be considered solved after productivity increased in the United States in the late 1990s (Ikeda, 2001). However, there are some data that show low productivity when using IT, despite computer-controlled production lines, throughout the whole country of Japan, though there have been some very successful cases.

2. Situation of IT investment

2.1. IT investment objectives and effect

The objective of IT investment may differ in each firm, however, there are various tendencies according to region, industry and so on. As for the regions, Figure 1 shows that Japanese firms tend to spend much more on improving business operational efficiency, in percentage, compare to firms in Western countries (Higano, 2009). However, the results do not seems to be effective enough (figure2). This situation may cause dissatisfaction among chief information officers (CIO). Research results have shown that the dissatisfaction level of top management is high. 46.9% of top management personnel answered “rather dissatisfied” and 14.0% answered “definitely dissatisfied” to a question (4-point scale) about the satisfaction with the information system of their firms (ERP Forum 2013) in Japan. This means about 60% of top management are unhappy with the information systems of their firms.
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2.2. Issues regarding system development costs and business process change

One of the reasons why information systems in firms are not effective enough is considered to be high development cost. It has been said that firms in Japan tend towards using custom-made software, and cautious regarding the installation of package software (Tanaka2010). Figure 3 shows International comparison of packaged software installation ratio (METI 2002). The packaged software installation ratio in Japan is low compare to the United States or some other countries in Asia and Europe, except computer aided design (CAD) system. Especially, installation ratio of ERP system is extremely low. Although cases of enterprise resource planning (ERP) system implementations had increased to about 50% (Figure 4) of the total enterprise system implementations, only limited modules are implemented in most cases (e.g. finance and accounting modules: 43.1%, sales modules: 25.7%, purchasing module: 24.3%)(ERP Forum 2013). And there are some cases that the firms can not achieve efficacy of ERP system that they are supposed to achieve, for the reason of the way of implementation are not adequate. Features of the way of IT implementation or management in Japan are also reason for this situation. Iizuka et al. found out from empirical data analysis that “degree of fit and gap” between business and ERP function is one of the factors that impact users’ satisfaction (Iizuka et al., 2012a). From the interviews conducted by the authors, many of the firms that reached their ERP project unsuccessful results tend to lay weight on their As-is process (the business processes of current business execution), and believes that preferable or ideal new business process (what is called To-be business process) should be the enhancement based on As-is process. Therefore some firms avoid choosing ERP, because there are large gap between As-is business process and ERP function, though the gap may be the possibility of improvement. For many years, some of the Japanese firms have been conducted As-is business process based improvement. As-is business process improvement can be considered as one of the reasons tend to use custom software. Figure 5 shows the ratio of IT investment of Japan, U.S. and Korea in 2005(Figure 5). Looking for data of Japan, ratio of software is low and development manpower cost is high, compare to those of U. S. and Korea. And Japanese firm seems to spend a lot of money on development manpower cost still in 2011 (Figure 6).
2.3. The scope of information system integration

Another factor that affects the IT investment effect can be considered the scope of information system integration (METI2013). Figure 7 shows the result of the survey about IT implementation stage conducted by the Ministry of Economy, Trade and Industry (METI) in Japan. The “IT utilization stage” is defined as follows (Figure 8):

- Stage 1: The information system is implemented.
- Stage 2: The information system is optimally utilized within a department or section within a firm.
- Stage 3: The information system is optimally utilized within an enterprise (expanded beyond departments or sections).
- Stage 4: The information system is optimally utilized among enterprises (including suppliers or customers).

The fact that about 70% of the firms are in stage 1 or stage 2 can be considered one of the reasons for the difficulty in implementing ERP systems in Japan, and the low effectiveness of IT investment in Japan. Behind this background, there is the culture of “Tatewari”, that is a kind of vertically-segmented administrative system organization which take “silo approach” in Japan. In the Tatewari type of organization, each section does not interfere to other departments, and everyone works hard only within the organization that they belong to.
3. Research trend about ERP implementation success (Literature Review)

Successful implementation of ERP systems can be considered as one of the solutions for improving the effectiveness of IT investment for some Japanese firms, since it might help to achieve cost effectiveness, and achieve value from new business processes. In this chapter, the authors will discuss critical success factors (CSF) of ERP implementation in Japan by looking through the relevant literature and considering the environment of Japanese firms. Literature for the survey was extracted from Google Scholar. The exact keywords were “ERP”, “ERP implementation success”, “Enterprise” and “CSFs”. This kind of extraction method has often been used in literature reviews recently (Schniederjans and Yadav, 2013) (Shah et al., 2011). By this method, 76 articles were extracted and used for the review (Takei and Iizuka 2013). The key items used for analyses were the date of publication, country, and the research trend by region are described in 3.2. Then about 50 of articles about CSF were reviewed and the CSF described in those articles were categorized. The major common CSF extracted from the literature were the cultural effect, management style, top management support, organizational fit, project team, interdepartmental co-operation, goals and objective, project management, user training, and various others.
3.1 Trends of ERP Research by Regions

In this section, the authors explain about the trends in ERP systems research. 86% of the reviewed articles about ERP systems focused on success factors. From the articles extracted, those focusing on countries were used for analysis (Table 1). Regarding numbers, the amount of literature about America (North and South America), and Europe is decreasing, though the amount for Middle East, Africa, and the Pacific is increasing (Table 1, Figure 9). From these results, it can be assumed that ERP systems have been more fully implemented in Western countries than in developing countries. In developing countries, firms need develop their business at rapid speed, ERP systems might meet their requirements. The differences in CSF by region can be explained as follows:

- **Common factors among countries**
  
  As mentioned in previous research, there are common CSF between countries (Shah et al., 2011).

- **Difference of BPR importance by regions**
  
  BPR used to be considered as an important CSF (Zhang et al 2003) (Finney and Corbett, 2007). However, some recent research results show that BPR is not always important (Wickramasinghe and Gunawardena, 2010) (Dezdar and Ainin, 2011). This trend is shown in countries in the regions of the Middle-east and south Asia.

- **Cultural effect on CSF**
  
  Some articles note that there are cultural effects on ERP system implementation results (Sawah et al, 2008). Most Belgian SMEs have a corporate culture that embraces change. As such, employees are accustomed to change, making change management a far less important issue (Doom et al, 2009).

- **Management style**
  
  Japanese management style is often discussed in regard to ERP system implementation, although the literature on ERP focusing on Japan is not extensive (Okabe, 2004). The authors mention this issue in the following section.
3.2 Importance of BPR

ERP are premised on BPR for implementation. Implementing an ERP system involves re-engineering the existing business processes to the best business standard. The organization should be prepared and ready for fundamental change to ensure the success of BPR (Zang et al., 2002). However, some recent research results show that BPR is not always important (Wickramasinghe and Gunawardena, 2010) (Dezdar and Ainin, 2011). This trend is shown in the countries in the regions of the Middle East and south Asia. Though there were articles which said that BPR is not such an important CSF in developing countries, a number of articles mostly in old papers focusing on Western countries insisted that BPR is important. As for Western countries, it can be considered that CSF are well-established compared to developing countries. This may one of the reasons why the numbers of articles are not increasing in this region. In developing countries, it can be considered that the stage of ERP implementation coincides with the business development stage. As for Japan, though the ERP implementation is not as wide as in Western countries, there are a number of firms who have been in business for long time in Japan (Nikkei Shimbunsha 2009). It is necessary to find a way to transform their business to achieve an IT investment effect.

4. Issue about BPR difficulty in Japan

4.1 BPR Implementation Status

Iizuka et al. found from statistical data analysis that the “degree of fit or gap” between business processes and ERP function is one of the factors that impacts user satisfaction with implementing information systems (Iizuka et al., 2013). From the interviews conducted by the authors, it was found that many firms that had
unsuccessful results with their ERP project tended to lay weight on their As-is processes (the business processes of current business execution), and believed that their preferable or ideal new business processes (which are called To-be processes) should be enhanced based on the As-is processes, although business process re-engineering (BPR) proposed by Hammer and Champy (1993) which advises drastic transformations has been a hot topic for decades. Therefore, some firms avoid choosing ERP because there are large gaps between the As-is business processes and the ERP functions, although it may possible for the gaps to be reduced. For some years, many Japanese firms had been conducting As-is processes-based improvement. Data from the survey conducted by the authors show that 72.9% of the respondents (managers of information systems, business planning, or internal audit divisions) stated that the policy of their BPR was “drastic BPR” but only 28.4% had attained it (Iizuka et al. 2013).

4.2 Age of the firms in Japan

One reason why it is difficult for Japanese firms to change their business may be the ages of the firms. Teikoku data bank, which is the largest corporate research provider founded in 1900, reported in September 2013 that there are about 26,000 firms in Japan that are more than 100 years old (Teikoku Data Bank 2013). Goto mentions that there are many firms with a long history in Japan (Nihon Keizai Shimbunsha, 2013). According to a survey conducted by him in The Graduate School for the Creation of New Photonics Industries, there are 3,113 firms that are more than 200 years old in Japan, and 1,563 such firms in Germany (Figure 12). The oldest firm in Japan is Kongo Gumi founded in 578, which was 1,435 years old in 2013. According to a report published by the Bank of Korea on May 14, 2008, there were 5,586 firms more than 200 years old in 41 countries. Of these, 3,146 are located in Japan, 837 in Germany, 222 in the Netherlands and 196 in France. 89.4% of the firms with more than 100 years of history are businesses employing fewer than 300 people (Yonhapnews 2008).

It is often said that since the Japanese are an agricultural people historically, so they had grew firms as growing foods crop. Sometimes this is considered the reason why merger and acquisition (M&A) used to be infrequent in Japan compared to overseas. However, most Japanese firms are exposed to international competition in modern times. Searching for ways to implement effective and drastic change is required, while taking advantage of the superiority through the long-held history.
4.3 Characteristics of traditional business process improvement and decision-making schemes 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 some of the major characteristics of Japanese-style management. Quality circle (QC) activities have been carried out in these conditions (jobs of employees are sufficient to provide a stable income, under lifetime employment), and they contribute to improving the quality of Japanese products (Nishi, 1993). Not only to improve the quality of products, but each employee also observes the business processes, and keeps making improvements where possible. Business process improvement used to be done in a bottom-up rather than a top-down style. “souï-kufuu in Japanese)” is one of the main keywords when discussing business process improvement in Japan (Iizuka et al, 2013). This word is often heard in end-user interviews, especially in small and medium-sized enterprises (SMEs) including firms that have world level technologies. 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 Souï-Kufuu results have become a kind of intellectual property. These are the reasons why the non-hierarchical business process modeling method has been preferred. By using that kind of chart, employees can share process flow information with each other. Also, recognition of ingenuity can be considered one of the reasons that they tend to prefer custom-made software. From the survey results analyzed by the authors about process defining decisions, it is possible to assume that attempts to adjust and align an appropriate decision with understandings of the difficulty impacts on the effect (satisfaction) with implementing information systems in their firms (Iizuka et al .2012b). As for the adjustment process, what is called “suriawase in Japanese)” is often thought to be important in Japan. The meaning of “suriawase” is close to “sync up”. “Sync up” is a way to try to achieve
mutual understanding and compromise among the people or in organizations, but without any decision-making process. Okui showed the difference between the United States and Japan in the decision-making schemes of professional baseball teams. He mentioned that managers of the Japanese professional baseball team have to make appropriate use of both commands and requests (and are torn between conflicting demands) with the general manager and players. Compared to this situation, the decision-making scheme in U.S. professional baseball teams is a rather simple top-down type (Fig. 13), and the decision-making scheme in firms is similar to the pattern of baseball teams (Okui, 2005). In the suriawase (sync up) type organizations, decisions are made using a bottom-up style, and discussions tend to take the form of exchanged equivocal opinions, the conduct code is “prioritize employees’ experience”, and the evaluation method is horizontal evaluation (Okui, 2005).

4.4 Skills of the workers

There are characteristics in worker’s skill about distribution in statics, in Japan. According to the Program for the International Assessment of Adult Competencies (PIAAC) conducted by the Organization for Economic Co-operation and Development (OECD), Japan marked the highest score for the assessment of 24 countries (OECD, 2013). is an international survey conducted in 33 countries as part of the Programme for the International Assessment of Adult Competencies (PIAAC). It measures the key cognitive and workplace skills needed for individuals to participate in society and for economies to prosper. The first results from the Survey were released on 8th October 2013 (PIAAC 2013). The key focus areas of the survey are literacy, numerical skills and problem-solving skills in IT-based environments. Though average score of Japan for “literacy”, and “numerical skills” were best in 24 countries, the score of “problem-solving skills in IT-based environments” is about average score which was 10th among 24 countries (Figure 14). Japan has the smallest difference in score points between adults at the 5th percentile and adults at the 95th percentile (129 points). The OECD average is 155 points (Figure 15). Figure 16 shows the total literacy score summarized by worker level. The margin between worker level differences is very small, comparable to the United States or Germany. This fact can be considered one of the reasons why non-management employees working on production lines or in back offices are tend to try their work to be effective. And since they are trying to seek the way of improving effectiveness by themselves, it is not easy to adopt top down management culture. As for “problem-solving skills in IT-based environments”, the distribution of skill is rather large, that means there are much more difference of ability among the nation, compare to literacy and numerical skills. People sometimes tend to focus on technical skills in IT. IT skills with problem-solving skills will be further developed and required, from now on.
5. Discussion

Traditional Japanese-style management has worked well and proved its effectiveness since the 1950s. However, the environment that many firms in Japan are facing is changing (e.g., a decrease in sales due to shrinkage of the domestic market requires firms to make efforts to reduce costs in order to maintain profits. Some firms have had to transfer production to overseas in order to reduce labor costs.) Though firms in Japan have tried to increase efficiency within their small organization scope (Tatewari organization) by skilled employees, they might change their business in more significant ways to achieve greater effectiveness.

However the strengths of Japanese firms should not be lost. Recognizing the total value of workers at all levels and knowing how each of their missions is positioned
within the whole firm is important. Considering this issue is vital for changing the business process to make it more effective.

Another thing to be considered is how firms can change or develop an effective business process in overseas operations. Most of the overseas affiliated firms or firms of Japanese firms have business with customers or suppliers as follows: affiliated firms of Japanese firms, firms whose head office is in that area, other organizations (e.g. in the public sector). Therefore, business process re-engineering or business process development should be addressed at standardization (at global and local levels) to achieve effectiveness in the business process adjustment process (with local management and employees), types of relationship with customers.

6. Conclusion and future research

The purpose of this paper is to consider the IT investment effectiveness of firms, especially Japanese firms and their affiliate firms, by looking at the condition of the Japanese firm’s environment. Ways for practitioners and consultants to adjust organizations and realize further effectiveness by aiming at overall optimization are required. Though there are successful cases of drastic change using the top-down approach, there are still many cases where firms struggling to change their business drastically. As one solution, the authors propose a computer-aided tool for adjusting the new business process from the viewpoint of top management and employees. Though, it might be a transitional condition for the some parts, the tool might support some Japanese firms facing a deadlock situation. For future research, regarding the tool development, 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. As for searching for a way to achieve effectiveness for Japanese firms, the authors will conduct new surveys to analyze relationship between organizational condition and effectiveness.

Acknowledgment

This work was supported in part by a JSPS Grant-in-Aid for Scientific Research in Japan (24530425). Also, we really appreciate the firms who cooperated in the interviews.
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