

# Analysis of Enterprise Performance Management from The Perspective of Game Theory

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**Abstract:** Performance management has always been one of the most important problems in human resource management. This paper mainly uses the classic example of "Prisoner's Dilemma" in game theory and the theory of dynamic game, through analyzing the process of horizontal game and vertical game in enterprise development, reveals the direct influence of game behavior in enterprise development, and aims at the adverse influence caused by it in enterprise development. This paper gives a set of suggestions on establishing and improving the game theory criterion in enterprise performance management, and uses the constraint system and game theory criterion to help the company's leadership and management team form an effective equilibrium solution to ensure the completion of the performance management goal, and then achieve the company's strategic goal.

**Keywords:** Performance management, Static game, The Prisoner's Dilemma, Dynamic game.

## 1. Introduction

The internal assessment and performance system of a company established in modern society essentially requires the company to focus on the benefit winners, from major shareholders and managers to all employees and customers, etc[1]. Various game problems among them are regarded as a collection of contracts (Watts and Zimmerman). In the long-term game theory companies will selectively make a variety of specific corresponding decisions. Stakeholders as "economic man", to maximize the gain their own rights and interests in the company as the basic principle, through to the company of all kinds of market competition game link on profit taking and rights, the market game link and form "force", also reflected in every aspect of the company's performance appraisal evaluation system [2].

## 2. Prisoner's Dilemma Game

(I) The basic construct of Prisoner's Dilemma

This study will explain the game phenomenon in employee appraisal system through "Prisoner's Dilemma". Suppose two suspects have the following options: if there are circumstances in which both confess, they will each receive eight years in prison; If there are two cases where both choose to deny, they will each be sentenced to 1 year; If A confesses, B denies, or A denies B confesses, those who confess will be released immediately, and those who deny will be sentenced to ten years [3]. In the following, -1, -8 and -10 are used to represent the decision payoff of the number of years sentenced. If the decision payoff of the criminal being released immediately is represented by 0, the decision result of the game can be represented by the decision payoff in Table 1.

Table 1.

The prisoner's B

		The prisoner's B	
		frank	denial
The prisoner's A	frank	-8,8	0,-10
	denial	-10,0	-1,-1

Among them, the two sides of the game make independent judgments without understanding the behavior of the other side, assuming that they can judge the income that the other side can obtain. However, since they cannot predict the decision of the other party, they must consider the possible influence of the behavior of the other party on their own interests. Therefore, both parties can choose their own decision under two premises: For A, assuming that B confesses, it is better for A to confess; As long as he denies B, A can still confess; And the same is true for B. The stable Nash equilibrium solution here is (confess, confess). As "economically rational people", both parties in the game try to obtain the highest interests. This mentality leads to the failure to ensure the maximization of interests in the whole game, which is more disadvantageous to all parties, resulting

in an irreconcilable situation.

(2) Applying the concept of "Prisoner's Dilemma" to the performance management system

The cooperation ability and competition between various departments of the company come from the difference of departmental interests, which is reflected in the decision-making of the heads of various departments of the company. The other part of the decision-making process is more or less will involve the vital interests of the department[4], such as product design department has a huge market of commodity information and provide the relevant document how the production process of product design and manufacturing departments to form, the stand or fall of production process and the design and manufacture department will also affect the product design department of commodities as well as the

marketing progress of application of the two Part of the game between the formation of relations.

Then, the Prisoner's Dilemma is used to explain the relationship between the creative part of enterprise advertising and the production department. Suppose that the business owner is the police, and the production department and the design department are prisoners A and B, then the enterprise wants the two departments to cooperate with each other, so that the enterprise can obtain the best efficiency. The results can be proved: assuming that the two departments coordinate and cooperate with each other and work together to achieve the maximum benefit of the enterprise, then the two departments will each get the year-end performance bonus of 15,000 yuan issued by the enterprise; If any of them do not cooperate, then it will be sentenced to a fine of 20,000 yuan, but the other party also more or less have a certain responsibility, will be subjected to a penalty of 10,000 yuan; If both parties fail to cooperate, they will be fined 15,000 yuan each. From the point of view of economic and social rational man alone, if the two cooperate, they can get a reward of 15,000 yuan respectively [5]. However, the leader will also evaluate the impact of this decision and the impact of potential decisions of other departments, and the comparison of the two results will form the basis for the decision of the other side. At the same time, this may also be influenced by personal emotional factors, such as supervisors and superiors, heads of other departments and subordinates. Therefore, agencies should not make decisions in isolation from the perspective of fully rational people, but should focus on making decisions from the perspective of people in a more complex society.

The formation of the final decision plan depends on the careful study of all the elements by the supervisor. Generally, the method is adopted based on the standard that the profit predicted by the manager is greater than the loss caused by the decision. For example, if the manufacturing department is dissatisfied with the design department or unwilling to cooperate, then the manufacturing department will compare the strategic cost with the benefit, and the former is explicit, while the hidden cost is not easy to judge [6]. Hidden costs are usually not easy to determine and measure, but they can be judged by the decision makers, such as whether it causes the decline of leadership prestige, makes the superior leaders have a bad impression and affects the future, and the peer leaders doubt their own values. When the explicit cost (the sum of implicit cost) exceeds the income range, the supervisor can adopt the non-cooperative countermeasure, otherwise, cooperate. The response of the design department to the manufacturing department is similar, requiring the supervisor to make reasonable decisions about the explicit and implicit costs and profits. However, it must be noted that the decision maker's cultural background, social experience and the surrounding people's quality of life and other factors will affect the reasonable judgment of the implicit cost, so it has a great subjectivity.

Based on this, all parties in the game take the maximum

interest as the criterion, and the optimization of the overall economic benefit is the real development goal of the company, but this obviously cannot be achieved. In order to achieve it, the company must consider the overall economic benefits and protect local interests. So the company before the staff plan must be fully thought first, including the implementation of staff management way, the supervisory inspection measures, know what behavior can hinder the profit maximization of the enterprise strategic target realization, to punish the action of personnel, and according to the appropriate management methods to make the sum of the factors affecting employee performance, director of advancement. In addition, we should pay attention to the situation that is not conducive to the development of some employees but beneficial to the overall interests of the company, and encourage and praise it, so as to achieve the goal of "loss inside the wall and compensation outside the wall", so as to find a balance point to achieve the best corporate purpose and employee performance.

(3) Apply the concept of "prisoner game" in performance appraisal

1. General assumptions of performance evaluation in the "Prisoner game" framework.

In order to streamline the work process, only two kinds of self-and mutual performance appraisal are implemented for two kinds of people (A and B). Among them, if two people are peers, it is a game process at the same level; if two people are superiors and subordinates, it is a game process at different levels [7], and it is assumed as follows:

(1) Both of them are regarded as independent economic men, and both of them are based on the principle of maximizing profits.

(2) There are two ways for the two parties to cooperate or not cooperate in the evaluation. The collaborative approach is one in which the players evaluate their own performance and that of others. Non-cooperation mainly includes the following situations: subordinates in the same level game do not cooperate, such as deliberately concealing their own mistakes or over-bragging their own achievements, or deliberately belittling the ability of colleagues; In the hierarchical game, subordinates do not cooperate, for example, in order to "please" the leader, deliberately praise the leader's achievements; Leaders' lack of cooperation, such as overvaluing or shielding the leaders, being too strict or tolerant to subordinates, and thus failing to reflect the actual work performance in the assessment results [8].

(3) Adequate investigation by the human resources department can obtain enough information to correctly determine the strategic problems of the evaluators.

2. Payoff explanation of the same level game

Based on the above assumptions, the relationship between investment strategies and returns of performance appraisal at the same level is analyzed and explained, as shown in Table 2 [9], which is similar to the explanation of "Prisoner's Dilemma" and will not be repeated here.

**Table 2.** Payoff matrix of performance appraisal game at the same level

		Employees B	
		cooperation	Don't cooperate
Employees A	cooperation	5,5	10,-2
	Don't cooperate	-2,-10	-3,-3

Since both sides are based on the maximization of strategic interests and seek the highest benefits for themselves, they

finally choose the cooperation strategy. Through this strategy, win-win cooperation between employees and the company is

achieved, which is the best state in team operation.

### 3. Payoff explanation of hierarchical games

The strategy and game method of hierarchical game between supervisors and subordinates in performance

appraisal are as follows, as shown in FIG. 3, which is very similar to the analysis of "Prisoner's Dilemma", and will not be repeated here.

**Table 3.** Income matrix of hierarchical game in performance evaluation

		The superior	
		cooperation	Don't cooperate
subordinates	cooperation	5,5	10,-2
	Don't cooperate	-2,-10	7,7

The process and structure of the game are the same as those of the employees at the same level. They both take profit maximization as the criterion, and finally choose the cooperation strategy.

### 4. Relevant suggestions

The analysis of various game forms in performance appraisal shows that companies expect all parties to coordinate with each other and achieve Nash balance. This should be built on the basis that human resources departments of all parties are very familiar with, and can correctly judge the type of evaluation strategy selected by all parties, otherwise the game will not be able to obtain an equilibrium solution. So the company in the build and perfect the system of performance appraisal process, particular attention must be paid to the establishment of effective mechanism and training of human resources department strong information collecting, tracking and data analysis ability, make sure you are able to accurately determine the policy type of leadership and staff, the company will regularly or irregularly survey in order to realize the strategic layer dynamic tracking, establish rolling performance management plan, to ensure that the performance appraisal Stable and healthy operation of the department.

## 3. The Static Game Analysis of Performance Appraisal

### (I) Other situations of the static game of performance

evaluation

#### 1. The game between shareholders and managers

Shareholders invest in the hope of increasing their wealth at a higher company price, while managers operate the capital in return for a relatively equal amount of expertise and innovation. In this process, because managers and users of capital, and is likely to be as the capital owner of the big shareholders deviate from the goal principle, so managers for personal self-interest mentality is likely to deviate from the big shareholders will, also often can graft happens, included in the back on the ground to provide quotation, to consumption behavior, or through the power violations for gift, etc ", or "adverse choice". Therefore, shareholders take corresponding measures, including the establishment of a complete performance appraisal system, to systematically ensure the effective use of their rights and capital, while managers on the other side will take corresponding impossible measures to establish a good relationship in the game process.

#### 2. Game between supervisor and subordinate

The game between leaders and employees has a long history. As for the leader, he is the biggest sharer of the employee's remuneration, and has a certain right of discourse on the amount of the employee's remuneration. To subordinates, his work attitude is often able to determine the progress of the work. Therefore, it can be argued that both parties form a long-term game similar to the Prisoner's Dilemma in the actual working situation (see Table 4).

**Table 4.** Game between supervisor and subordinate

	The supervisor offers a higher reward	The director offered a lower reward
Active subordinates	(100,100)	(50,250)
Subordinates are inactive	250,50)	(80,80)

From the above analysis, if the subordinates work actively, the best choice of the supervisor is still not a high salary, but to maximize the enterprise benefit by providing the minimum salary. If the subordinate is not actively working, the best predictor for the supervisor is the minimum pay. Similarly, if the supervisor overpays the subordinate, the best option for the subordinate is not to work hard, but to slow down in order to maximize the profit. If the supervisor GIVES THEM too low pay, the SUBORDINATES will not work hard, but also choose to slow down. To sum up, if the influence of other conditions is removed, both managers and employees will repeat the process of this game strategy, and finally reach the bad Nash equilibrium in which the supervisor provides too low salary and the employees are inactive (80,80).

### 3. Game between core employees and ordinary employees

In the company, the game relationship between employees is very common, which is mostly formed after employees make a fair comparison between their own work ability and that of other employees. For the core staff, the game relationship between employees and ordinary staff is

particularly prominent. Core talents can play the radiation and leadership function, grasp the key points, lead the enterprise center work, so as to become the backbone of the company's business team. In contrast to ordinary talents, the shortage of this type of talent can be quickly sought from the company's "replacement ", without causing major problems in the company's daily management operations. According to the Pareto principle, 20 percent of the core talent can generate 80 percent of the company's revenue. This is similar to the "smart pig game" model: if the core talent plays a key role, they can get a reward that is not equal to their performance level, while the average talent can get a huge reward that exceeds their ability level. Core employees of slacking can reduce the company's business, the returns its also drops as well as the psychological expectations, thus greatly weakened the efficiency of their own feeling and happiness, and ordinary employees even if it can be reduced to a treatment of the resulting company, but because of its own sense of efficiency is low, and did not give happiness too much damage. Therefore, in the company, there is often a situation of "input

is not proportional to output", forming an unbalanced game. Under the status quo of "free riding", the core employees will be further discouraged in their work enthusiasm and initiative, thus encouraging the mentality of ordinary employees to make a living, weakening the company's performance and completing the company's tasks.

#### (2) Analysis of corresponding countermeasures

The above analysis of the game relationship shows that both sides of the game will appear in many different forms, but under different scenarios, the strategic responses of both sides are of great research value. Therefore, reasonable suggestions can be put forward for performance appraisal and management through detailed elaboration.

#### 1. Methods and countermeasures of the game between shareholders and managers

In the game process between the two, in order to avoid the company managers can "gain" behavior, performance evaluation assessment system can consider the following improvement measures: a specification for managers reward means have the corporate authority file, outstanding performance in the performance of managers and their contribution can be I will be will be sufficiently attractive privileges, including cash, stock, and spirit Reward, managers can share the company's property with the company, develop a good corporate culture of participating in social activities conducive to the achievement of the company's goals. At the same time, we should pay attention to the principle of fair distribution, and set a reasonable amount and form of remuneration for performance assessment indicators, which is generally slightly higher than the average level of the market.

#### 2. Methods and countermeasures of game between supervisor and subordinate

Long time repeated game between the leaders and staff bad decision-making results reached the Nash equilibrium (80), so can take the following measures to improve this phenomenon: leadership don't work in the management of mixed too much for personality psychology, emotional factors, such as preferences or opinions, and closely basis through closely reasoned and constitute of the performance evaluation index system to evaluate people management The work, the reward of the reward, the punishment of the punishment. Specific is in the process of game: assuming that actively try to go to work at a lower level will be able to get the highest salary one hundred, assuming that the lower slacking will have minimum wage (or direct punishment), 50 staff in charge of working under high remuneration incentive effect combination becomes (50, 50), and with the method of subordinates to do our best to work the effect of the composition (100, 10 0) see, it is certainly more advantageous for subordinates to choose them, and then motivate them to take work seriously.

#### 3. Methods and countermeasures of game between core employees and ordinary employees

The game process between the core staff and the general employees relationship need to try to improve as follows: first of all, should clear staff is the important value of employees, creating benefits for the company, ability is one of the important standard to distinguish between each employee compensation, so must adopt new performance appraisal means fully reflect the real performance of employees, the same as the compensation for the employees of also will be in the form of step; Second, establish a new incentive mechanism

to reward every outstanding employee who has made an important effort with cash, power and spiritual rewards. Third, we should establish "leading performance incentive mechanism, actively cultivate and promote the core of the appropriate good employees, and give him more more power and reward, let the core good employees as a leader, the formation of company personnel to learn good, avoid the phenomenon of general good employees may be slacking and within the company to establish good habits.

## 4. Conclusion

The measures proposed in the above analysis are the basic judgment of the internal competitive game situation of the enterprise. However, it must be paid attention to that, because there are more complex game relations with more players in the company, the change causes and judgment of the relationship will also become the key basis for the evaluation and improvement of the company's employees. However, the change should not be too frequent, otherwise it will make the employees confused, unable to develop healthily and steadily, and interrupt the formation of the company's cultural atmosphere, resulting in opposite side effects. Therefore, the new assessment system established by the company must carry out the criterion of relative fairness, improve the value that can be implemented, and the rules and regulations must be monitored frequently. The supervision mechanism covering the whole company should be established as the "insurance" to realize the development of the company.

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