ANALYSIS OF EFFECTIVE APPROACH FOR BUSINESS PROCESS RE-ENGINEERING
From the Perspective of Organizational Factors

Kayo Iizuka

School of Network and Information, Senshu University, Tokio, Japan

Yasuki Iizuka

School of Science, Tokai University, Tokio, Japan

Kazuhiko Tsuda

Graduate School of Business Science, University of Tsukuba, Ibarati, Japan

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Abstract: This paper presents analysis results of business process re-engineering (BPR) effects including customer satisfaction and their formative factors. Although BPR has been studied for some decades, additional issues have come into existence recently, *e.g.,* balance of efficiency and internal control (including information security management), organization reform or enterprise integration including the causes of recent economic circumstances. Analyses in this paper are aimed at addressing these issues. By clarifying the mechanism for achieving BPR effectiveness, analysis is focused on organization perspectives and communication infrastructure.

1 INTRODUCTION

Various methods have been used to evaluate information systems and business process re-engineering (BPR). However, attempts to evaluate the total system integration service have been lagging somewhat behind that of other evaluation methods which have focused on the technical aspects of information systems. Some of the system integrators had started to conduct customer satisfaction surveys that focus on each element of current system integration satisfaction scored by IT sections, although satisfaction of the system integration service is implicated by various organizations within each firm, not just the IT section.

Iizuka attempted to construct a customer satisfaction structure model of system integration service from the perspective of organization structure (Iizuka 1993, 1999). Some satisfaction theories that had been adapted to consumer products

(Hannan 1989) (Shimakuchi 1986), etc.) were arranged to create a satisfaction structure model. Correlation between 'expectation', 'performance' and 'current satisfaction' was analyzed and verified. Organization behavioural factors and theories such as those proposed by Sheth were also arranged and built into the model (Sheth 1977). Survey sheets were sent to three sections (IT sections, business planning sections, and end user sections) for each firm, in order to analyze aggregated organizational satisfaction structure. In 1997, Chikara adapted customer satisfaction theories (Shimakuchi 1998) to the information system audit area. The customer satisfaction model was used as part of the audit items (Chikara1997), and it was heralded as a type of epoch-making research. Although these trials for applying customer satisfaction theories to system information evaluation were successful at the time, some relevant issues did emerge. Various relationship types between the IT section and business planning (BP) section were identified. The

structure of an organization is one such example; the IT section and business planning section are independent sections in some firms, but they belong to the same superordinate organization in other firms; the IT section is part of the business planning section in some firms, and all IT service functionality is supported by IT subsidiary companies in other firms. BPR policy is another aspect that also shows variety; drastic business process re-engineering and the as-is process are based on business improvement. System implementation policy also shows variety, such as "system specification should comply with user business process requirements", or "define business process considering IT capability". In order to clarify customer satisfaction structure considering these relevant issues, we created and conducted another customer survey and analyzed it from various aspects. The details are described in later chapters.

2 RELATED WORKS

Related works about the BPR effect induced by IT implementation or IT operation could be classified into analysis of success factors of IT implementation, analysis of success factors of IT management, and return on investment of IT. Based on the BPR theory presented by Hammer and Champy, researchers had conducted studies from various perspectives (Hammer 1993). Grover focused on the implementation problem (Grover 1995), Earl analyzed the relationship between BPR and strategic planning (Earl 1995), and Attaran explored the relationship between IT and BPR from capabilities and barriers to effective implementation (Attaran 2004). Taguchi analyzed the success factors of IT management, especially for ERP systems (Taguchi 2007). Kadono focused on the mechanism of how IT creates business value, particularly from the viewpoint of IT management (Kadono 2006). Chikara attempted to adapt the customer satisfaction method to the information system as part of the information system audit measurement (Chikara 1997). However, these works do not thoroughly focus on the relationship of organizations or the difference of the satisfaction structure of organizational sections. Moreover, there are additional issues that have come to light recently, *e.g.*, balance of efficiency and internal control (including information security management), organization reform or enterprise integration including the causes of recent economic

circumstances. In order to address these issues, we endeavour to conduct research to clarify the mechanism for achieving BPR effectiveness.

3 RESEARCH FRAMEWORK

Our research aims to clarify the mechanism for achieving BPR effectiveness, and we formed hypotheses based on our framework as follows:

- Hypothesis 1: BPR effectiveness differs by SI element factor (*e.g.,* system design / development skill, system consulting skill, system maintenance skill, integrator's knowledge about business and customers' industry, support level for system)
- Hypothesis 2: "Total satisfaction" differs by each organizational section in a firm.
- Hypothesis 3: Structure of "total satisfaction" (correlation between "total satisfaction" and "satisfaction of each factor such as satisfaction of technical matter factors, project management factor, and business impact of using IT") differs by each organizational section in a firm.
- Hypothesis 4: Structure of "total satisfaction" differs by BPR policy (drastic BPR, or as-is business process based improvement)
- Hypothesis 5: Structure of "total satisfaction" differs by system implementation policy (system specification should comply with user business process requirements, or define business process considering IT capability)
- Hypothesis 6: Structure of "total satisfaction" differs by organization structure of the information system section and business planning section.
- Hypothesis 7: Structure of "total satisfaction" differs by the IT subsidiary firm's organization structure and function.
- Hypothesis 8: "Total satisfaction" score secular change (delta) differs by BPR policy type.
- Hypothesis 9: "Total satisfaction" score change (delta) differs by IT implementation policy.
- Hypothesis 10: BPR effect factor differs by organizational factor (*e.g.* organization structure, communication infrastructure, section-related satisfaction structure).
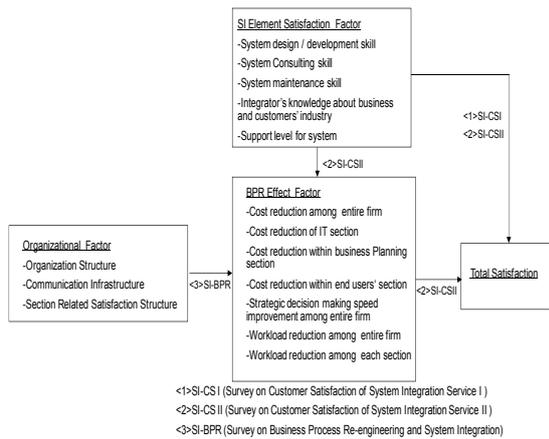
Figure 1: BPR effectiveness and satisfaction

4 RESEARCH RESULT AND FINDINGS

We conducted several surveys for firms, two customer satisfaction surveys and an organization survey. Customer surveys are CSS-OBP (customer satisfaction survey from Organization Buying Perspective) I and CSS-OBP II. The organization survey is SEC-BPR (security and BPR survey). And we also planned an additional survey for the construction extended model. Most of the hypotheses listed in Chapter 3 were verified. Some of the analysis results are explained in the following sections.

4.1 Customer Satisfaction Survey Result

This survey is conducted aiming to determine the metrics of how to maximize customer satisfaction as one of the effects. The result of multi regressions of various factors to "total satisfaction" (tested by organizational section) is reported in Table 1.

The number of integration elements that correlate with "total satisfaction" reduced in 2002. However, the system elements that are listed above seem to carry less conviction. One of the reasons is the coefficient value does not appear to be large enough. Therefore, we tried to develop multi regression including satisfaction of effect of using the information system (Table 2).

This result seems to have more conviction. That means effectiveness using the information system has become an important issue for the system integration service.

Table 1: Multi Regression Result for Total Satisfaction and SI Elements (By section, CSS-OBP I).

Predictor Variable	Coefficients	F-value	P-value
IT section			(n=97)
Satisfaction of end user	0.55	30.79	***
System maintenance skill	0.27	9.58	***
Integrator's knowledge about business and customers' industry	0.19	5.00	**
Constant	-0.12		
Overall model		30.73	***
Business planning section			(n=60)
System design / development skill	0.51	26.33	***
Cost performance	0.55	25.12	***
Ability to avoid company risk	0.29	6.00	**
Skill level about advanced IT	-0.26	8.64	***
Trustful company	-0.37	13.11	***
Integrator's knowledge about business and customers' industry	0.38	9.83	***
Integration skill of multi vendor's products	0.21	5.11	**
System maintenance skill	-0.14	2.30	**
Constant	-0.35		
Overall model		14.39	***
End users section			(n=69)
System design / development skill	0.51	26.47	***
Ergonomics	0.44	19.93	***
Integrator's knowledge about business and customers' industry	0.23	5.05	**
System management skill	0.29	6.11	**
System consulting skill	-0.18	2.47	
Specification of each product	-0.15	2.11	***
Constant	-0.44		
Overall model		34.27	***

Level of significance *:10%, **:5%, ***:1%

In terms of the "total satisfaction" change delta for each firm, the average score differed by BPR policy. The average satisfaction score of firms whose policy is "drastic BPR" was a 0.59 point increase, while the "As-is business process based improvement" group did not change on average.

In terms of the "total satisfaction" delta (secular change) for each firm, the average score differed by BPR policy. The average satisfaction score of firms whose policy is "draw to-be business process at first, and consider IT deployment" was a 0.47 point increase, while the "consider to-be business process and IT deployment opportunity collaterally" group shows a negative change on average.

Table 2: Multi Regression Result for Total Satisfaction and SI Elements and the Effect Induced by Using Information Systems (By section, CSS-OBPII).

Predictor Variable	Coefficients	F-value	P-value
IT section			(n=56)
Cost reduction among entire firm	0.64	18.09	***
Integrator's knowledge about business and customers' industry	0.27	4.543	**
Support for system problems	0.26	5.13	**
Cost reduction of IT section	-0.22	3.52	*
Constant	-0.08		
Overall model		12.76	***
Business planning section			(n=52)
Cost reduction within business planning section	0.85	22.01	***
Strategic decision making speed improvement among entire firm	0.47	10.37	**
Satisfaction of end user	0.44	8.25	*
Cost reduction among entire firm	-0.36	4.45	**
Specification of each product	-0.36	2.36	-
Constant	-0.29		
Overall model		14.39	***
End users section			(n=51)
Workload reduction within end user section	0.44	19.42	***
Having good connection (from integrators)	0.57	25.53	***
Strategic decision making speed improvement among entire firm	0.42	17.53	***
Cost reduction among entire firm	0.21	5.73	**
Support for system problems	-0.19	3.42	*
Ability for avoiding company risk	-0.20	3.03	*
Constant	-0.61		
Overall model	-0.61	20.59	***

Level of significance *:10%, **:5%, ***:1%

Table 3: "Total Satisfaction" Score Average (by BPR policy type).

BPR Policy (CSS-OTC02)	Change Delta From CSS-OBP I To CSS-OBP II
Drastic BPR	0.59
As-is business process based improvement	0.00

Table 4: "Total Satisfaction" Score Average (by IT implementation policy type).

IT implementation policy (CSS-OTCII)	Change Delta From CSS-OBPI To CSS-OBPII
Draw To-be business process at first, and consider IT deploy-ment	0.46
Consider To-be business process and IT deployment opportunity collaterally	- 0.17

4.2 Organization Structure and Projects Survey Result (BPR, BSC, Information Security)

Research on BPR effectiveness of the IT implementation or operation includes: analysis of success factors of IT implementation, analysis of success factors of IT management, and return on investment of IT. Therefore, we analyzed the effectiveness difference caused by these organization type differences (Figure2～4).

Relationships between the IT section and BP section have diversified over the last few years. The change has been seen in the relationship between IT sections and BP sections because IT has changed their mission from a mere man-hour saving tool to a decision making support tool of management. For instance, some of the IT sections that had been independent organizations are beginning to have a strong relationship with BP sections. Therefore, analyzing the relevance of correlation of BPR effectiveness with organization types is considered valuable from these viewpoints.

Figure 2 shows the result of the analysis of the relationship between setting metrics ("Setting numerical target of BPR?") and BPR effects ("Had effective BPR result?"). These questions were only asked to the firms that answered "BPR status is now implemented". By organization pattern (1) IT section and BP section have an independent relation, (2) the IT section and BP section belong to the same higher level organization and (3) the IT section is located under the BP section.

The ratio of the firms that answered "setting of numerical targets-yes" was high for the groups of the firms that answered that the IT section and BP section have an independent relation (Figure 2). However, the ratio of the firms that answered "effective result-yes" was high for the firms that
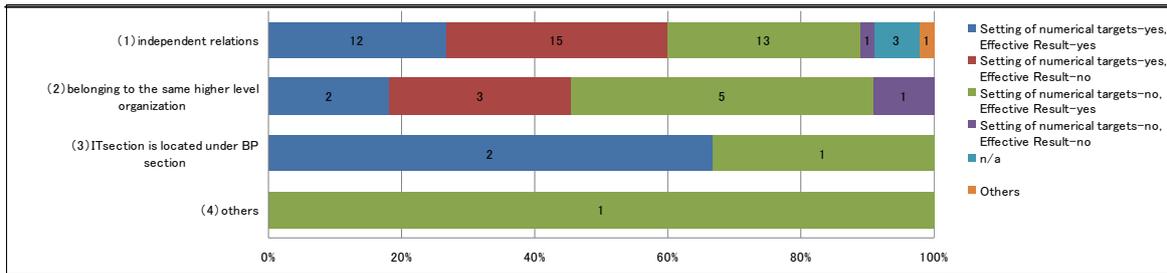
Figure 2: BPR Effectiveness by Organization Type (SEC-BPR).
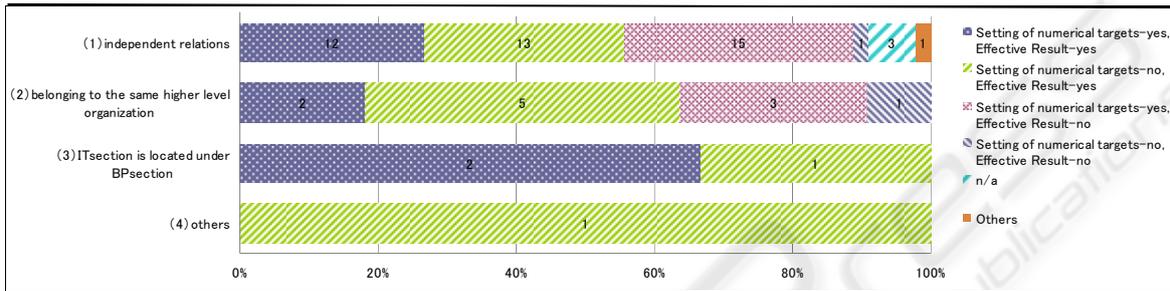
Figure 3: BPR Effectiveness by Organization Type (SEC-BPR)(Sort order changed).
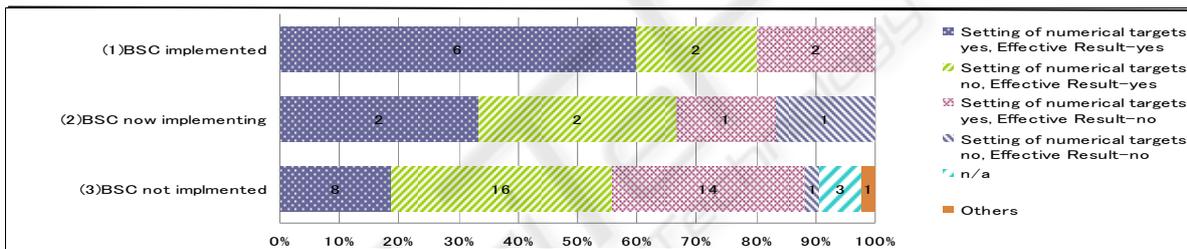
Figure 4: BPR Effectiveness by BSC Implementation Status (SEC-BPR).

answered that the IT section and BP section belong to the same organization (Figure 2), and in this organization pattern, "setting of numerical targets-no, effective result-yes" is much more prevalent than other organization patterns. The reason for this fact is that the organization infrastructure compensates by setting specific numerical targets. In other words, setting numerical targets may enable compensation of an organization of communication infrastructure in some way. As communication infrastructure, a balanced scorecard (BSC) is also effective (Figure 4). The firms that answered "BSC implemented" have a greater tendency to achieve BPR effectiveness than "BSC not implemented" firms.

5 CONCLUSIONS AND FUTURE RESEARCH

As for BPR effectiveness, there are various influencing parameters: *e.g.,* management issues, project task issues, and in addition there are emerging issues that have only come to light recently, *e.g.,* balance of efficiency and internal control (including information security management), organization reform or enterprise integration including the causes of recent economic circumstances. In order to address these issues, we conducted surveys including questionnaires and interviews from several viewpoints for the various sections (IT, BP, end users) of the firms. Consequently, correlation between BPR effectiveness and organization types or organization of communication infrastructure was demonstrated. Correlation between various BPR effects and total

satisfaction was also verified. The integrated BPR effectiveness model, in which parameters are set, would be attained with a combination of these results. We will continue our research and analysis in order to complete the overall model of our BPR effectiveness frameworks.

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REFERENCES

Grover V. et al., 1995. The implementation of business process re-engineering, *Journal of Management Information Systems Archive* Volume 12 , Issue 1 (June 1995) pp.109 – 144.

Hammer. M., Champy. J., 1993.re-engineering the Corporation: *A Manifesto for Business Revolution, Harper Business;* Reprint.

Earl. M.J., Sampler. J. L., Short. J.E., 1995. S*trategies for Business Process re-Engieering: Evidence from Field Studies, Journal of Management Information Systems Archive*, Volume 12 , Issue 1 (June 1995), pp.31 - 56

Attaran. M., 2004. *Exploring the Relationship between Information Technology and Business Process re-Engineering, Information & Management.* Volume 41, Issue 5, May 2004, pp.585-596

Taguchi, Y., Iizuka, K. et al. 2007., *Study for the Success Factors of ERP System Utilization, - Analysis of Utilization Pattern and Management, Proceedings of the National Convention* 2007 Autumn of JASMIN

Oowada T., 2007. "*Measurements of IT Investment (*IT Toushi no Hyoka Hoho)", Chuo Keizaisha.

Kadono Y., and Tsubaki., H., 2006, *Development of "IT Management Effectiveness*" and *Analysis, Journal of the Japan Society for Management Information*, Vol.14 No. 4 March 2006

Chikara., T,. and Takahashi. T., 1996. *Research of Measuring the Customer Satisfaction for Information Systems, Computers & Industrial Engineering* Volume 33, Issues 3-4, December 1997, pp.639-642

Iizuka (Hirotsu), K., 1993,"*Customer Satisfaction of System Integration Business* (SI Business ni Okeru Kokyaku Manzoku ni Tsuite, in Japanese)", Master's thesis, Keio University, 1993

Iizuka K. and Wada M., 1999. "*Customer Satisfaction of Information System Integration Business in Japan"*, Informatica – An International Journal of Computing and Informatics Vol.23 No.4, 1999 pp.473-476

Hanan M. and Karp P., , "*Customer Satisfaction", American Management Association*, 1989

Shimakuchi, M., 1986 "*Theories of Strategic Marketing* (Senryakuteki Marketing no Ronri, in Japanese)", Nihon Keizai Shimbumsha

Sheth J.N., 1977, *Industrial Buying Behaviour*, North-Holland Publishing. Co.