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Business process reengineering implementation: an investigation of critical success factors

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Abstract. Intense world-wide competition has forced organizations to reengineer their old fashioned processes to achieve new heights of success. However, business process reengineering (BPR) implementation is a difficult task and many organizations have failed to achieve the expected results. Consequently, the present study attempts to throw more light to the subject. Through a comprehensive review, critical success factors (CSFs) that influence the success of BPR programs are identified. Then, using a DEMATEL methodology, these CSFs and the causal relationships among them are analyzed.

Keywords: Business process reengineering; Critical success factor; Implementation

1. Introduction

During the last decades, the efficiency of administrative processes has become a major concern for many organizations. Accordingly, different tools and methods have been developed to improve and speed up the organizational processes [[1]]. One of these tools is business process reengineering which has gained widespread attention from both academics and managers. BRP is a popular management approach, which enables organizations to handle with rapid business and technological changes. BPR can radically transform organizations for dramatic improvement [[2]].

In early 1990s, Hammer and Champy [[3]] introduced the concept of BPR. They defined BPR as a fundamental redesign of organizational processes to create radical improvement in vital areas such as cost, quality, service, and speed.

Through reorganizing, eliminating some processes and finding new ways of doing things, BPR helps organizations to change their old fashioned structures into innovative processes. Successful implementation of BPR brings many benefits to the organization. According to Farmer [[4]] customer satisfaction, increased productivity, higher flexibility, increased employees and improved coordination, and improved competitive advantage are the main benefits of successful BPR implementation. BPR helps organizations to achieve new heights of success by dramatically changing existing business processes.

Despite the numerous advantages of BPR, its implementation is perceived to be a difficult task and many unsuccessful experiences have been reported in the literature. According to Al-Mashari et al [[5]], Chiplunkar et al [[6]], and Hall et al [[7]] 50-70 percent of BPR efforts fail to achieve its programmed results. Accordingly, to implement BPR successfully, critical success factors should be identified and analyzed. In terms of BRP, CSFs are areas which organization must accomplish to achieve a successful implementation.

Small and medium sized enterprises (SMEs) play a critical importance to the development and prosper of many economies. Nowadays, an increasing number of SMEs tend to implement BPR initiatives. Successful BRP implementation enables SMEs to achieve dramatic gains in business performance. However, a comprehensive review of literature indicates that much has been written about BRP implementation in large organizations, and little attention has been paid to the SMEs. In an attempt to help managers and

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practitioners to implement BRP projects successfully, the present paper tries to identify and analyze the CSFs in the Iranian SMEs context. Thus, the main objectives of this paper are:

- to identify CSFs for BPR implementation in Iranian SMEs;
- to find out the relationships between CSFs;
- to developed a causal model of CSFs in BPR implementation;
- to categorize the identified CSFs into driver and dependent groups;
- to contribute to the development of BRP theory by investigation of the causal relationships between the identified CSFs; and
- to provide insights for managers aimed at BRP implementation.

The reminder of this paper is organized as follows. The next section discusses the CSFs for BPR implementation. The DEMATEL method along with practical solving procedure is presented in section 3. Finally, the finding of this research are presented, which is followed by discussion and conclusion.

2. Critical success factors for BPR implementation

Successful implementation of BRP involves defining and deployment of several critical success factors. To date, different researchers have defined different CSFs for successful BRP implementation. Based on a comprehensive review of the literature, viewpoints of the academics and interviews with several SME managers, 7 BRP CSFs have been identified. Some supportive studies and a brief explanation of these CSFs are presented in this section.

2.1. Collaborative working environment

Collaborative working environment is one of the most widely cited factors in the literature. In organizations, employees work together. Having friendly interactions is a main feature of any dynamic environment. Collaborative climate reduces resistance to change and simplifies BPR implementation [[2], [8], [9]].

2.2. Top management commitment and Support

Top management plays the most important role in the organization and determines the strategic direction of the organization [[2], [8]]. The degree of top management support in BPR implementation is very critical. Top management should have adequate knowledge about BPR implementation and make important decisions in BPR implementation process. In addition top management should motivate employees and have a friendly interaction with BPR team [[10]].

2.3. IT infrastructure

To achieve the expected results of BPR implementation, appropriate IT infrastructure is needed. In most projects, BPR starts from IT department. IT is a natural partner of BPR and plays a critical and central role in BPR projects. IT not only speeds up the process to be carried out but also integrate processes and reduces errors, hence improves productivity [[11], [12]].

2.4. Training

Training plays a crucial role in BPR implementation. Since BPR changes the organizational processes, employees should have adequate skills to do the new tasks. Through a proper training program, employees will have an in-depth comprehending of their new tasks [[13], [14], [15]].

2.5. Less bureaucratic structure (flatter structure)

A flexible organizational structure enables BPR to encourage creativity and innovativeness in the organization. Therefore having a less bureaucratic and more participative structure is essential for successful BPR implementation. This is parallel with McAdam [[16]] statement that organizations should apply a more participative structure to avoid failure of BPR implementation [[15]].

2.6. Culture

Culture has been recognized as a CSF for BPR implementation in the literature [[2], [8], [11]]. Coordination, employees' involvement and friendly interactions are the standard feature of an innovative organizational culture. Effective utilization of employees' ideas enables organizations to achieve their expected results. Further, a strong appropriate culture makes positive changes, avoids stress and reduces resistance to change.

2.7. Adequate financial resources

Obviously, implementing BPR without adequate financial resources is unthinkable. Budget allocation to BPR is a long-term investment for achieving favorable results. BPR implementation is a costly process. Therefore, organizations should have adequate financial resources for implementing changes and facing with unpredictable situations [[2], [15]].

3. Methodology

To comprehend the causal relationships between the elements of a complex system, a systematic and logical approach is needed [[17], [18]]. DEMATEL, a comprehensive method developed by the Science and Human Affairs Program of the Battelle Memorial Institute of Geneva is a tool that meets the objective of understanding the causal relationships among elements [[19]]. DEMATEL allows researchers and managers to gain a deeper understanding of the relationships among variables

3.1. Calculate the average matrix

In the first step, respondents are asked to evaluate the direct influence between any two factors by an integer scale from 0, 1, 2, and 3, representing “no influence”, “low influence”, “medium influence”, and “high influence”, respectively. To develop the causal model, 17 experts, including Iranian SMEs managers and academia were consulted. Each respondent would produce a direct matrix, and an average matrix *A* is then derived through the mean of the same factors in the various direct matrices of the respondents. The average matrix *A* is shown in table 1.

Table 1- The average matrix

Factor	F_1	F_2	F_3	F_4	F_5	F_6	F_7
F_1	0.000	0.000	0.000	0.000	2.454	0.000	0.000
F_2	1.987	0.000	0.000	2.564	1.763	2.654	2.365
F_3	1.872	0.000	0.000	1.524	1.972	2.625	0.000
F_4	1.524	0.000	0.000	0.000	1.625	2.524	0.000
F_5	2.413	0.000	0.000	0.000	0.000	0.000	0.000
F_6	2.431	0.000	0.000	0.000	2.762	0.000	0.000
F_7	0.000	0.000	2.524	2.442	1.652	0.000	0.000

3.2. Calculate the normalized initial direct-relation matrix

Based on the average matrix A, the normalized direct-relation matrix M can be obtained through the equations (1) and (2).

$$M = k.A \qquad (1)$$

$$k = \frac{1}{\max_{1 \le i \le n} \sum_{j=1}^{n} a_{ij}} \qquad ,i, j = 1,2,...,n \qquad (2)$$

Where, the notation of a_{ij} indicates the degree to which factor i affects on factor j in average.

3.2. Calculate the total relation matrix

Once the normalized direct-relation matrix M is calculated, the total-relation matrix T can be acquired using the following equation, in which “I” is denoted as the identity matrix. Matrix T is shown in table 2.

$$T = M(I - M)^{-1} \qquad (3)$$

Table 2- The total relation matrix

Factor	F_1	F_2	F_3	F_4	F_5	F_6	F_7
F_1	0.048	0.000	0.000	0.000	0.227	0.000	0.000
F_2	0.369	0.000	0.047	0.278	0.389	0.307	0.209
F_3	0.308	0.000	0.000	0.135	0.324	0.262	0.000
F_4	0.235	0.000	0.000	0.000	0.249	0.223	0.000
F_5	0.223	0.000	0.000	0.000	0.048	0.000	0.000
F_6	0.279	0.000	0.000	0.000	0.304	0.000	0.000
F_7	0.152	0.000	0.223	0.245	0.279	0.106	0.000

3.3. Produce a causal diagram

The sum of rows and the sum of columns are separately denoted as D and R within the total relation matrix through the following equations.

$$T = t_{ij} \quad i, j = 1, 2, ..., n \qquad (4)$$

$$D = \sum_{j=1}^{n} t_{ij} \qquad (5)$$

$$R = \sum_{i=1}^{n} t_{ij} \qquad (6)$$

Then, the horizontal axis vector (D + R) named "driving power" is made by adding D to R. Similarly, the vertical axis (D - R) named ''dependence'' is made by subtracting D from R. Generally, when (D - R) is positive, the criterion belongs to the driver group. Otherwise, if the (D - R) is negative, the criterion belongs to the dependent group. The causal diagram can be acquired by mapping the dataset of (D + R, D – R).

Matrix T provides useful information on how one factor affects another. But it is necessary for a decision maker to set up a threshold value to filter out some negligible effects. Thus, only the effects greater than the threshold value would be chosen and shown in diagraph. In this study, the threshold value is set up by computing the average of the elements in matrix T.

Table 3- The amounts of *(D + R)* and *(D − R)*

Factor	*(D + R)*	*(D − R)*
F_1	1.890	-1.340
F_2	1.597	1.597
F_3	1.297	0.759
F_4	1.364	0.049
F_5	2.090	-1.547
F_6	1.481	-0.314
F_7	1.213	0.796

The relationships between the factors are shown in the causal diagram (figure 1). This diagram indicates that how on factor affects on the other factors.

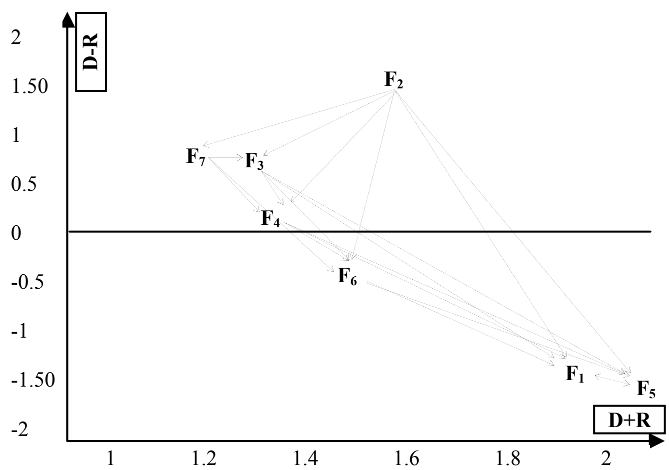

Figure 1: The causal diagram

4. Conclusion

An increasing number of Iranian SMEs attempt to implement BPR to achieve its benefits. In this paper we applied a DEMATEL methodology to better understand the CSFs. This paper identified 7 CSFs and developed a causal model of them, which indicates the inter-relationships between these CSFs. The identified CSFs also classified into two groups of driver and dependent factors. From the values of (D − R), it is observed that four factors namely "top management commitment", "IT infrastructure", "training" and "adequate financial resources" are driver, while the other CSFs are dependent. Therefore these four CSFs play a main role in BPR implementation. The finding of this paper can be used as guideline for managers to concentrate on the most influential factors.

5. References

[1] K.K. Chan, and T.A. Spedding. An integrated multidimensional process improvement methodology for manufacturing systems. *Computers & Industrial Engineering*. 2003, 44 (4): 673-93.

[2] K, Salimifard, M.A. Abbaszadeh, and A, Ghorbanpur. Interpretive Structural Modeling of Critical Success Factors in Banking Process Re-engineering. *International Review of Business Research Papers.*2010*,* 6 (2): 95-103.

[3] M. Hammer, and J. Champy. Reengineering the Corporation. Harper Business, NewYork, NY, 1993.

[4] J.R. Farmer. Reengineering the factory. Production and Inventory Management Journal, 1993, 34 (1): 38-42.

[5] M. Al-Mashari, Z. Irani, and M. Zairi. Business process reengineering: a survey of international experience. Business Process Management Journal, 7 (5): 437-55.

[6] C. Chiplunkar, S.G. Deshmukh, and R. Chattopadhyay. Application of principles of event related open systems to business process reengineering. Computers & Industrial Engineering, 2003, 45 (3): 347-74.

[7] G. Hall, J. Rosenthal, J. Wade. How to make reengineering really work. Harvard Business Review, 1993, 71 (6): 119-31.

[8] T.J. Crowe, P.M. Fong, and J.L. Zayas-Castro. Quantative risk level estimation of business process reengineering efforts. Business Process Management Journal, 2002, 8 (5): 490-511.

[9] N. Abdolvand, A. Albadvi, and Z. Ferdowsi. Assessing readiness for business process reengineering. *Business Process Management Journal*, 2008, 14 (4): 497-511.

[10] A.R. Dennis, T.A. Carte, and G.G. Kelly. Breaking the rules: success and failure in groupware-supported business process reengineering. Decision Support Systems, 2003, 36 (3): 31-47.

[11] H.A. Reijers, and S.L. Mansar. Best practices in business process redesign: an overview and qualitative evaluation of successful redesign heuristics. Omega, 2003, 33 (4): 283-306.

[12] T. Guimaraes. Field testing of the proposed predictors of BPR success in manufacturing firms. Journal of Manufacturing Systems, 1999, 18 (1): 53-65.

[13] S.L. Mansar, F. Marir, and H.A. Reijers. Case-based reasoning as a technique for knowledge management in business process redesign. Electronic Journal on Knowledge Management, 2003, 1 (2): 113-24.

[14] M.E. Terziovski, P. Fitzpatrick, and P. O'Neill. Successful predictors of business process reengineering (BPR) in financial services. International Journal of Production Economics, 2003, 84 (4): 23-32.

[15] H. Ahmad, A. Francis and M. Zairi. Business process reengineering: critical success factors in higher education. Business *Process Management Journal*, 2007, 13 (3): 451-469.

[16] R. McAdam. Radical change: a conceptual model for research agendas. Leadership & Organization Development Journal, 2003, 24 (4): 226-35.

[17] M.A. Abbaszadeh, M. Ebrahimi, and H. Fotouhi, H. Developing a causal model of critical success factors for knowledge management implementation. International Conference on Education and Management Technology, Cairo, Egypt, 2010

[18] G.H. Jamali, M. Ebrahimi, and M.A. Abbaszadeh. TQM Implementation: An Investigation of Critical Success Factors, International Conference on Education and Management Technology, Cairo, Egypt. 2010.

[19] J. Shieh, H. Wu, and K. Huang. A DEMATEL Method in Identifying Key Success Factors of Hospital Service Quality. Knowledge-Based Systems, 2010. 23 (4): 277-282.