

Research On Incentive Mechanism of General Contractor and Subcontractors Dynamic Alliance in Construction Project Based on Team Cooperation

Honglian Yin^{1*}, Aihua Sun¹, Quanru Liu¹, Zhiyi Chen¹

¹Shandong Water Conservancy Vocational College, Rizhao, China

*Corresponding author e-mail: sdsyhl@163.com

Abstract. It is the key of motivating sub-contractors working hard and mutual cooperation, ensuring implementation overall goal of the project that to design rational incentive mechanism for general contractor. Based on the principal-agency theory, the subcontractor efforts is divided into two parts, one for individual efforts, another helping other subcontractors, team Cooperation incentive models of multiple subcontractors are set up, incentive schemes and intensities are also given. The results show that the general contractor may provide individual and team motivation incentives when subcontractors working independently, not affecting each other in time and space; otherwise, the general contractor may only provide individual incentive to entice teams collaboration between subcontractors and helping each other. The conclusions can provide a reference for the subcontract design of general and sub-contractor dynamic alliances .

1. Introduction

Gert Wijnen and Rudy Kor considered that a team is a group of people with complementary skills who are committed to achieving same goals and consistent work methods which is responsible for this method^[1]. Alchina and Demesetz thought that a team is a group of agents who can choose their efforts level separately while each agent's marginal contribution for output depended on other agent's efforts which can't be observed separately^[2]. Under general contracting mode general contractors use dynamic alliance project management mode to organize all the subcontractors to satisfy the market needs. Resources sharing, complementary advantages, risk and benefit sharing score on team cooperation meant to establish a long-term cooperation between the general contractors and subcontractors so as to enhance the core competitiveness of enterprises and reduce transaction costs^[3]. Water conservancy and hydropower projects have characteristics of large scale and professional a turnkey project usually has more than one subcontractors, the general contractor and the subcontractors use project planning, organization, command and adjust management means together to achieve project objectives in order to achieve the common goal of construction projects through a clear division of labor and cooperation. In the general contract project the division of labor cooperation can greatly increase the formation of the synergy effect of engineering projects which in fact is the team production. If the subcontractors sincerely cooperate for the general contractor the project will be successfully achieved otherwise it will appear such adverse consequences the cost increase, quality drops and time delay so that management coordination difficulty increases. Therefore



reasonable incentive mechanism is key factor for general contractor to excite the subcontractors working hard and mutual cooperation and ensuring the realization of overall objective project and subcontractors to establish long-term cooperative relationship.

It is still in the initial stage to introduce the dynamic alliance into the construction enterprise and project management and the relevant literature is still relatively less. Domestic scholars carried on research on the dynamic alliance of the organization structure from the perspective of the owners of water conservancy and hydro-power projects^[4]. The general contractor carried on the research mainly in a small amount of literature mainly focused on the subcontractor's selection method^[5,6], the total score of the dynamic alliance to jointly strive to add revenue distribution^[7], total score package of dynamic alliance operation mode in water conservancy and hydro-power projects and the formation process^[8]. The Chinese and foreign scholars have done a lot of research about how to motivate the team members to cooperate effectively. The literature showed^[9] that the client can realize team cooperation through the incentive mechanism to break a balanced budget while the principal role is not to supervise team members but to break the budget balance; Literature^[10] gave out different impact on members of the collaborative output and construct static game model and repeated game model for teamwork; Literature^[11] believes that the establishment of good team cooperation relationship between members can help to increase the sensitivity of the income distribution, and improve the effectiveness of profit sharing incentive system, the relationship of cooperation between team cooperation and profit sharing incentive mechanism is a two-way interactive relationship. Literature^[12] constructed a team including a principal client and two agents to study the relationship between incentive structure and team collaboration based on principal-agent model. incentive schemes provide individual and team two levels of output in the client, the equilibrium selection agent on their own efforts and cooperation, so that the optimal incentive coefficient of the principal set.

Our paper introduced the incentive mutual cooperation among the various subcontractors on the basis of the above literature and used the client-agent theory to establish the model for the team cooperation incentive model which provides the basis for the design of the project total score.

2. Design of the Model

(1) Assume there is a general contractor G and two subcontractors S_1 、 S_2 in the project team every subcontractor is in charge of a subcontract work.

(2) The efforts of the subcontractor can be divided into two parts one for the efforts of their own work $e_i(e_i > 0)$ and another for efforts of the other subcontractors $h_i(h_i > 0)$. These help includes money lending, technical assistance, evidence providing, claim each other, disputes reducing and allowing the use of the finished project. Assume the marginal cost of subcontractors' efforts is $c_i(e_i, h_i)$

$$(\partial c_i / \partial e_i \geq 0, \partial c_i / \partial h_i \geq 0, \partial^2 c_i / \partial^2 e_i \geq 0, \partial^2 c_i / \partial^2 h_i \geq 0, i=1,2) \quad \text{and further hypothesis}$$

is $c_i(e_i, h_i) = 0.5(e_i)^2 + 0.5(h_i)^2 + \Delta e_i h_i (i = 1, 2)$. In the formula $0 \leq \Delta \leq 1$ stands for the degree of

conflict between two kinds of efforts by the subcontractors. If $\Delta=1$, $c_i(e_i, h_i) = 0.5(e_i + h_i)^2$ which means that two kinds of hard work can replace each other and the subcontractor pays great attention to the total effort level. If $\Delta=0$, $c_i(e_i, h_i) = 0.5(e_i)^2 + 0.5(h_i)^2$ the two efforts to separate each other, the subcontractor's efforts to help other subcontractors will not increase their marginal cost and the output of each subcontractor is determined by its own efforts and by the help of other subcontractors.

(3) Assume the risk of the general contractor is neutral and the risk of the subcontractor is averse. Suppose in particular that the subcontractor's disutility function has constant absolute risk averse on

time and state which can satisfy additivity $V_i(w_i) = -\exp(-\rho w_i)$. In the formula w_i is the subcontractor's actual monetary income and ρ is the risk aversion of subcontractors.

(4) Assume the production function of each subcontractor work is

$$x_i = e_i + h_j + \varepsilon_i(i, j = 1, 2, j \neq i) \text{ and } \varepsilon_i \text{ is random factor who obeys the normal distribution, mean}$$

value is 0 and variance sigma is σ^2 . Assume $R(e, h)$ is the total income of the

project $R(e, h) = B + x_1 + x_2$ in which B stands for the owners pay to the contractor's fixed price.

(5) Assume the general contractor uses linear incentive contract whose payment form is

$$r_i(e, h) = b_i + \lambda_i x_i + \beta_i (x_1 + x_2). \text{ In the formula } b_i \text{ is a sub project of the subcontractor's fixed price}$$

subcontract (reward), λ_i is individual incentive strength of subcontractor subcontractor (individual output distribution ratio) and β_i is team work incentive intensity (sub contractor team common output distribution).

(6) Game model is divided into three stages: In the first stage the contractor provide specific incentives to subcontractors; In the second stage each subcontractor decides whether to accept or reject the Contractor's payment. If at least one subcontractor refused it means the end of the game so two subcontractors are retained the utility u_0 . If the two subcontractors both accept contract then the game enters the third stage; In the third stage each subcontractor can determine their own hard work and help to achieve their respective output respectively.

Assume π as total net revenue of contractor and subcontractor while π_g , π_i as net revenue of contractor and subcontractor respectively, the total revenue and revenue of each contractor can be described as follows on the above assumptions.

$$\pi_g = R(e, h) - \sum_{i=1}^2 r_i = B + \sum_{i=1}^2 x_i - \sum_{i=1}^2 r_i \quad (1)$$

$$\pi_i = r_i - c_i(e_i, h_i) - c_i(r_i) \quad (2)$$

$$\pi = R(e, h) - \sum_{i=1}^2 c_i(e_i, h_i) - \sum_{i=1}^2 c_i(r_i) = B + \sum_{i=1}^2 x_i - \sum_{i=1}^2 c_i(e_i, h_i) - \sum_{i=1}^2 c_i(r_i) \quad (3)$$

Due to the subcontractor's risk aversion and the assumption of the contractor under the linear incentive contract conditions, the risk cost of the subcontractor is

$$c_i(r_i) = 0.5 \rho \text{Var}(r_i) = 0.5 \rho [\text{Var}(\lambda_i x_i) + \text{Var}(\beta_i (x_1 + x_2))] = 0.5 \rho \sigma^2 (\lambda_i^2 + 2 \beta_i^2) \text{ and the determination}$$

equivalent income of the sub contractor can be calculated as follows.

$$\begin{aligned} \pi_i &= r_i - c_i(e_i, h_i) - 0.5 \rho \sigma^2 (\lambda_i^2 + 2 \beta_i^2) = b_i + \lambda_i (e_i + h_j) + \beta_i \sum_{i,j=1, i \neq j}^2 (e_i + h_j) \\ &\quad - [0.5 (e_i)^2 + 0.5 (h_i)^2 + \Delta e_i h_i] - 0.5 \rho \sigma^2 (\lambda_i^2 + 2 \beta_i^2) \end{aligned} \quad (4)$$

The maximum expected utility function of the sub contractor $E(V_i) = -E[\exp(-\rho \pi_i)]$ is equivalent to maximizing the above certainty equivalent income.

As the contractor is risk neutral so the Contractor's expected utility is equal to the expected return.

$$\begin{aligned} E[U(\pi_g)] &= E[U(B + \sum_{i=1}^2 x_i - \sum_{i=1}^2 r_i)] = E(B + \sum_{i=1}^2 x_i - \sum_{i=1}^2 r_i) \\ &= B + \sum_{i,j=1, i \neq j}^2 (1 - \beta_i)(e_i + h_j) - \sum_{i,j=1, i \neq j}^2 [b_i + \lambda_i(e_i + h_j)] \end{aligned} \quad (5)$$

The total certainty equivalent income of the contractor and the subcontractor can be calculated as follows.

$$\begin{aligned} E[U(\pi)] &= E[U(B + \sum_{i=1}^2 x_i - \sum_{i=1}^2 c_i(e_i, h_i))] \\ &= B + \sum_{i,j=1, i \neq j}^2 (e_i + h_j) - \sum_{i=1}^2 [(0.5(e_i)^2 + 0.5(h_i)^2 + \Delta e_i h_i) - 0.5 \rho \sigma^2 (\lambda_i^2 + 2 \beta_i^2)] \end{aligned} \quad (6)$$

Under asymmetric information the incentive mechanism decision problem of general contractor to each subcontractor is to choose λ_i, β_i in satisfying subcontractor's individual rationality constraint (IR) and the incentive compatibility constraint (IC) conditions as to maximize the collective profits of the contractor and subcontractors as a dynamic alliance namely means the maximization of total qualitative equivalence revenue which is presented to solve the optimization problem (P):

$$(P): \max_{e_i, h_i, \lambda_i, \beta_i} \{ B + \sum_{i,j=1, i \neq j}^2 (e_i + h_j) - \sum_{i=1}^2 [(0.5(e_i)^2 + 0.5(h_i)^2 + \Delta e_i h_i) - 0.5 \rho \sigma^2 (\lambda_i^2 + 2 \beta_i^2)] \} \quad (7)$$

$$s.t \begin{cases} (IR) b_i + \lambda_i(e_i + h_j) + \beta_i \sum_{i,j=1, i \neq j}^2 (e_i + h_j) - (0.5(e_i)^2 + 0.5(h_i)^2 + \Delta e_i h_i) - 0.5 \rho \sigma^2 (\lambda_i^2 + 2 \beta_i^2) \geq u_0 \\ (IC) \max_{e_i, h_i} \{ b_i + \lambda_i(e_i + h_j) + \beta_i \sum_{i,j=1, i \neq j}^2 (e_i + h_j) - (0.5(e_i)^2 + 0.5(h_i)^2 + \Delta e_i h_i) - 0.5 \rho \sigma^2 (\lambda_i^2 + 2 \beta_i^2) \} \end{cases} \quad (8)$$

3. Model Analysis

3.1. Determination of Optimal Level of Effort

In formula (9) we calculate the partial derivation of e_i, h_i and make it equal to zero then get the level of effort required to maximize the benefits of the subcontractors.

$$\begin{cases} \beta_i + \lambda_i - e_i - \Delta h_i = 0 \\ \beta_i - h_i - \Delta e_i = 0 \end{cases} \quad (10)$$

Further can be obtained:

$$\begin{cases} e_i = \frac{(1 - \Delta) \beta_i + \lambda_i}{1 - \Delta^2} \\ h_i = \frac{(1 - \Delta) \beta_i - \Delta \lambda_i}{1 - \Delta^2} \end{cases} \quad (11)$$

Obviously $e_i \geq h_i$ meaning that the level of subcontractor's effort working for itself is bigger than helping other subcontractor which is easy to understand. The following analysis shows the impact of the incentive intensity coefficient and the level of conflict between the two levels of effort levels.

(1) Effect of Incentive Strength on Their Self Efforts Level

$\frac{\partial e_i}{\partial \beta_i} = \frac{1}{1+\Delta} > 0$, $\frac{\partial e_i}{\partial \lambda_i} = \frac{1}{1-\Delta^2} > 0$ shows that the contractor will be conducive to improve the incentive intensity of subcontractors to increase their work efforts in the incentive scheme established. $\frac{1}{1-\Delta^2} > \frac{1}{1+\Delta}$ shows the influence of incentive strength of individual efforts output on subcontractor's own work is greater than the effect of team output.

(2) Effect of Incentive Strength on Helping Efforts Level

$\frac{\partial h_i}{\partial \beta_i} = \frac{1}{1+\Delta} > 0$, $\frac{\partial h_i}{\partial \lambda_i} = -\frac{1}{1-\Delta^2} < 0$ shows that the contractor improving output intensity of incentives will promote collaboration between subcontractors while improving the incentive intensity of the individual output will inhibit the collaboration between subcontractors.

(3) Effect of Conflict Degree between Self Efforts and Helping Efforts on Efforts Level

According to $\frac{\partial e_i}{\partial \Delta} = \frac{2\Delta\lambda_i - (1-\Delta^2)\beta_i}{1-\Delta^2}$ if $\frac{\lambda_i}{\beta_i} > \frac{(1-\Delta)^2}{2\Delta}$, $\frac{\partial e_i}{\partial \Delta} > 0$. When the incentive scheme is established the conflict between the self effort and the help effort will be beneficial to the subcontractor to increase the effort level of their self work if the individual output incentive intensity and total output motivation intensity are relatively large. If $\frac{\lambda_i}{\beta_i} < \frac{(1-\Delta)^2}{2\Delta}$, $\frac{\partial e_i}{\partial \Delta} < 0$. If the individual output incentive intensity and total output incentive intensity is relatively small the conflict between its own efforts and help efforts will reduce the level of sub contractor's self efforts. $\frac{\partial h_i}{\partial \Delta} = \frac{-(1+\Delta^2)\lambda_i - (1-\Delta^2)\beta_i}{1-\Delta^2} < 0$ shows that the incentive program is timed the conflict between its own efforts and help efforts will inhibit the sub contractors to help each other.

3.2. Determination of Incentive Intensity

Put Formula (11) into formula (7) for the partial derivative respectively and then set them to zero we can obtain the incentive intensity the contractor provides at maximum total profit under the subcontractor's optimal effort level.

$$\begin{cases} 2 - \beta_i - \lambda_i - 2(1+\Delta)\rho\sigma^2\beta_i = 0 \\ 1 - \Delta - (1-\Delta)\beta_i - \lambda_i - (1-\Delta^2)\rho\sigma^2\lambda_i = 0 \end{cases} \quad (12)$$

Solution as follows.

$$\begin{cases} \lambda_i = \frac{\Delta + 2(1-\Delta^2)\rho\sigma^2 - 1}{\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2} \\ \beta_i = \frac{1 + \Delta + 2(1-\Delta^2)\rho\sigma^2}{\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2} \end{cases} \quad (13)$$

It's easy to be shown that the Contractor's optimal incentive intensity is determined by three aspects: the extent of conflict by the subcontractor's two kinds of efforts, risk attitude and external uncertainty. Also it is shown that β_i is always greater than λ_i which means in order to entice subcontractor mutual cooperation and help the output incentive intensity which the contractor team can provide will be higher than that of the individual output.

Put formula (13) into formula (11) and we can obtain subcontractor's optimal two efforts level as follows.

$$\begin{cases} e_i = \frac{(2-\Delta)[\Delta + 2(1-\Delta^2)\rho\sigma^2 - \Delta]}{(1-\Delta^2)[\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2]} \\ h_i = \frac{(2-\Delta)[\Delta + 2(1-\Delta^2)\rho\sigma^2 + 1]}{(1-\Delta^2)[\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2]} \end{cases} \quad (14)$$

(1) Effect of Subcontractor Absolute Risk Aversion on the Excitation Intensity

In formula (14) λ_i and β_i can be partial derivated respectively to ρ and the solution is as follows.

$$\begin{aligned} \frac{\partial \lambda_i}{\partial \rho} &= \frac{2(1-\Delta^2)\sigma^2[\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2]}{[\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2]^2} \\ &\quad - \frac{[\Delta + 2(1-\Delta^2)\rho\sigma^2 - 1][(3+2\Delta-\Delta^2)\sigma^2 + 4(1+\Delta-\Delta^2-\Delta^3)\rho\sigma^4]}{[\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2]^2} < 0 \\ \frac{\partial \beta_i}{\partial \rho} &= \frac{2(1-\Delta^2)\sigma^2[\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2]}{[\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2]^2} \\ &\quad - \frac{-[\Delta + 2(1-\Delta^2)\rho\sigma^2 + 1][(3+2\Delta-\Delta^2)\sigma^2 + 4(1+\Delta-\Delta^2-\Delta^3)\rho\sigma^4]}{[\Delta + (3+2\Delta-\Delta^2)\rho\sigma^2 + 2(1+\Delta-\Delta^2-\Delta^3)(\rho\sigma^2)^2]^2} < 0 \end{aligned}$$

This shows that the more risk aversion the subcontractor is (the greater ρ is) the weaken incentive intensity will be (the smaller λ_i and β_i is). As the λ_i and β_i are both given so the greater ρ is the higher the risk cost of the subcontractor will be.

(2) Effect of conflict between the self efforts and helping efforts on the Excitation Intensity

In order to simplify the analysis our paper only analyzes two kinds of extreme forms when $\Delta=0$ and $\Delta=1$.

1) If $\Delta=0$ the subcontractor's effort cost function turn to $c_i(e_i, h_i) = 0.5(e_i)^2 + 0.5(h_i)^2$ and

$$\left. \frac{\partial c_i}{\partial h_i} \right|_{h_i=0} = h_i = 0.$$

Subcontractor's work is independent of each other which can be shown in actual project that two subcontractor's work has no relationship and does not interfere with each other in space so the contractor's appropriate help to other subcontractors will not increase their marginal costs. At this time the contractor's incentive scheme provides both individual motivation and team motivation and the optimal incentive intensity can be calculated in formula (15).

$$\begin{cases} \lambda_i = \frac{2\rho\sigma^2 - 1}{(3+2\rho\sigma^2)\rho\sigma^2} \\ \beta_i = \frac{2\rho\sigma^2 + 1}{(3+2\rho\sigma^2)\rho\sigma^2} \end{cases} \quad (15)$$

2) If $\Delta=1$ the subcontractor's effort cost function turn to $c_i(e_i, h_i) = 0.5(e_i + h_i)^2$ and $\left. \frac{\partial c_i}{\partial h_i} \right|_{h_i=0} = e_i \neq 0$. Two kinds of subcontractor's work can replace each other and the marginal cost is strictly positive when helping efforts are zero which means contractor implement little help will also have a greater cost. The optimal incentive intensity can be calculated in formula (16).

$$\lambda_i = 0, \beta_i = \frac{2}{1+4\rho\sigma^2} \quad (16)$$

Therefore in practical engineering when the work of the two subcontractors has a front and back relationship especially in key lines or two kinds of work are closely related and easy to cause mutual interference the contractor's optimal incentive scheme is only motivate a team and does not provide individual motivation in order to entice subcontractor cooperating with each other and helping others. When the subcontractor work independently of each other and do not affect each other in time and space the contractor may provide individual motivation and team motivation meanwhile.

4. Conclusion

Our paper used the principal-agency theory to discuss the subcontracting cooperation business in total dynamic alliance and set up a incentive model with numbers of subcontractors based on unity and cooperation finally gave the incentive scheme under different conditions of the contractors and the corresponding incentive intensity.

(1) Subcontractors' effort level for himself is more than effort level of helping other subcontractors when contractors providing individual motivation and team motivation. Contractors increasing incentive intensity is advantageous to subcontractors who can increase the input of its own efforts. The effect of individual incentive intensity of their own hard work is greater than the effect of the contractor team incentive intensity.

(2) The contractors improving team incentive intensity will promote collaboration between business while improving individual incentive strength will inhibit the collaboration between business.

(3) In practical engineering when subcontractors work independently from each other and do not affect each other in time and space the contractor can provide individual motivation and meanwhile team motivation. When subcontractors work more closely linked and influence each other in time and space the contractor can only provide team incentives to lure subcontracting business collaboration and help each other.

In practical engineering the general contractor should use appropriate incentive schemes in the design of sub contract to enable subcontractors to the collective interests, unity and cooperation, jointly completed the goal of the project, the realization of common interests. In actual operation the sub contract can increase the corresponding terms such as subcontractors have the obligation to allow other subcontractors and the general contractor using complete engineering and equipment and cooperating with other subcontractors, otherwise corresponding punishment will be given.

Acknowledgments

This work was supported by the shandong province higher educational humanities and social sciences research project (NO.J16WF03 and NO.J16WE45)

References

- [1] Gert Wijnjen & Rudy Kor. Project and project management methods for unique tasks[M]. Qi Anbang, translate. TianJin city; Nankai University Press, 2005:174.
- [2] Alchain A. and Demsetz H. Production, Information Costs and Economic Organization[J]. American Economic Review. 1972, 62, 777-795.
- [3] Yin Honglian, Wang Zhuopu, Xu Guangyu. Application of Dynamic Alliance in Project Management of General Contractor[J]. Yangtze River, 2008, 39(15):98-100.
- [4] Xu Jiuping, Lijiao. Structural Integration of the Organization Mode of the Dynamic Alliance of the Construction Project of Large Scale Water Conservancy and Hydropower Project[J]. System Engineering Theory and Practice, 2012(11):2447-2458.
- [5] Wang Zhuopu, Yin honglian, Ni Huaqiu, etc. Study on the Selection Mechanism of the Dynamic Alliance of Water Conservancy and Hydropower Engineering[J]. China Rural Water and Hydropower, 2010(1): 147-150.
- [6] Li Zhongfu, Jing xingkai, Lihong. Research on the Selection Method of Construction Subcontractors under the General Contracting Mode[J]. Journal of Engineering Management, 2010(10): 550-554.

- [7] Yin Honglian, Wang Zhuopu, Chen Zhiyi. Research on the Income Distribution of the Dynamic Alliance of the Total Score of the Project[J]. Yangtze River, 2009, 40(5): 87-94.
- [8] Yin Honglian. Study on Total Score Package of Water Conservancy and Hydropower Engineering Based on Dynamic Alliance[D]. Nanjing: Ph. D thesis of Hohai University, 2010.
- [9] Itoh H. Incentive to Help in Multi Agent Situations [J]. Econometrica. 1991, 59(3) : 611 - 636.
- [10] Tian Ying, Pu Yongjian. The game analysis of team cooperation incentive mechanism[J]. Journal of Engineering Management. 2005, 19(2) : 133 - 135.
- [11] Huang Bin. Mutual Cooperation and Incentive Effectiveness in the Team [J]. Business Research. 2006, (8): 84-87.
- [12] Wang Yanmei, Zhao Xinan. Analysis of the Optimal Incentive Model of Teamwork Cooperation[J]. Journal of Northeastern University (NATURAL SCIENCE EDITION) [J]. 2007, 28 (9): 1346-1349.