■ *Research Paper*

Business Process Re-engineering Concepts and Tools Effectiveness: A Survey of Practitioners

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Business Process Re-engineering (BPR) has been embraced by business organizations as an approach to implement and manage change. Managers are being trained to apply several concepts and techniques to successfully manage the change process. However, there is little empirical evidence to support claims of the effectiveness of concepts and techniques in practice.

This paper reports results of a survey conducted to assess the perceived effectiveness of BPR concepts and tools among business practitioners. The survey also gathered data on demographic variables to investigate relationships between the nature of work and the duration of experience with the perceptions of BPR concepts and tools. The results indicate that surveyed practitioners perceived BPR concepts and tools as effective. Practitioners in financial and manufacturing fields of business in particular found benchmarking and use of customer data as effective techniques in BPR implementation. © 1997 John Wiley & Sons, Ltd. and Cornwallis Emmanuel Ltd.

INTRODUCTION

A survey of 1200 US corporations found that by 1997, over $52 billion per year would be spent on business re-engineering (Koster *et al.*, 1994). In its 1996 annual survey CSC Index reports 'Implementing business re-engineering' and 'Instituting cross-functional information systems' as in the top-ten list of critical issues facing I/S management in North America and Europe (Koster *et al.*, 1996a). Since the early 1990s, many reported BPR successes have documented the methods and tools applied in process improvement initiatives with contradictory outcomes. This has raised questions such as—Is

BPR really effective, or is it a passing fad? What determines BPR success? Can BPR concepts and tools be applied to actual business improvements? Are certain BPR concepts and tools better suited for some disciplines?

The research reported in this paper addresses these questions. It reports the results of a survey that investigated and analysed the perceptions of business practitioners in a cross section of industries toward the effectiveness of commonly applied BPR concepts and tools. The study also researched organizational characteristics and the demographics of respondents in combination with their perceived effectiveness of BPR concepts and tools.

The underlying goal of this research is to field test components of a theoretical model. A conceptual model of BPR is presented in Figure 1, along with the measurement points that were used
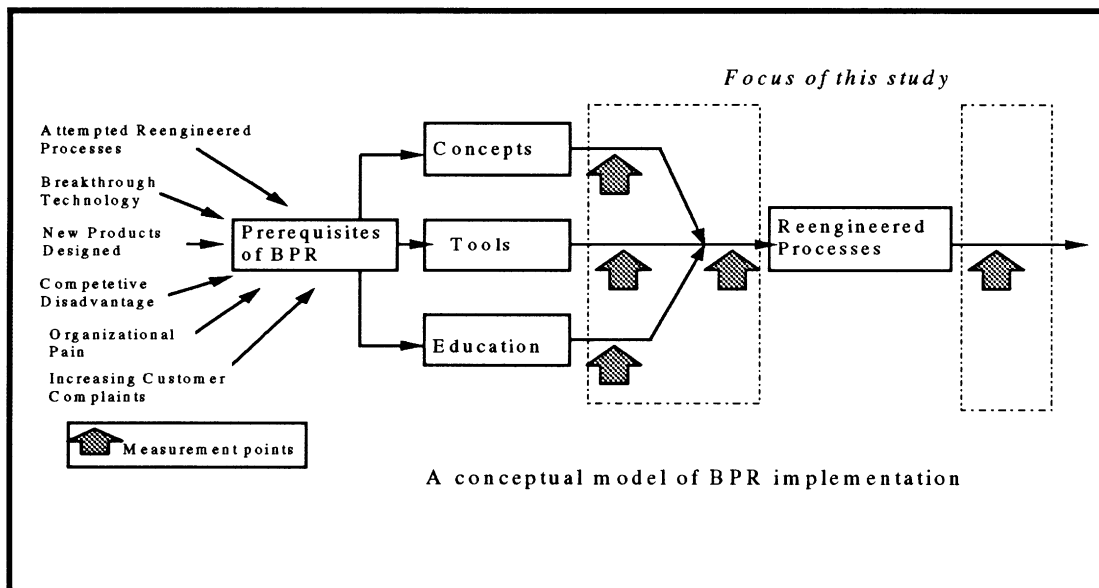
Figure 1. A conceptual model of business process re-engineering implementation process and the relevant measurement points focused in this study

in this study. Developing an understanding of such a model and asking questions of the practitioner community provide feedback as to whether the model demonstrates the way things actually work in organizations.

THE STUDY

A survey of BPR practitioners was conducted to measure the perceived effectiveness of BPR concepts and tools. Measurement of user perceptions is fundamental to the understanding of the effectiveness of BPR and other quality management measures (Galletta and Lederer, 1989). BPR practitioners' perceptions are crucial in (i) understanding those tools and concepts that are perceived as effective; (ii) predicting the participation and usage of BPR tools; and (iii) developing software tools and information systems to effectively support future BPR initiatives.

A survey was mailed to 418 BPR practitioners in a single mailing. The respondents were practitioners from Maryland, Pennsylvania, Washington DC, and Virginia in the US mid-Atlantic region. Most respondents had involvement in BPR projects or had plans to do so. All respondents were MBA students who had completed a BPR course during a 2-year period at an AACSB-accredited business school. The course was offered 12 times by four instructors, at three locations in the Washington

DC–Baltimore region. Each instructor followed the same course outline, text books, and readings.

A total of 146 valid responses were returned, yielding a response rate of 34.9%. The non-respondents were distributed over semesters and locations. The respondents had an average age of 30 years with a mean work-experience of 8 years (Table 1). Respondents are employed with Fortune

Table 1 Table listing the demographics of the respondents

Description	Mean	
Age	Average	30
Sex	Male	55.5%
	Female	42.5%*
Years of Education after High School		
	Average	5.7
GPA	Average	3.79
Nature of work	Manufacturing/ Engineering	23.4%
	Finance/ Accounting	19.3%
	Marketing/Sales	17.9%
	Information Systems/DP	9.0%
	Administration	7.6%
	Research	1.4%
	Other	21.4%
Years of work experience	Average	8.0

*2% missing.

Table 2.   A Table listing respondents' experience with BPR

N=146	Valid Cases	Valid Percent	Months (Mean)
Organization plans BPR in the future	67	45.8%	6.761
Organization did BPR in the past	82	56.1%	8.792
Organization has done BPR in the past *or* future	94	64.3%	–
Organization has done BPR in the past *and* future	57	39%	–
Participated in BPR before course	45	30.8%	8.733
Participated in BPR after course	39	26.7%	3.987
Participated in BPR before *or* after course	63	43.1%	–
Participated in BPR before *and* after course	21	14.3%	–

500 service and manufacturing companies, government agencies, small businesses, and not-for-profit organizations. About one-quarter of the respondents listed the nature of their work as manufacturing or engineering related. The average years of education after high school is reported as over 5 years. More than 55% of the respondents are male and over 42% are female. The survey instrument was developed using standard techniques including pilot testing and reliability analysis. Of particular note is that respondents were allowed to express their lack of knowledge on a subject in answering the questionnaire. This capability can produce a higher validity of the data by not forcing respondents to pick a category (Andrews, 1989; Converse, 1976–77).

EXPERIENCE WITH BPR

The respondents were asked to indicate whether their organization had undergone BPR and if there were plans for future BPR (Table 2). Over 45% of respondents indicated that their organization has plans for future BPR. Some respondents answered 'yes' for future BPR plans but skipped the question of time period when such future BPR was expected. This may indicate that although the organizations are planning future BPR, the respondents are unsure of when it will take place. Perhaps a choice of 'unsure' for the time period would have

been appropriate. Over one-half of the respondents reported that their organizations had undergone BPR in the past.

We were also interested in determining how many organizations, among the ones planning for BPR, had conducted BPR in the past. The responses indicated that nearly 65% of the organizations represented in the survey had either undergone BPR or had plans for future BPR between the previous or upcoming 12 months. Additionally, 39% had implemented BPR and also had plans for future BPR. Less than one-third of the respondents participated in a BPR project for 8 months to one year prior to being enrolled in the course, and just over one-quarter participated for 4 to 6 months in BPR since taking the course. However, this assessment is also confounded by how long, prior to responding to the survey, the respondent took the course. Clearly, a respondent who took the course one year ago would have had greater opportunity to participate in BPR than the one who took the course 6 months ago. Still, we asked this question to seek differences among the perceptions of respondents due to duration of involvement in BPR. About 14% of the respondents participated in BPR both before and after taking the course.

SURVEYED BPR CONCEPTS AND TOOLS

The following BPR concepts and tools were listed in the survey questionnaire. These concepts and tools are discussed in BPR literature as valuable and appropriate for firms engaging in BPR. These were also the topics discussed in the course.

BPR concepts

1. Activity based costing
2. Change management
3. Reducing cycle time
4. Delighted customers
5. Empowered employees
6. Information technology as an enabler in BPR
7. Mass customization
8. Strategic alliances with other organizations
9 Wisdom of teams
10. Value chain analysis.

BPR tools

1. Competitive benchmarking
2. Selection of critical success factors (CSF)
3. Historical customer data

Table 3a   A table listing the description of each attitude toward BPR, its average response, and the number of non-respondents (6=strongly agree; 1=strongly disagree)

Description	Mean N=146	Standard Deviation	No Opinion
BPR as a concept allows organizations to achieve improvements	4.93	0.955	1
BPR can be defined as a discipline	4.01	1.15	8
BPR is a fad	2.94	1.31	2

Table 3b   A table listing the description of each attitude toward BPR, Chi-Square values, degrees of freedom, and significance

Description	Chi Square	Degrees of Freedom	Significance
BPR as a concept allows organizations to achieve improvements	27.71	2	0.000*
BPR can be defined as a discipline	19.27	2	0.000*
BPR is a fad	25.39	2	0.000*

*$p<=0.05$.

4. Process mapping through activity flow charting diagrams
5. Fishbone diagrams
6. Process mapping through functional maps
7. Customer–finance–resource linkages model
8. Matrix for identifying key business processes
9. Process measurement and control
10. Market turbulence maps.

SURVEY QUESTIONS AND FINDINGS

Did respondents perceive BPR as effective overall, or is it a passing fad?

Respondents were asked whether BPR as a concept allowed organizations to achieve improvements, whether BPR could be defined as a discipline, and whether BPR is a fad. Respondents indicated that BPR did support organizational improvements. In addition, they perceived BPR to be a discipline and not a fad. These responses show that practitioners have a favorable attitude toward BPR and its perceived outcomes. (See Table 3a for the descriptive statistics and Table 3b for the statistical analysis.)

Can BPR concepts be applied to actual business improvements? Did respondents find a particular concept more effective than others?

Respondents were asked about the value of each BPR concept. Those concepts that were extremely valuable were rated a 6; those that were not at all valuable were rated a 1. (See Table 4a for the descriptive statistics of the practitioner responses, and Table 4b for the analysis of the responses.) Practitioners reported value in business improvements for all the BPR concepts. This reported value was statistically significant for all the BPR concepts except activity based costing and the wisdom of teams. Respondents reported the greatest overall value to BPR in the concept of delighted customers. Other highly valued concepts included reducing cycle time, empowered employees, and information technology as an enabler.

Can BPR tools be applied to actual business improvements? Did respondents find a particular tool more effective than others?

Just as with the BPR concepts, respondents were asked to rate the value of BPR tools. Those tools that were perceived as extremely valuable were rated a 6; those tools that were perceived as not at all valuable were rated a 1. (See Table 5a for the descriptive statistics of the practitioner responses, and Table 5b for the analysis of the responses.) Practitioners reported value in business improvements for all the BPR tools except fishbone diagrams. The reported value was statistically significant in for all the BPR tools except activity flow diagrams and functional maps. Respondents reported the greatest overall value to BPR using the tool of competitive benchmarking. Other highly

Table 4a   A table listing each BPR concept, measures of central tendency, and a summary of non-responses (6=extremely valuable; 1=not at all valuable)

Description	Mean N=146	Standard Deviation	Median	No Opinion	Not Applicable
Activity based costing	4.28	1.34	4	9	14
Change management	4.65	1.08	5	7	8
Reducing cycle time	5.12	1.18	5	3	13
Delighted customers	5.50	1.07	6	0	3
Empowered employees	5.16	2.04	6	1	3
Information technology as an enabler in BPR	5.15	1.05	5	1	2
Mass customization	4.46	1.46	5	2	14
Strategic alliances with other organizations	4.88	1.21	5	4	9
Wisdom of teams	4.84	1.18	5	2	3
Value chain analysis	4.54	1.11	5	7	7

Table 4b   A table listing the description of each BPR concept, Chi-Square values, degrees of freedom, and significance

Description	Chi Square	Degrees of Freedom	Significance
Activity based costing	1.06	2	0.586
Change management	8.78	2	0.012*
Reducing cycle time	39.56	2	0.000*
Delighted customers	119.66	2	0.000*
Empowered employees	28.95	2	0.000*
Information technology as an enabler in BPR	29.06	2	0.000*
Mass customization	6.79	2	0.033*
Strategic alliances with other organizations	11.79	2	0.002*
Wisdom of teams	4.86	2	0.087
Value chain analysis	9.72	2	0.007*

*$p<=0.05$

valued concepts included critical success factors and historical customer data.

Are certain BPR concepts and tools better suited for some demographic groups?

Analysis of the responses to the survey do point out some correlations between specific BPR concepts, tools, and demographics. Both age and work experience correlated positively with activity Based costing, cycle time, and fishbone diagrams. Older, more experienced respondents found these concepts and tools more valuable, while younger respondents reported higher perceived value for the use of customer data. Strategic alliances were reported as more valuable to respondents with more work experience and a higher academic grade point average (GPA). Female respondents found mass customization less valuable than did male respondents.

Are certain BPR concepts and tools better suited for some disciplines or functional areas?

The only findings which indicate a discipline-specific perception of effectiveness are in the fields of finance and manufacturing/engineering. These respondents find benchmarking tools and customer data as particularly valuable BPR tools. There were no other concepts or tools that were perceived as more valuable for any particular functional area.

Does past or future BPR implementation in the respondents' organization affect their attitude toward the concepts or tools?

Respondents who had more experience with BPR implementation reported a higher value for the concepts of change management, cycle time, IT as an enabler, mass customization, and strategic alliances. In addition, they reported greater perceived effectiveness of the tool of benchmarking and matrix for identifying rocesses. This is an important finding

Table 5a A table listing each BPR tool, measures of central tendency, and a summary of non-responses (6=extremely valuable; 1=not at all valuable)

Description	Mean N=146	Standard Deviation	Median	No Opinion	Not Applicable
Competitive benchmarking	5.06	1.03	5	2	8
Selection of critical success factors (CSF)	4.87	1.15	5	1	3
Historical customer data	4.83	1.16	5	1	5
Process mapping through activity flow charting diagrams	4.60	1.22	5	2	9
Fishbone diagrams	3.66	1.27	5	33	11
Process mapping through functional maps	4.37	1.21	4	4	7
Customer–finance–resource linkages model	4.40	1.23	5	25	12
Matrix for identifying key business processes	4.36	1.27	5	3	10
Process measurement and control	4.69	1.03	5	0	5
Market turbulence maps	3.47	1.41	3	14	13

Table 5b A table listing the description of each BPR tool, Chi-Square values, degrees of freedom, significance

Description	Chi Square	Degrees of Freedom	Significance
Competitive benchmarking	15.55	2	0.000*
Selection of critical success factors (CSF)	21.41	2	0.000*
Historical customer data	7.68	2	0.021*
Process mapping through activity flow charting diagrams	4.78	2	0.091
Fishbone diagrams	17.32	2	0.000*
Process mapping through functional maps	3.92	2	0.140
Customer–finance–resource linkages model	6.24	2	0.044*
Matrix for identifying key business processes	7.46	2	0.024*
Process measurement and control	13.31	2	0.001*
Market turbulence maps	9.57	2	0.008*

*$p <= 0.05$

since those respondents who have more BPR experience are more likely to accurately perceive applicability of specific concepts and tools.

CONCLUSIONS AND RECOMMENDATIONS

The results of the analysis from this study indicate that the surveyed BPR practitioners consider concepts and tools of BPR as useful in accomplishing process re-engineering (Table 6). Such results provide a degree of empirical legitimacy to BPR as an approach to improving processes and furthering the industrial engineering principles of continuous improvement. It is also evident the practitioners believe that BPR is important for the success of their organizations. Organizations may take comfort in the fact that although BPR often has a negative connotation, it is considered to be an

Table 6   Key learning outcomes

BPR study component	Key learning outcome
Attitudes	BPR is a discipline; BPR is *not* a fad
Concepts	All BPR concepts perceived as valuable
	Delighted customers is most valuable concept
	Reducing cycle time is a highly valued concept
	Empowered employees is a highly valued concept
	Information technology as an enabler is a highly valued concept
Tools	Fishbone diagrams were *not* perceived as valuable
	Competitive benchmarking is most valued tool
	Critical success factors is a highly valued tool
	Use of historical customer data is a highly valued tool
Age	Activity based costing, cycle time, and fishbone diagrams are more valued by older professionals
	Use of customer data is more valued by younger professionals
Experience	Activity based costing, cycle time, fishbone diagrams, and strategic alliances were more valuable to more experienced professionals
Nature of work	Competitive benchmarking and the use of customer data are more valuable to finance and manufacturing or engineering professionals

effective approach in improving competitiveness of the businesses.

The results from this study do not support the argument that BPR is a passing fad. Practitioners in business indicate that BPR is more a discipline than a current buzzword. This is in congruence with previous research (Davenport and Short, 1990) that the some concepts of BPR have been practiced since Taylor proposed his theory of continuous improvement. Perhaps increase in the capabilities of information technologies have facilitated BPR's wider usage. Given that 40% of respondents and their organizations had completed BPR and were planning more BPR in the future is an indication of support for BPR and should encourage organizations and individuals who are considering BPR.

The study provides insights into the demographics of respondents and their perception of BPR. The age, and the length of work experience of practitioners appear to affect their perceptions of BPR. Older individuals with more work experience exhibit greater confidence in the effectiveness of BPR. It can be assumed that there is some correlation between age and work experience, i.e. older practitioners are likely to have more years of work experience. Organizations proposing to re-engineer may consider more experienced individuals to participate in BPR initiatives to incorporate organizational knowledge into the redesign. This may support the conventional wisdom that individuals with more work experience have a better understanding of the business processes and factors that influence them.

Younger respondents perceive the use of customer data as more effective in BPR. A possible explanation may be that older practitioners of BPR rely on their experience and instincts to reengineer processes, while younger practitioners lack that experience and rely on historical data. Organizations may be well served in providing training in the use of customer data in BPR implementation.

There appears to be support for information technology as an enabler in BPR implementation. Organizations undergoing BPR are advised to include information technology literate team members to facilitate new or re-engineer existing processes. Information technology often plays an important role in the re-engineering of processes and information technologists can recommend solutions that use technology as an enabler in such processes.

Finally, this study indicates that BPR concepts and tools gain relevance during and after a re-engineering project. The perception of this relevance is limited prior to the practitioner's exposure to a BPR initiative within the organization. This indicates the need for organizations to promote a positive representation of BPR concepts and tools in the planning stages of a project. Organizations might also consider using experienced BPR professionals to train team members on specific concepts and tools that they perceive as effective. Such training might also strengthen team cohesiveness.

LIMITATIONS OF THE STUDY AND AREAS OF FUTURE RESEARCH

The study was conducted in one region of the United States, from a group of students enrolled in

a graduate school between 1994 and 1995. Therefore, the results reflect the perceptions of individuals enrolled during this period in the Mid-Atlantic region of USA and are not generalizable. More studies with a larger sample size and covering a wider geographical area are needed. The response rate of survey was about 35%. A higher response rate would have been preferable. The study did not investigate the organizational characteristics such as structure, management style, and competitive environment nor did it attempt to investigate the nature and extent of processes for which the effectiveness of concepts and tools were associated.

Future research could investigate organizational characteristics such as size, layers of management, number of locations, and level of market turbulence along with the appropriateness of BPR concepts and tools for certain processes. The competitive environment in which the organization conducts business often defines the extent of the re-engineering effort. Future research may also focus upon the extent of BPR such as work process redesign, business process redesign and business transformation and the suitability of BPR concepts and tools (Koster *et al.*, 1996b). The nature of various processes such as order fulfillment, supplier management, and new product development can also determine the appropriate set of BPR concepts and tools.

For BPR to transition into a discipline that is well-grounded in theory, researchers should develop a theory for BPR implementation, an appropriate set of independent and dependent variables for measuring BPR outcomes, and controlled experiments. Such theory development and experimentation can be accomplished in collaboration with an existing body of work in behavioral research. An eventual goal of researchers and practitioners in BPR should be to build

measurement criteria into the processes so that the performance of steps in the process can be monitored on an ongoing basis. In addition, improvements in the redesigned process can be measured and resources invested can be justified. Such newly designed processes should be flexible so that changes in the business environment which require changes in the process are rapidly accomplished.

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