

Article

Consideration of ERP Effectiveness: From the Perspective of ERP Implementation Policy and Operational Effectiveness

Haruna Jinno ^{1,2}, Hiromichi Abe ¹ and Kayo Iizuka ^{1,*}

¹ School of Network and Information, Sensu University, 2-1-1 Higashimita, Tama-ku, Kawasaki, Kanagawa 214-8580, Japan; haruna.jnn@gmail.com (H.J.); hiromichi.abe1@gmail.com (H.A.)

² Graduate School of Informatics and Engineering, The University of Electro-Communications, 1-5-1 Chofugaoka, Chofu, Tokyo 182-8585, Japan

* Correspondence: iizuka@isc.senshu-u.ac.jp; Tel.: +81-44-911-1261

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Abstract: The aim of this paper is to present the results of an analysis of implementing enterprise resource planning (ERP) effectiveness from the perspective of implementation policy and operational effectiveness. Re-engineering has become increasingly important recently due to the rapid changes in the business environment. By implementing ERP systems, companies can standardize their business processes and thereby manage them more effectively and efficiently. However, it is difficult to achieve that kind of effectiveness and efficiency by just implementing ERP. Companies want to know the suitable way to achieve effectiveness. In Japan, ERP systems started to be implemented in the 1990s, and the installation rate to the whole enterprise system is increasing yearly in Japan. However, there are some companies that cannot achieve effectiveness, though some companies have succeeded. The authors developed a model focusing on implementation policy and customization policy, and analyzed the survey results. Data used for the analysis (182 samples) was from the ERP Users' Survey (2013). For the analysis method, covariance structure analysis using IBM®SPSS®Amos provided by International Business Machines (IBM) Corporation was conducted. This research aimed to contribute to the successful implementation of ERP in Japan.

Keywords: enterprise resource planning (ERP) system; success factor; customize policy; operational efficiency; cooperational efficiency

1. Introduction

Re-engineering has become increasingly important recently due to the rapid changes in the business environment. Michael Hammer insists that organizations must change their priorities, because reengineering is the only solution for adapting well to the change (Hammer and Stanton, 1995) [1]. As Hammer (1996) indicated by stating “business success results from superior processes performance”, some companies achieve advantages from re-engineering [2]. The enterprise resource planning (ERP) system is one of the tools for realizing re-engineering. Use of ERP systems is now the most common Information Technology (IT) strategy for all organizations (Holland and Light 1999) [3]. ERP systems are powerful software packages that enable businesses to integrate a variety of disparate functions [4]. O’Leary mentions that ERP can be used to help firms create value. By implementing ERP systems, companies can standardize their business processes and thereby manage them more effectively and efficiently. However, it is difficult to achieve that kind of effectiveness and efficiency by just implementing ERP. Companies have to know the suitable way to achieve effectiveness. ERP systems started to be implemented in Japan in the 1990s, and the installation rate to the whole

enterprise system is increasing yearly in Japan (ERP2014) up to 34.9% in 2014 [5]. However, it is often said that the success rate of ERP projects is not high in Japan. The reasons for this situation may be the characteristics of Japanese firms, such as their way of changing their business processes and IT [6]. Japan’s situation is unique. Although Japanese organizations emphasize process management, Japan’s geographic/regional location and IT culture contain ERP usage. Japanese organizations emphasize employee loyalty and provide all means to retain employees. Business process re-engineering (BPR) before implementing ERP violates this policy and restricts the use of ERP. Instead, they build systems in-house or customize existing software [7]. There are some data showing that Japanese companies tend to spend a lot more on improving business operational efficiency, compared to companies in Western countries [8]. Companies in Japan tend to use custom-made software, and are more cautious regarding the installation of packaged software, compared to the United States or other Western countries [9–11]. Their preference for using custom software can be seen even when implementing packaged software. When a conflict occurs between divisions or sections in a firm when determining a new business process, an approach such as the greatest common divisor is often taken. This approach easily increases the steps of the programs [12]. There is a deep gap between the result of the behavior of many Japanese firms when implementing ERP and the effectiveness that they want to achieve by such implementation. Iizuka et al. mentioned that the difference in BPR policy makes differences in the effectiveness [10]. The focus of [10] was the difference between drastic BPR and as-is based improvement, however there seems to be more room to analyze with implementation policy, such as business focused implementation or IT focused implementation. In this paper, the authors present the result of an analysis of ERP effectiveness from the perspective of ERP implementation policy and operational effectiveness.

2. Literature Review

There are many categories of research targeted at ERP, such as the critical success factors (CSF) of implementing ERP, project management, and so on. Successful implementation of ERP can be considered as a critical solution 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 [13]. Therefore, seeking the critical success factors of ERP implementation is quite worthwhile. Major CSF pointed out from the research results are, BPR [14–16], top management support or commitment [15,17], and so on.

Takei et al. mentioned that 86% of the reviewed articles about ERP systems focused on success factors [13]. Therefore, CSF is considered the most important issue for ERP implementation. As seen in Table 1, regarding numbers, the amount of literature about America (North and South America), and Europe is decreasing, though the amount for the Middle East, Africa, and the Pacific is increasing (Table 1, Figure 1).

Table 1. Classification based on the publication region (Takei et al. 2014 [13]).

1999–2001		2002–2004		2005–2007		2008–2010		2011–2013	
USA	7	China	1	Canada	1	Belgium	1	China	2
UK	2	Italy	1	China	2	Egypt	2	India	3
Singapore	1	Korea	2	India	1	India	1	Iran	5
		Saudi Arabia	1	Malaysia	3	Malaysia	1	Malaysia	2
		Singapore	1	Poland	1	Pakistan	1	Pakistan	1
		Netherlands	1	Slovenia	1	Slovenia	1	Saudi Arabia	1
		Turkey	1	Sweden	1	Taiwan	1	Taiwan	1
		UK	1	Taiwan	1	UAE	1	UAE	1
		USA	10	USA	9	USA	1	USA	2
Total	10		19		20		10		18

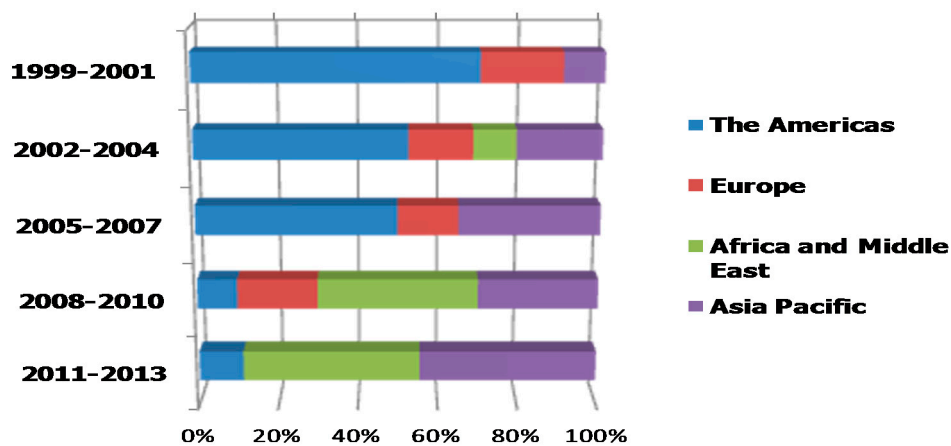


Figure 1. Trend analysis of publications (Takei et al., 2014 [13]).

From these results, it can be assumed that ERP systems have been more fully implemented in Western countries than in developing countries. BPR has been one of the critical success factors (CSFs) in Western countries, and some methodologies or tools that support BPR have been established. However, in developing countries, firms need to develop their business at a rapid speed, so ERP systems might meet their requirements [13]. Takei et al. mentioned that some recent research results show that BPR is not always important. This trend is shown in the countries in the regions of the Middle east and south Asia [13]. In Asia, such as Malaysia, a key factor of adopting IT is related to organizational factors such as external pressure, top management [18]. 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). 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 [6]. Iizuka et al. mentioned from their research 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, rather than drastic business process changes.

As for the ERP issues, there is some work related to the advanced technologies such as mobile solution in ERP [19,20]. These solutions are related to defining new business processes rather than business process re-engineering. The authors will focus on BPR in this paper.

The reasons why many companies in Japan are vigorously accepting ERP packaged software are: firstly, the project organization structure and human resources for ERP are not mature, and secondly, the effects are not easy to grasp [21]. However, there are some successful cases of ERP implementation in Japan. Table 2 shows one of the effective cases of ERP implementation, which realized a reduction of 120 million yen in running costs per year [12].

Table 2. A case showing achievement of effectiveness from ERP implementation (Kumazawa 2004 [12]).

<i>Before ERP</i>			
Machine's Name	Purpose	Item of Payment	Expense/Year
System-1	Sales management of SPS.	Machine Lease	4750
		System Charge	6000
		Operation Charge	26,000
		Maintenance Charge	20,000
		System-1 Total	56,750
System-2	Production of SPS. (inventory, MRP, Purchase)	Machine Lease	0
		System Charge	0
		Operation Charge	24,000
		Maintenance Charge	10,000
		System-2 Total	34,000
System-3	Production of SPS. (cost, inventory, WIP, Purchase)	Machine Lease	1980
		System Charge	1200
		Operation Charge	0
		Maintenance Charge	5000
		System-3 Total	8180
Outsourcing	Human Resource	Total	16,800
System-4	Sales management of SP. Production of SP. All of accounting.	Machine Lease	22,000
		System Charge	14,000
		Operation Charge	30,000
		Maintenance Charge	70,000
		System-4 Total	136,000
Total Running Cost		Machine Lease	28,730
		System Charge	21,200
		Operation Charge	80,000
		Maintenance Charge	105,000
		Others	16,800
		G-Total	251,730
<i>After ERP</i>			
Machine's Name	Purpose	Item of Payment	Expense/Year
Hard Ware	Multi Interface Server	2,900,000	30,332
	Human Resource Server	1,880,000	
	ERP Main Server	137,500,000	
	ERP Development Server	7,500,000	
	Multi Report Server	1,880,000	
ERP (Annual Supporting Fee)			19,872
Developing Tool (Annual Supporting Fee)			193
MRP Planner (Annual Supporting Fee)			5904
Multi Interface (Annual Supporting Fee)			1958
Multi Report (Annual Supporting Fee)			1760
Human Resource/Salary & Add-on (Annual Supporting Fee)			1958
Fixed Assets (Annual Supporting Fee)			336
System charge			8000
Operation charge			50,000
Total Running Cost			120,313
Estimate of Total Cost Reduction/Year			−131,417

It might be useful for Japanese firms to not only consider how to adjust their management style and implementation, but also to consider how to manage and develop their global business [13]. The authors developed a model to find out how to achieve effectiveness of ERP implementation in Japan, considering implementation policy and operational effectiveness. Details of the results are given in the next chapter.

3. Analysis of Customer Satisfaction Structure

3.1. Conceptual Research Framework and Hypothesis

In this chapter, the authors describe the result of an analysis of the ERP implementation satisfaction structure. Satisfaction items consisted of operational satisfaction and standardization policy. Since the authors have mentioned that Japanese firms want to improve their operational efficiency, it would be useful to determine the structure of the satisfaction structure, including operational satisfaction and implementation activities. Figure 2 is the conceptual model for analysis.

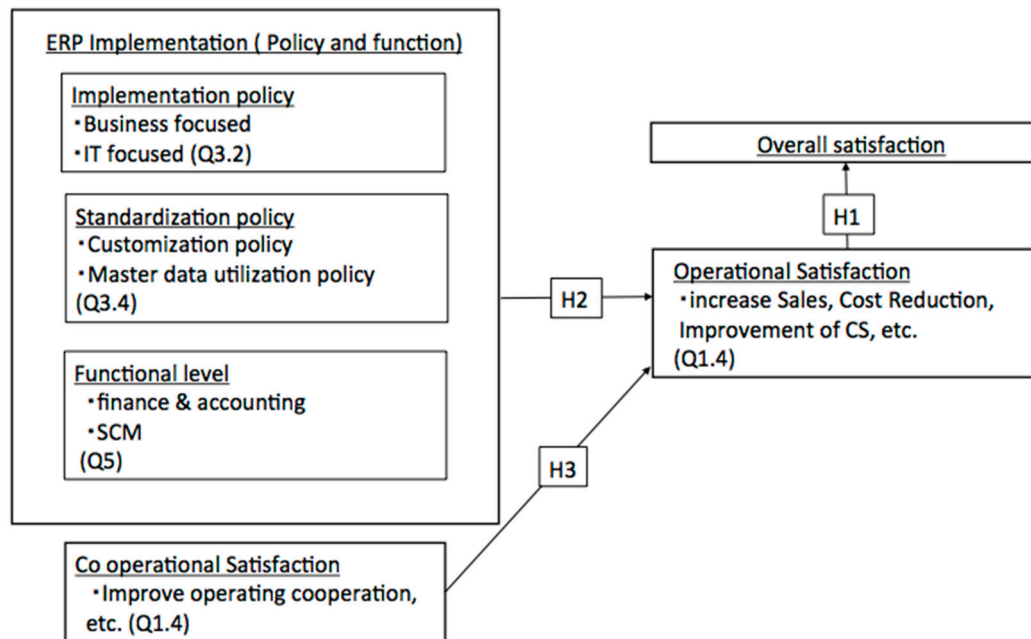


Figure 2. The conceptual model.

The major 3 hypotheses based on the conceptual model (Figure 2) for the analysis are as follows;

Hypothesis 1 (H1): *Operational satisfaction has a positive impact on overall satisfaction.*

Since “ERP can be used to help firms create value (O’Leary, 2000),” companies want to achieve value [4]. It is easy to understand that overall satisfaction will increase if operational satisfaction meets companies’ expectations. The research items for operational satisfaction are defined as follows: understanding business performance rapidly at company level; prompt implementation of accounting settlements; managing the enterprise information system at a global level; cost reduction; agile IT implementation forcing BPR and corresponding to International Financial Reporting Standards (IFRS).

Hypothesis 2 (H2): *ERP implementation (policies and functions) have a positive impact on operational satisfaction.*

Much of the research concerning ERP effectiveness has tried to analyze the relationship between ERP implementation activities and organizations. However, implementation policies such as customization policies have not been considered important factors. As for Japanese companies, the package software customization issue is important, and implementation policies with software functionality are defined as items for analysis. The research items for policies and functions are defined as follows: customization policy; master data utilization; IT-focused implementation; business-focused implementation; functional level of Enterprise Performance Management (EPM)

and Business Intelligence (BI) systems; functional level of marketing and sales systems; functional level of finance and accounting systems; functional level of global Supply Chain Management (SCM) systems. Customization policy was scaled with the degree of standardization focus and narrow down the customized function by degree of criticality of the business processes.

Hypothesis 3 (H3): *Cooperational satisfaction has a positive impact on operational satisfaction.*

Since ERP systems are aimed at realizing effectiveness targeted at a wide range, which means not only for one division, cooperational effectiveness or satisfaction might be quite important. The research items for cooperational satisfaction are defined as follows: information utilization; inventory reduction by supply chain improvement; and improvement of customer satisfaction.

3.2. Research Result

Data used for analysis was from the ERP Users' Survey (2013) [21]. This survey was conducted by the ERP Forum in Japan and Impress Japan Ltd. (Ibaraki, Japan). The ERP forum is a (non-profit organization) NPO, founded in 1996 with 200 member companies (system integrators, consultants, ERP vendors, and major Japanese practitioner companies). Impress Japan Ltd. is one of the major publishers dealing with IT and the media. *IT Leaders* is a well-known magazine. The survey was conducted in the form of a web questionnaire, and respondents were solicited via an e-mail magazine sent to readers of *IT Leaders*. This data may be valuable since the respondents were individuals with awareness of IT issues.

For the survey, 350 samples were gathered, and 182 samples, that were answers from firms that had implemented ERP, were used for analysis. Table 3 shows the profile of the survey data.

Table 3. Profile of survey data.

Annual Sales	Frequency	Percentage
Above 1000T	18	10%
Between 300B and 1T	21	12%
Between 100B and 300B	27	15%
Between 50B and 100B	23	13%
Between 30B and 50B	15	8%
Between 10B and 30B	36	20%
Between 5B and 10B	13	7%
Under 5B	29	16%
Total	182	100%
Industry	Frequency	Percentage
Service	31	17%
Finance business	5	3%
Public corporation	0	0%
IT firm	48	26%
Industry	82	45%
Distribution	16	9%
Total	182	100%
Organization (Department/Section)	Frequency	Percentage
Chief Information Officer (CIO)	5	3%
IT	105	58%
Business planning	11	6%
Chief Executive Officer (CEO), Executive team	9	5%
System user	52	29%
Total	182	100%

The analysis was performed based on the model shown in Figure 2, and the results are shown in Figure 3 and Tables 4–6. Operational satisfaction such as understanding business performance; prompt implementation of accounting settlements; managing enterprise information systems at a global level; cost reduction; agile IT implementation forcing BPR, and corresponding to IFRS, shows a positive impact on overall satisfaction. ERP implementation policy and functions such as, customization policy; business focused implementation; functional level of EPM and BI systems; functional level of marketing and sales systems; functional level of finance and accounting systems; and functional level of global SCM systems, showed positive impacts on operational satisfaction. However, the survey items “master data utilization” and “IT focused implementation” did not show significant results. That is to say that the elements of implementation policy such as customization policy and business focus are important with functionality of the business modules; on the other hand, IT-focused issues, including master data utilization or standardization, are not so important as business-focused issues. Cooperational satisfaction, such as information utilization, inventory reduction by supply chain improvement, and improvement of customer satisfaction, showed positive impacts on operational satisfaction. Hypotheses 1 to 3 are supported by the analysis result.

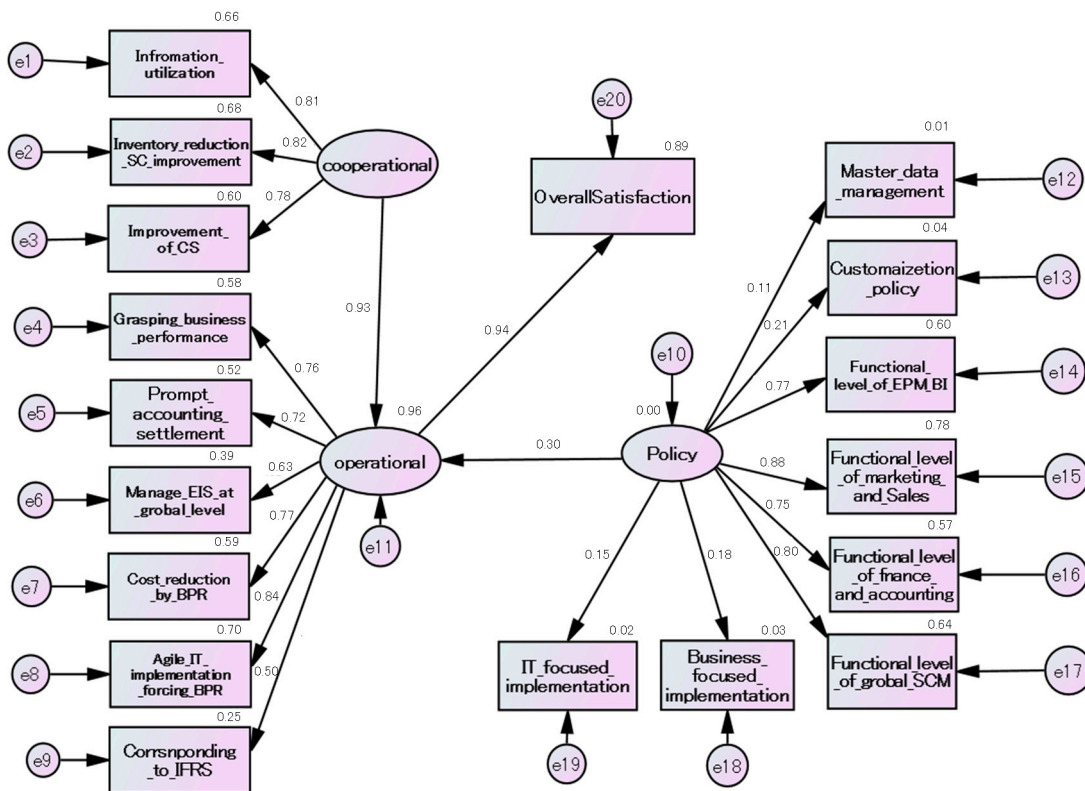


Figure 3. Significant and insignificant path coefficients.

Table 4. Significant and insignificant path coefficients (Regression Weight).

	Path		Estimate	S.E.	C.R.	P	
	Operational_satisfaction	<—	Cooperational_satisfaction	0.648	0.112	5.798	***
	Operational_satisfaction	<—	Policy_and_activity	0.200	0.047	4.307	***
	Improvement_of_CS	<—	Cooperational_satisfaction	1.000			
Inventory_reduction_SC_improvement		<—	Cooperational_satisfaction	1.120	0.106	10.617	***
Information_utilization		<—	Cooperational_satisfaction	1.061	0.095	11.157	***
Cost_reduction_by_BPR		<—	Operational_satisfaction	1.372	0.230	5.973	***
Manage_EIS_at_global_level		<—	Operational_satisfaction	1.209	0.231	5.241	***
Prompt_accounting_settlement		<—	Operational_satisfaction	1.335	0.229	5.838	***
Grasping_business_performance		<—	Operational_satisfaction	1.435	0.241	5.954	***
OverallSatisfaction		<—	Operational_satisfaction	1.549	0.243	6.369	***
Agile_IT_implementation_forcing_BPR		<—	Operational_satisfaction	1.530	0.249	6.148	***
Corrsnponding_to_IFRS		<—	Operational_satisfaction	1.000			
Function_o_level_of_global_SCM		<—	Impremention_policy	1.029	0.141	7.287	***
Functiona_level_of_fnance_and_accounting		<—	Impremention_policy	0.874	0.108	8.059	***
Functiona_level_of_marketing_and_Sales		<—	Impremention_policy	1.124	0.128	8.757	***
Functional_level_of_EPM_BI		<—	Impremention_policy	1.000			
Customaization_policy		<—	Impremention_policy	0.306	0.127	2.411	**
Master_data_management		<—	Policy_and_activity	0.145	0.110	1.312	0.190
Business_focused_implementation		<—	Policy_and_activity	0.229	0.112	2.040	**
IT_focused_implementation		<—	Policy_and_activity	0.153	0.104	1.469	0.142

Note: S.E. = Standard Error; C.R. = Critical Ratio; P = Probability; *** $p < 0.001$; ** $p < 0.01$.

Table 5. Significant and insignificant path coefficients (Standardized regression).

	Path		Estimate	
	Operational_satisfaction	<—	Cooperational_satisfaction	0.932
	Operational_satisfaction	<—	Impremention_policy	0.297
	Improvement_of_CS	<—	Cooperational_satisfaction	0.776
Inventory_reduction_SC_improvement		<—	Cooperational_satisfaction	0.825
Information_utilization		<—	Cooperational_satisfaction	0.814
Cost_reduction_by_BPR		<—	Operational_satisfaction	0.769
Manage_EIS_at_global_level		<—	Operational_satisfaction	0.627
Prompt_accounting_settlement		<—	Operational_satisfaction	0.721
Grasping_business_performance		<—	Operational_satisfaction	0.759
OverallSatisfaction		<—	Operational_satisfaction	0.943
Agile_IT_implementation_forcing_BPR		<—	Operational_satisfaction	0.839
Corrsnponding_to_IFRS		<—	Operational_satisfaction	0.503
Function_o_level_of_global_SCM		<—	Impremention_policy	0.800
Functiona_level_of_fnance_and_accounting		<—	Impremention_policy	0.754
Functiona_level_of_marketing_and_Sales		<—	Impremention_policy	0.882
Functional_level_of_EPM_BI		<—	Impremention_policy	0.775
Customaization_policy		<—	Impremention_policy	0.208
Master_data_management		<—	Impremention_policy	0.112
Business_focused_implementation		<—	Impremention_policy	0.183
IT_focused_implementation		<—	Impremention_policy	0.147

Table 6. Significant and insignificant path coefficients (Variances).

	Estimate	S.E.	C.R.	P	Label
Cooperational_satisfaction	0.337	0.059	5.735	***	
e10	0.356	0.076	4.720	***	
e11	0.007	0.006	1.105	0.269	
e1	0.193	0.026	7.431	***	
e2	0.198	0.031	6.493	***	
e3	0.223	0.029	7.582	***	
e4	0.246	0.028	8.711	***	
e5	0.268	0.030	8.861	***	
e6	0.366	0.047	7.763	***	
e7	0.211	0.025	8.583	***	
e8	0.160	0.020	8.000	***	
e9	0.479	0.060	7.955	***	
e12	0.585	0.062	9.399	***	
e13	0.737	0.080	9.231	***	
e14	0.237	0.042	5.585	***	
e15	0.129	0.036	3.628	***	
e16	0.207	0.034	6.168	***	
e17	0.212	0.048	4.451	***	
e18	0.536	0.061	8.859	***	
e19	0.380	0.048	7.959	***	
e20	0.049	0.009	5.189	***	

Note: S.E. = Standard Error; C.R. = Critical Ratio; P = Probability; *** $p < 0.001$; ** $p < 0.01$.

4. Conclusions

The implementation of ERP systems is increasing in Japan. However, there is much customization and many add-on programs compared to European and American countries, and it is said that this is the reason for dissatisfaction regarding ERP implementation. In order to achieve greater effectiveness of ERP implementation, customization and add-on programs should not be used too much, because they will reduce the advantages of ERP systems that help to standardize the business processes of companies. Nevertheless, why did so much customization and use of add-ons occur at the time of ERP implementation in Japan? Because it is difficult for them to throw away existing business processes in the existing way. "Japan's economic strengths are legendary, but its cultural weaknesses are now becoming apparent as well: a preference for consensus over creativity, for gradual rather than radical change. Moreover, if in the United States individualism has gone too far, then Japan and some other Asian cultures have erred in the opposite direction. While people in East Asian companies may excel at cooperation and team work, cultural norms there often discourage the kind of open criticism, free inquiry, and useful conflict that generate energy and innovation. If confrontation and losing face are taboo, outdated methods will not be challenged" (Hammer and Champy) [2]. This explanation disagrees with the use of an ideal ERP package. Thus, the key to satisfaction with the implementation of ERP is to exclude compromise. The results of this study, in terms of deciding to customize the policy and promoting its introduction to ascertain how much the business is affected, it can be said that the best policy in enhancing the overall effect is ERP. However, just by throwing away existing business processes, including the processes that are the source of superiority, and making ERP implementation IT-focused, it is difficult to achieve effectiveness of ERP implementation. Therefore, it becomes important to seek business-focused objectives and suitable customization policy. Iizuka et al. mentioned that there are differences in BPR effectiveness depending on the business process notation structure that the company uses [22]. For future research, the authors will analyze how customization policy works, concerning business process notation structure.

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