The strategy based on game theory for cross-organizational business process reengineering in supply chain

¹JIAN-FENG LI, ¹YAN CHEN, ²XU-SHENG CUI Department of Management Science and Engineering, ¹Dalian Maritime University, ²Dalian International Cooperation Holdings Ltd. The Linha Road, Dalian city, P.R. CHINA lijianfeng_vvv@yahoo.com.cn

Abstract: - Many enterprises with their own benefits are involved in cross-organizational business process reengineering in supply chain, which is different from BPR within one enterprise. The enterprises have rights to take part in the cross-organizational BPR project or not, in this way, their activities under the benefits will affect the progress of the project and the different results will be gotten. It has been an important matter which hasn't been worked over deeply in the current research, so this paper probes into that problem and analyzes the reengineering strategy in supply chain, i.e. how to adopt the proper method based on game theory in the analysis of enterprises' interrelating actions under their benefits for BPR in order to achieve good results. Concretely, the amalgamation of reengineering benefits for different enterprises, the relationship of reengineering activities and the effects of different reengineering modes are investigated deeply. This paper studies the benefits and activities of reengineering entities and emphasizes the various and inducing ability of the reengineering method, which enriches the current research of BPR and has intrinsic value on the actual project of cross-organizational BPR in supply chain.

Key-Words: Game theory; Business process reengineering; Cross-organization; Supply chain; Reengineering strategy; Project management.

1 Introduction

With the development of information technology and the formation of economic globalization, the competition in the market becomes more and more vehement. The key points that enterprises gain the advantage in competition have changed. It isn't not only competition within enterprises themselves but also between supply chains which the enterprises belong to[1,2], therefore, supply chain management have received great attention from enterprisers and scholars[3]. According to the recent studies by international data company (IDC), IT services market scale in supply chain management has increased form 26.1 billion to 40.5 billion. The annual growth rate is about 9.2%[4].

1.1 The Importance of Cross-organizational BPR in Supply chain

The hinge of supply chain management is to strengthen the cooperation of enterprises in the supply chain. One of the important things is to redesign the cross-organizational business process[5]. There are three main reasons below:

- Unreliable and delaying states in the cooperation will decrease when business processes among different enterprises in the supply chain are connected closely.
- Process cost will decrease through the elimination of some redundant parts among the different business processes of enterprises in supply chain.
- Synergic time will be shortened, repertory cost will be reduced and Customer's satisfaction will increase, when the validity that enterprises' business process merges in the supply chain is strengthened.

Some enterprises have made the prominent economic performance through cross-organizational BPR project in supply chain.

For example, Nokia Networks Company has implemented one project named BIRD in order to syncretize the business procedure between itself and the customers with enormous orders in supply chain. After one and a half year, Nokia Networks Company has reduced its repertory level by about 40%, and sale achievements have increased by a large margin[6]. Imation Company has cooperated with Monroe Company closely at logistic service procedure, as a result, the rate of its order accuracy has reach 99.9%, and the expenses of the storage and transportation in North America area has been reduced by 70 million dollars[7].

Pellton International Company, one large-scale transnational chemical company, has carried on a successful cross-organizational business process reengineering in supply chain with its two important customers Basco PLC and Perdirelli Company, which has made the repertory level roughly reduced by 75% and cycling time probably reduced by 70%[8].

In this way, the cross-organizational business process reengineering in supply chain has received great attention from most persons. Michael Hammer, as the founder of BPR, has pointed out in his new book "Agenda: what every business must do to dominate the decade (publish in 2002)" that it is one of the important things that the enterprises should be concerned with in the next decade[9].

1.2 The Discrepancies and Problems

However, as a new paradigm produced in recent year, the cross-organizational business process reengineering is different from traditional BPR in one enterprise. The discrepancies are approximately shown in two aspects below.

Firstly, the enterprises in the supply chain belong to the relatively independent entities with some their own benefits, and it means both common benefits and inconsonant benefits exist together for each other when cross-organizational BPR comes into being, which is different from that only one beneficial body in traditional BPR, so the benefits of all the enterprises in the supply chain who take part in cross-organizational BPR should be considered carefully together.

Secondly, the enterprises in the supply chain have relatively independent active ability, and it means that the reengineering entities don't totally submit to the request of BPR project as same as the units in one enterprise on account of the decision from managers. As relatively independent bodies, they can take part in the cross-organizational BPR or not according to their own benefits; even quit the project which is going on if there is not the restriction of contract.

Therefore, it's difficult to implement and popularize the cross-organization business process reengineering in supply chain.

For example, many enterprises worry about revealing their own secrets such as advantage

technology, sophisticated management method and harmonious company culture on account that business processes of the different enterprises in supply chain are connected closely, so they don't take part in the cross-organizational BPR in supply chain, in this way, that BPR project can't be initiated at all.

Other enterprises don't carry the crossorganizational BPR in supply chain through to the end, just inasmuch as the benefits which come from BPR project in the original period are not enough or don't be shown as quickly as possible. Even they maybe give out the BPR project entirely, that will make some enterprises suffer great losses which have invested a lot into the BPR project such as some changes in the management and money for buying the information technology that may not come back as irreversible consumption if there are not some contracts to restrict the reengineering entities' actions in supply chain.

1.3 The Reengineering Strategy

As a result, it's necessary to work over the reengineering strategy in supply chain, i.e. to adopt the proper method based on game theory in the analysis of enterprises' interrelating actions under their benefits for BPR in order to achieve good result, such as what sequence is followed to finish specific reengineering matter, whether waiting time is needed to understand some condition, and whether some means is taken to encourage or restrict reengineering entities' actions.

For example, enterprises can choose the reengineering mode that the cross-organizational BPR project is finished totally in one time and the business processes among different enterprises are closely connected immediately in supply chain. Through that method, reengineering result can come in to being quickly but some bad outcome may be shown out if investigation for BPR is not very good, and the whole procedure is irreversible.

Also, enterprises can choose the reengineering mode that only little part of BPR project is done firstly in order to see what's going on in supply chain and then, the next step for BPR is in decision. In this way, enterprises have more rights to choose their reengineering actions, and don't lose too much because of investing a lot into cross-organizational BPR project in supply chain.

What's more, enterprises in supply chain can choose the reengineering mode that some normal parts of cross-organizational BPR project are initiated firstly where benefits come into being clearly and quickly, and then induce the partners to take part in the kernel part of BPR project which may bring forward some contradiction and whose benefits are latent now but great in a long run.

Different reengineering methods may affect enterprises' actions under their benefits and lead to different reengineering results, so it's very important to think of cross-organizational BPR in supply chain in the strategic way.

2 Literature

The thought of cross-organizational BPR is reflected in the early literature of BPR, such as Hammer, Champy and McHugh, who all point out that business process reengineering will cross over the borders of organizations and its final purpose is to break the barriers of enterprises[10]. Besides, the tendency of cross-organizational BPR is also shown out in some papers about the inter organizational system (IOS), for example, Theodore H.Clark believes that cross-organizational BPR is the logic extension of IOS, which has been applied in the different enterprises[11].

However, on account of information network technique's deficiency and business management thought's backwardness, cross-organizational BPR didn't launch to be studied well at that time. Until Champy, another founder of the BPR, wrote a new book "X-Engineering the Corporation: Reinventing Your Business in the Digital Age" in 2002, the subject of cross-organizational BPR was brought forward formally and became a hot topic that need to be concerned with[12]. In Champy's book, the scope of BPR has been extended from within one enterprise to within enterprises' customers, suppliers and partners, what's more, many respects of crossorganizational BPR are explained according to the number of enterprises who take part in the BPR project as the nods in supply chain[13]. Therefore, a lot of scholars are wild about working over the cross-organizational BPR in supply chain.

2.1 The Three Research Branches

There are approximately three research branches in that subject.

2.1.1 Cognitive Research Branch

The key points in that branch are mainly to understand and grasp cross-organizational BPR in supply chain, for example:

♦ The important effects on supply chain management by cross-organizational BPR are clarified and cross-organizational BPR is appraised highly as BPR-II (Mohsen, Attaran and Paul, R.J, 2004)[17,18].

- The necessity is illuminated distinctly that crossorganizational BPR project should be carried on by the enterprise members in supply chain (Lambert and Croxton, 2005)[16].
- ◆ The connotation of cross-organizational BPR in supply chain and the relationship between BPR and supply chain management (SCM) are expatiated carefully (Guo and Sun, 2007)[14,15].
- ◆ The improvement of performance is "limited" only through inter organizational system (IOS), and the increase of performance by a large margin must depend on both "technological innovation" and "procedure innovation" (Zhou, 2007)[19].

In that research branch, the importance of crossorganizational BPR in supply chain is shown definitely.

2.1.2 Supportive Research Branch.

The key points in that branch are mainly to describe and construct cross-organizational business process, which is the basis of further process reengineering, for example:

- The importance of describing and classifying the cross-organizational business process in supply chain is emphasized by Douglas M Lambert, and he also distinguishes the types of business process in supply chain[20].
- ◆ The Supply-Chain Operations Reference model (SCOR model) is brought forward by Supply-Chain Council, which describes carefully the basic process and concretive level of the supply chain, and it is advantageous to support the information exchange and cooperation among the enterprises in supply chain[21].
- ♦ The analysis for the business process of the supply chain in the "role" view comes into being, which points out that description of cross-organizational working flow according to the role relationship can realize the close connection among the cross-organizational business process (Zhao, 2003)[22].
- ♦ The cross-organizational process modeling is contrasted and sorted, which is good to develop the research of cross-organizational BPR in supply chain (Ling, 2004)[23].

In that research branch, some essential studies that descript the business process in supply chain are brought forward to support the effective improvement of cross-organizational business process's connection in the next step.

2.1.3 Methodological Research Branch.

The key points in that branch are mainly to probe into the method of cross-organizational business process in supply chain. There are approximately three parts in that branch:

- The principle and sequence. The guidelines and steps of cross-organizational BPR in supply chain are described carefully[24,25].
- ◆ The adjuvant means. For example, the principalagent model based on dynamic game theory is given out in order to design an incentive mechanism for solving the problem of enterprises' coordination after the crossorganizational BPR (Zhou, 2006)[26].
- The special reengineering method. For example, the balanced scorecard method is utilized to the cross-organizational redesign business process in supply chain (Peter Horvatth, 2003)[27]. The core procedure analytic matrix is used for the cross-organizational BPR in supply chain (Wesley Changchien, 2006)[28]. Fuzzy comprehensive evaluating method is imposed on the direction of cross-organizational BPR in supply chain according to the supply chain performance measurement system brought forward by Felix T S Chan (Kong, 2006)[29].

In that research branch, the actual methods are analyzed seriously, which is the core of crossorganizational BPR in supply chain.

2.2 The Deficiency in the Current Research

In the current research, the important role is set up in the cognitive research branch, and supportive tools for the description of the business process in supply chain are provided in the supportive research branch, however, after understanding the important role and having the supportive tools, the most pivotal thing is to probe into the reengineering methods in the third methodological research branch. There are some important things needed to be concerned with in this new developing areas, which are shown below:

◆ The game driven by the benefits. The enterprises in supply chain are the entities with their own benefits which have rights to take some activities. Their game behaviors under the benefits will affect the progress and result of crossorganizational BPR in supply chain. In the methodological research branch, that point isn't embodied on the principle and sequence of crossorganizational BPR in supply chain, what's more, the scholars didn't consider that attribute of game in the special reengineering method at present. Basically, only the paper written by Zhou involves that attribute of game, however, its purpose is to study the incentive mechanism after the BPR, and doesn't show the influence of the game on the cross-organizational BPR, such as progress and result.

• The cross-organizational reengineering modes. The old indea of reengineering within one enterprise is embodied in current research, which doesn't consider the game activities of multientities in supply chain. It supposes that the BPR project normally can be finished in one time, and don't consider the different modes according to the multiple enterprises' interrelating actions under their benefits for BPR, such as some normal parts of cross-organizational BPR project are initiated firstly where benefits come into being clearly and quickly, and then induce the partners to take part in the kernel part of BPR project, or only little part of BPR project is done firstly in order to see what's going on in supply chain and then, the next step for BPR is in decision. The different reengineering modes will affect multiple entities' activities and the different reengineering results of crossorganizational BPR in supply chain will be achieved finally.

Thus, according to the above two deficiencies in current research, this paper probes into the reengineering strategy, that is also how to adopt the appropriate cross-organizational strategy in supply chain. In this way, the benefits of multiple enterprises are considered and the game activities of reengineering entities are induced in order to achieve the good cross-organizational reengineering results, which can enrich the current research of BPR and has intrinsic value in the project of crossorganizational BPR in supply chain.

3 Strategic Analysis Framework

The multiple enterprises in supply chain are involved in cross-organizational BPR project. Their activities under the benefits will affect the progress and results of the cross-organizational BPR project. In this way, it's not appropriate only to adopt the old reengineering method for the BPR project within one enterprise on account that the multiple reengineering entities have rights to take the actions to some extent in contrast with the BPR project within one enterprise that the upper managers can just give the orders to the underlings how to do it, thus different reengineering modes that are chosen featly for the BPR project are necessary. From the above appoints, a reengineering framework in the strategic view are set up, which is shown in Fig 1.



Fig 1. Strategic Reengineering Analysis Framework

3.1 Reengineering Benefits

The cross-organizational BPR in supply chain plays an important role in today's competition. The enterprises take part in the BPR project in order to achieve the reengineering benefits. There exists both some reengineering badness and the reengineering goodness. Thus, it's necessary to analyze those benefits in the two aspects.

On the one side, the enterprises in supply chain will increase some benefits when they take part in the cross-organizational project. For example, the redundant parts among the different business processes are eliminated and process cost can decrease; unreliable and delaying states decrease and cooperation of partners in supply chain increase; the what's more, through information communication and process connection closely, the enterprises in supply chain collaborate together to adjust their production to follow the change the final customers' need, which will reduce the repertory cost by a large margin and satisfy the customers greatly.

On the other side, the enterprises in supply chain will also decrease some benefits when they take part in the cross-organizational project. For example, their excellent management method and technological secret may be lost; their enterprise may be changed; what's more, they maybe depend on others more and more on account of the connection of their business process, and they are tied together closely enough to find more good chance of partnership, otherwise they will lost the investment that have been put into the BPR project. That badness of cross-organizational BPR in the supply chain may be too big for the enterprises to take part in the BPR project.

Thus, reengineering benefits, which is also the players' payoff as one of three basic factors in the game theory, are explained clearly in two sides. They can be expressed in the mathematic formula too. Ug is represented as the goodness from the BPR project and Ub is represented as the badness, which is both thought of the aggregation. If the weights are considered, the reengineering benefits in the cross-organizational in supply chain are shown below:

$$U = U_g \times W_g + U_b \times W_b \tag{1}$$

3.2 Reengineering Activities

Players, players' action and players' payoff are three basic factors in the game theory. Players are the enterprises in supply chain, which are simple and there is a little to say about. The players' payoff has been expatiated above in the two aspects, and now, reengineering activities, i.e. players' actions, are explained below. There are about three basic reengineering activities for the enterprises to choose in a cross-organizational BPR project: "take part in", "don't join" and "quit".

The enterprises in supply chain will take part in some special content of cross-organizational BPR project if that project can bring more reengineering benefits for themselves. However, if the gain is less than the loss or something is not very clear, they will "not join" that cross-organizational BPR project at present. In this way, on account that the crossorganizational BPR project need multiple partner's involvement, if some want to take part in the project, but others don't, the cross-organizational BPR project will not be initiated totally as the designer does. What's more, if there is not the constrict of some contracts, the enterprises in the supply chain maybe "quit" the cross-organizational BPR project which has been carried on, and it can bring some loss to other enterprises who have invested a lot into that project.

Thus, the enterprises' reengineering activities are interrelated. The enterprises in the supply chain choose their reengineering activities is under their reengineering benefits, and the different action choices will affect each other and lead to the different progress and result of cross-organizational BPR in supply chain.

3.3 Mode Construction

The multiple enterprises are involved in the crossorganizational BPR in supply chain. Their reengineering activities under the benefits will affect the progress and result of BPR project. In this way, the reengineering mode plays an important role in cross-organizational BPR project, which both directs the reengineering benefits and steers the reengineering activities of the enterprises in supply chain.

In a supply chain, there are many things to do for the cross-organizational BPR, such as elimination of the redundant parts between different enterprises' business process, adjustment of communication procedure in order to connect the processes closely and change of transportation procedure to allot assets reasonably among the partners. If the whole business process in supply chain is thought of as a big and total procedure, which can be described through the already existing modeling tools in the supportive research branch, that reengineering things are considered as many subprojects, which are decomposed from the entire reengineering project. That subprojects are basic for the reengineering mode construction.

With the inner logic of the subprojects followed, the different sequence is set up by the way of arranging the cross-organizational BPR subprojects, and then, it's considered whether the waiting time during the reengineering period is needed to understand the uncertainty and whether some incentive mechanism is built up for inspiriting and restricting the actions of the engineering partners in supply chain.

In this way, the different cross-organizational reengineering mode in supply chain is constituted, which make up a scheme aggregate for the BPR project. From that aggregate, an appropriate reengineering mode will be chosen to control the reengineering progress and in order to achieve the best reengineering result for the cross-organizational BPR project in supply chain.

3.4 Mode Selection

The reengineering mode selection is the most important part in the strategic analysis framework. Here, the different reengineering benefits are the origin of the problems in the cross-organizational BPR project, the interaction of enterprises' reengineering activities leads to the different progress and result of the cross-organizational BPR project, and the reengineering modes are constructed to make up a scheme aggregate for the BPR project. The most important thing is to select the appropriate reengineering mode to achieve the best result of cross-organizational BPR project.

For the enterprises in the supply chain, they normally decide whether to take part in the crossorganizational BPR project according to the forecast of the reengineering benefits that they will achieve, what's more, that forecast will be changed with the reengineering results in the former period or the some incentive mechanism added. For example, some parts of the BPR project are carried on firstly that the reengineering profits will come into being clearly and quickly, and then, the kernel part of BPR project will be done that reengineering profits are latent and long-term. The reason is that the forecast for kernel part's reengineering will turn better by the way that some obvious profits are shown firstly. As is the incentive mechanism, some inspiriting and restricting methods are to change the forecast for some special parts of cross-organizational BPR project in fact or make some uncertainty less and the condition more clearly.

That is the basic gist for the reengineering mode selection. In the aggregate of reengineering modes, the sequence of arranging the cross-organizational subjects is different, and as is the incentive mechanism, the already finished parts of crossorganizational will be give the confidence of disanimation to the enterprises in supply chain for the next reengineering subject. In this way, the selection of the reengineering mode is in fact to choose the different results of cross-organizational BPR in supply chain.

4 The Model of Cross-organizational BPR in Supply Chain

Following the above strategic reengineering framework, a model of cross-organizational BPR in supply chain is built up. Firstly, only two players'

cross-organizational reengineering model based on game theory is explained.

4.1 The Reengineering Model with Two Players Based on Game Theory

Supposing only two enterprises(X and Y) in supply chain, they may have a cross-organizational BPR project. After decomposing the total reengineering project into some littler subjects, the enterprises in supply chain maybe set up k kind of reengineering mode, in which there are m steps that m can be equal to 1 with the meaning of accomplishing the reengineering project in one time (Fig 2). Some symbols are explained below, which are three basic factors in the game theory.

- X: X player
- Y: Y player
- N: Virtual player
- T: take part in
- D: don't join
- Q: quit
- U: player's payoff (benefits)

According to the Harsanyi transformation, the uncertainty can be explained in the game theory by adding a virtual player N. Supposing there are only two conditions "good" and "bad", if X player don't want to initiate the BPR project with forecasting the conditions, the players' payoffs, i.e. their benefits are both zero. If X player want to take part in some cross-organizational BPR project in supply chain, but Y player don't want to join it, the BPR project can not be initiated on account that that project need the collaboration of enterprises in supply chain, thus their payoffs are both zero too. Only when they are willing to take part in that project, they will achieve their benefits (Ux1, Uy1).

In the next step, both enterprises also consider the uncertainty conditions. If the reengineering contract can not be achieve, their reengineering benefits are not changed as the same as the last ones (Ux1, Uy1). Otherwise, in case that the "discount" is not thought of, the total benefits are the summation the in the first two steps (Ux1+Ux2, Uy1+Uy2), if one enterprise quit the BPR project which has been carried on, their benefits are (Ox2, Oy2) or (Ox2',Oy2'). Here, one player will get loss, and the other's



Fig 2. The cross-organizational BPR game model with two players

benefits from quitting will be larger than that it continues to carry on the BPR project. In this way, they "maybe" carry through cross-organizational BPR project in the *m* steps, and their payoffs are $(Ux_1+\dots+Ux_m, Uy_1+\dots+Uy_m)$.

That is a dynamic game with incomplete information, and the enterprises in supply chain pursue the perfect Bayesian equilibrium. Although there are only two conditions: "good" and "bad", many factors are included in those conditions, such as the competitive market, politic environment, management rules within the enterprise and their corporate culture. According to those factors, enterprises in supply chain will set up the probability of goodness and badness for themselves and others, what's more, the probability will be modified with the situations observed in the crossorganizational BPR project. In that dynamic game with incomplete information, the enterprises (X and Y) will decide whether to take part in the BPR project on the basis of the reengineering benefits and the probability for that benefits. When player X and Y are both involved in the project, some progress of cross-organizational BPR will be achieved. For the different engineering mode, the different engineering steps in design will be gotten according to the equilibrium outcome of the game with incomplete information.

Thus, engineering mode selection depends on the game equilibrium between player X and player Y. selection rule is based on two aspects. One is the final reengineering benefits. Two players X and Y will select the mode which can be carried on some progress and bring them the most benefits. The other is the probability of achieving those benefits. For each step of reengineering design, there is the probability of goodness or badness for the BPR project. They will select the reengineering mode with the largest mean value. When that probability is not very clear some times, so some engineering mode is chosen that small part of crossorganizational BPR project is tried firstly to clarity some reengineering results in supply chain, or some inspiring or restricting means are set up in order to modify the forecasting probability of the players in advance. In this way, the game equilibrium is achieved, i.e. some steps in the BPR project are finished until one of players X and Y don't want to take part in the next reengineering BPR subproject. They will achieve some reengineering benefits that are the summation of benefits in the front subprojects finished $(Ux1+\dots+Uxt, Uy1+\dots+Uyt)$, where $t \leq m$.

4.2 The Reengineering Model with Multiple Players Based on Game Theory

The basic game procedure within the multiple enterprises for the cross-organizational BPR project in supply chain is as same as that procedure between two enterprises above.

Supposing there are n enterprises in supply chain $(x1, x2, x3, \dots, xn)$, for the special content in each step of some reengineering mode, they will investigate the situation and forecast the probability of goodness and badness, and then, they take one of three reengineering activities according to their expected reengineering benefits. Here, Si is represented as the aggregate of reengineering activities that *i* player can choose, in which s*i* is the basic special activity (take part in , don't join and quit), so $(s1, s2, \dots, sn)$ means the combination that every player choose one reengineering action. In addition, Ui is represented as the payoff of the iplayer, and Ui (s1, s2, ..., sn) is *i* player's payoff when combination of activities (s1, s2, ..., sn) is chosen by each player. That game for multiple players in supply chain can be represented as $G = \{S1,$ $S2, \dots, Sn; U1, U2, \dots, Un\}.$

In that game, every enterprise in supply chain pursues the equilibrium in the continueation game. It will carry on the cross-organizational BPR project until it achieves the biggest reengineering benefits for itself. Here, S_i^* is represented for one enterprise's optimal activity that can bring that enterprise most reengineering benefit from the whole rest steps in the cross-organizational BPR project.

$$\sum U_i(s_1, \cdots, s_{i-1}, s_i, \cdots, s_n) \leq \sum U_i(s_1, \cdots, s_{i-1}, s_i^*, \cdots, s_n)$$
(2)

When every player takes the best reengineering activity for itself to all the others' activities, the Nash equilibrium in the continueation game will come into being. At that time, all the enterprises in supply chain will not change its reengineering activities, so the relative steady state is gotten.

$$s_i^* = \max(s_1^*, \cdots, s_{i-1}^*, s_i, s_{i+1}^*, \cdots, s_n^*)$$
(3)

In this way, some steps in the different reengineering mode are taken and the progress of cross-organizational BPR project will be finished with the corresponding reengineering results.

For the reengineering model with multiple players, although more enterprises are involved in the BPR project than two-player reengineering model, the basic technical method is not changed (Fig 3). The reengineering activities are driven by the enterprises' benefits, which is also affected by the reengineering mode, so the reengineering mode will produce the equilibrium in the game which also means some progress of cross-organizational BRP in supply chain and relative results of BPR project come into being, thus the enterprises in supply chain achieve the reengineering benefits. It probes into that problem in a dynamic and changeable view.



Fig 3. Strategic Technical Flow Chart

5 Conclusions

Cross-organizational BPR in supply chain plays a great role in the modern competitive market. According to the deficiency of studying enterprises' reengineering benefits and activities, this paper makes use of game theory to analyze the reengineering strategy in supply chain. It possesses several characters as follows: (1) the connections conflicts of reengineering benefits and are investigated that is useful for the study of multiple reengineering entities in the BPR-II; (2) the dynamic ability of reengineering entities is emphasized that is favorable to making up the insufficiency of research on the reengineering activities; (3) the variety of reengineering mode in dynamic view is shown to enrich the method's study for the cross-organizational BPR in supply chain; (4) reengineering mode selection is expatiated in the view of game for cross-organizational BPR in supply chain.

6 Acknowledgment

The authors would like to thank peer reviewers for commenting this article. This work is supported by Science Foundation of Ministry of Education of China (Grant NO. 20070151022) and Research Project of the Educational Department of Liaoning Province (Leading Laboratory Project) under Grant 20060083. References:

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