

The Game and Competition Method

-- A Powerful Tool for Human Resource Management based on Game Theory

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Abstract

Different from management by objectives (MBO) that places an emphasis on performance indicators, game and competition method originates from the game theory, and it has developed into a brand-new management thinking, system and method. Through incorporating the internal participants into different game and competition structures and relating the profit to competition and game, the profit of all participants is no longer achieved just based on the "absolute value" of their independent performance, but mostly based on the results of game with other participants within the game and competition structure.

Keywords

Game Theory; Competition; Management; Mechanism.

1. Introduction

Currently, the most common management method is management by objectives (MBO), which is proposed by Peter Drucker (1986). This management method can be elucidated by that the senior-level leaders are responsible for proposing the vision, mission and values of the organization, the enterprise strategy and overall objective are formed and allocated to each employee, thus forming several quantitative indicators and task and an established linear relationship between profit and contribution. Over the past years, MBO has exerted favorable impacts on allocating quantifiable industrial production and sale tasks in enterprises. However, with the business development, the system of MBO has been hindered by two problems that cannot be solved by itself:

1. An intrinsic antithesis between subordinates and superiors is formed within the enterprise organization, which causes a failure to achieve cooperation

Under the system of MBO, every employee desires to work less and earn more; While, the enterprise wants employees to work more and earn less. In this case, the game between subordinates and superiors around KPI is just like the tug of war. Both sides would make every endeavor to defeat the opposite, and the eventual outcome is also a compromise. Employees only want to complete their objectives within the specified working hours, which will not stimulate all the enthusiasm and talent of employees. With respect to some specific management problems, for instance, on constraining employees' behavior, the management relationship between subordinates and superiors is extremely prone to cause some management problems, such as "the superiors have policies; the subordinates have their countermeasures", all antitheses between subordinates and superiors, deception and invisible passive working attitudes formed around indicators, KPI related to human relationship, and the insufficient incentives resulted from the dramatic difference between basic salary and bonus

base. As per the conventional thinking, the only approach is to increase supervision, which brings the consequences of soaring management costs.

The most extreme situation is that in the United States, employees construct an efficient labor union system to satisfy their demands, and the labor union organization is the inevitable product of this pyramid management mode with the confrontation between subordinates and superiors.

The traditional management structure is presented in the following figure:

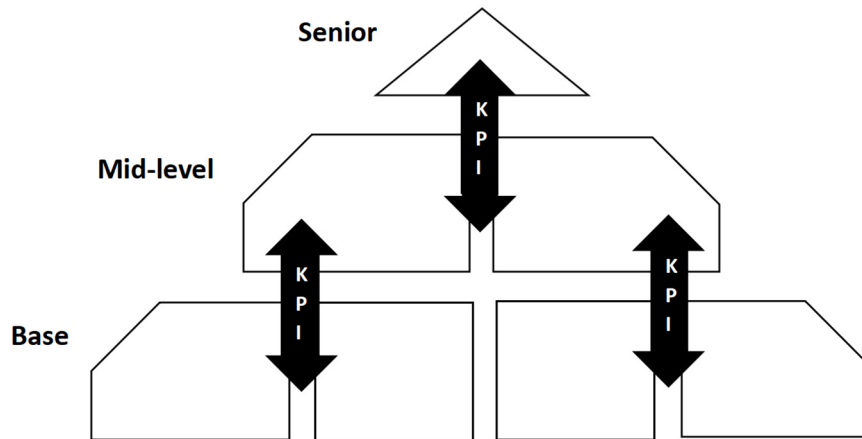


Figure 1. Relationship Diagram within the Organization under MBO

Note: The arrow represents the direction and relationship of the game

2. Some back-office departments are unable to form reasonable objectives

There is still favorable vitality for MBO in some domains where clear tasks and objectives can be formulated, such as production and sales departments. However, as for the back-office departments, such as the departments of research and development, purchasing and human resources that cannot conduct a clear performance appraisal, it is difficult to formulate objectives, perform quantization and formulate clear indicators, the system of MBO cannot provide clear and reasonable objectives and tasks to the research and development departments and other non-front-line departments, which results in the failure of external competition to be directly transmitted to the inside of enterprises, thus making these enterprises lose their competitive advantages.

From this figure, it can be seen that in order to remedy the game between subordinates and superiors and poor market adaptability of MBO, there should be a new management method to eliminate these problems. Over the last decade, similar management methods have been proposed to remove the shortcomings of traditional MBO, among which objectives and key results (OKR) management method proposed by Intel and Amoeba management system proposed by Kazuo Inamori (2012) are the representatives. In terms of OKR management method, the right to formulate objectives is delegated to employees, in an attempt to stimulate their creativity and enthusiasm. OKR is an approach to managing senior creative talents and has been effective in a few high-tech companies with abundant talents, such as Intel or Google; While, it is not applicable to those companies with relatively scarce talents and the focus on manufacturing and sales; While, the Amoeba management system has generated a wave in China recent years. This system is an attempt to introduce competition, game and cooperation into enterprises by splitting enterprises into many independent settlement groups, the responsibility of cost control is delegated to the base level to achieve the objective of self-

management. However, it has not been popularized due to the fact that the internal friction caused by its settlement structure is greater than the benefits.

2. Theoretical Background

The original meaning of game is "recreational game". However, it is usually interpreted as "strategy" or "stratagem", indicating that the participants in the game will formulate their strategies according to the possible behaviors of others (Myerson R B 1997) and it is a long-standing management ideology throughout the history of mankind. The strategy of "playing off one power against another" used by ancient Chinese dynasties to govern the frontier areas reflects the core of game theory.

As a pioneer in promoting game theory into a systematic academic thought, John Nash proposes the Nash equilibrium to demonstrate that the behavioral strategies eventually adopted by all participants are determined and predictable under a certain rule-based environment. This theory is subsequently applied to economics, where scholars intended to employ it to explain various economic behaviors in society, such as oligopolistic competition and duopoly (Tisdell J, Harrison S 1990). Afterwards, the study of game theory is extended to the enterprise strategy, such as judging the competitive strategy adopted by enterprises according to the theory of market advantage.

In the domain of enterprise management, game theory is mainly used in bargaining, cooperation in R&D, accounting law issues and franchise decision incentive. (Kalyan Chatterjee and William Samuelson 2014). Other researchers like Chuanli Wei (2015) focus on the marketing strategy selection which based on game theory. Some researchers combined game theory with other operation management theory, and applied it to distribution system and expansion planning (Zeng Chen, LV Xuejing 2003) As for the aspects of human resource management, it is only manifested by less relevant academic research and experts in practice, only DAI Tianyu (2010) and a few researchers had done researches on this field.

This paper would focus on the application of game theory in human resource management, and propose with two basic structures adapted from the real management case, which can be applied directly to the human resource management and place incentive on different departments and employees efficiently.

3. The Game and Competition Method

In this paper, game and competition method can be defined as putting participants to be managed and their stakeholders into a special structure with innate game relationship, setting their relationship as parameters with mutual constraint or incentive by formulating game and competition rules, thus achieving the effect of mutual constraint and incentive.

In the previous management issue, the simplest employee competition system had been already generated, such as "horse racing system" and "knockout system". These management methods have broken away from MBO and achieved favorable impacts in practical application. However, they are only the simplest application of game and competition methods in practice. Competition is one of the manifestations of game, and it is a positive incentive game based on game parameters.

In the model of game and competition management system, the elements include: participants, measurement and rules, and structure. These elements are designed around the competitive objectives of enterprises or management problems to be solved.

The main difference from the traditional MBO (KPI) is that the benchmark for employees' profits is not the absolute value of their own performance, but the result of competition with

others in a game and competition structure or the game result. Profits are assessed by the result of competition with others, not mainly by individual performance.

The game and competition method are a reshaping of enterprises' micro-structure in enterprise management. The original structure of superior-subordinate incentives and constraints can be extended, and the superiors can be emancipated from the information asymmetry and inadequate incentives. During the incentive, the external market environment can be related to the internal incentive; With respect to the constraint, mutual supervision can be formed in the same level, which could break the original game relationship between subordinates and superiors, thus achieving the improvement of management efficiency. As shown in the following figure:

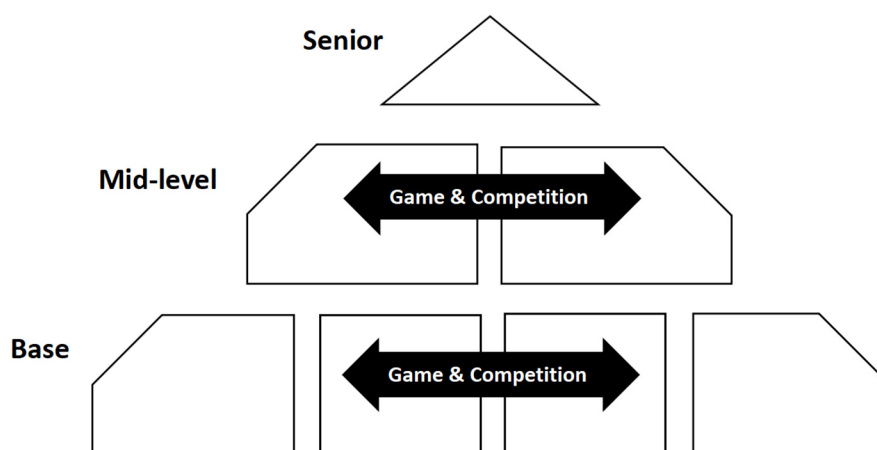


Figure 2. Diagram of the Game and Competition Relationship within the Organization under the Game and Competition Method

Note: The arrow represents the direction and relationship of the game

3.1. The Game and Competition Measurement and Rules

Game and competition measurement is the measurement and settlement method between the behavior result of participants and counters. In addition, it is the specific game rule in the game and competition. A complete game and competition measurement design shall contain: indicators, coefficients and rules.

Measurement indicators are the behavior indicator of participants. In the process of formulation, they can be divided into quantitative measurement indicators and non-quantitative measurement indicators.

Quantitative measurement indicators are the key behavior indicators of related management problems, such as sales volume, patent application volume and so forth. Hence, they are linear and quantifiable indicators.

Non-quantitative measurement indicators often correspond to some non-quantifiable participants in enterprise management, such as service quality, customer satisfaction and so forth. These non-quantitative measurement indicators cannot be directly related to the behavior of game and competition participants, but they can indirectly generate a quantifiable measurement indicator by incorporating multiple quantitative measurement indicators and assigning different measurement indicator weights.

When multiple behaviors of participants are required to be managed, setting separate measurement indicators for each behavior makes management cost and implementation significantly more difficult. In order to perform unified management, a unified account is generated in merit point management (Rong LI 2014), in which merit points are adopted to manage many measurement indicators, including but not limited to merit points, lottery tickets,

virtual accounts and so forth. Benefited from its characteristics of "unification and account system", the merit point system can be adopted to optimize the measurement indicators in the management environment such as logistics management and enterprise culture shaping, and enhance the feasibility of the whole game and competition management system.

Measurement coefficients are the correlation coefficients between counters and measurement indicators, whose specific values shall be set and adjusted according to the actual situation of enterprises. Compared with artificially determined coefficients, the design rule of dynamic coefficients evolved from dynamic KPI is more scientific and more suitable for the actual situation of the ability and willingness of game and competition participants.

Meanwhile, the setting of coefficient requires the consideration of the impacts of objective management on the company's operation. The futile or superficial setting is not feasible, and it shall be consistent with the strategic planning and financial indicators of the enterprises, with a view to preventing the management cost from exceeding the profits.

Measurement rules are the integration of all measurement indicators and measurement coefficients, and they are also the basic rules to explain the relationship between the behavior of game and competition participants and reward and punishment.

3.2. The Game and Competition Structure

The two kinds of game and competition structures presented in this paper originate from the real practical cases of Chinese enterprises, and they are the enrichment of their management thoughts. In this paper, attempts would be made to restore these real cases to a fictional model with police and prisoners as the participants, which would be employed to construct the theoretical system of game and competition method.

Different game and competition structures have different attributes and their relatively applicable management scenarios and problems. Enterprises shall choose one or more structures according to their management problems before they can select and divide participants according to the requirements of the structures. Afterwards, they can formulate the corresponding rules and parameters.

After each of the above structures, the fictional model of the police and prisoners would be taken as an example, and some details would be simplified, in an attempt to enable readers to better and faster understand the core of each structure. However, the considerations in practical application are very complex.

3.2.1. Simple Structure

There are five basic structures under the simple structure: one-one structure, self-time dimension structure, Self-splitting structure, One-many / Many-one structure and Many-many structure.

3.2.1.1 One-one Structure

Definition: The overall game and competition structure is a one-one game and competition when both game and competition participants in the game and competition structure are separate individuals. The game and competition participants can be two employees, two teams, two departments and two branch companies.

Attributes :

The one-one structure tends to have two participants in an evenly matched position due to the small number of participants, while the information asymmetry is weak. Through the design of appropriate parameters and rules, the management purpose of mutual competition and constraint can be achieved.

Case:

Referring to the classic prisoner's dilemma case, two prisoners are participants A and B in the one-one structure.

3.2.1.2 Self Time Dimension Structure

Definition : The whole structure is the self time dimension game and competition when the participants in the structure are themselves in different time dimensions. Participants are often divided into their historical performance or working achievement, or their possible performance in the future.

The participants in the self time dimension game and competition structure only contain themselves. Commonly, this structure is applied in performance incentive management. The participants cannot cease to make progress and can always keep incremental thinking via introducing the historical self into the structure. The participants can be guided to spontaneously make reasonable, challenging and achievable objectives via introducing the future self into the structure, and deep bonding with the objectives can be hence generated. The incremental performance management method (Zhubing JIANG 2012), side bet system and sales forecasting method are all game and competition of the same individuals in the time dimension.

In practical applications, such structures tend to reward employees based on their own growth rate rather than absolute performance. Meanwhile, the management can also be performed by having employees set their own objectives and the merit point system.

Case:

1) Management background and purpose: Fight occurs frequently among prisoners in prison when they engage in outdoor activities. In order to select civilized prisons, it is required to reduce the number of fights. The original method of punishing brawlers in solitary confinement has been ineffective.

2) System design: The prison management side formulates the following rules.

A. If the total number of monthly fights in the prison decreases by 3% compared with last month, all prisoners would be rewarded with an increase of ten minutes of outdoor activities every day.

B. If the total number of monthly fights in the prison increases by 2% compared with last month, all prisoners would be punished with a decrease of ten minutes of outdoor activities every day.

3) Analysis :

In this case, all prisoners constitute a game participant, and they are competing with their historical achievements. Whether increasing or decreasing the time of outdoor activities, prison management personnel can achieve the purpose of reducing the total number of fights.

3.2.1.3 Self-splitting Structure

Definition : When the participant in structure is a single individual, whose subordinate, team, resources and other parts are forcibly split into the left and right parts, both sides would be engaged in gaming, which can be defined as the Self-splitting structure.

Case:

1) Management background and purpose: In order to sell new drugs, the criminal syndicate in a certain country wants to replace the original drugs in the market as soon as possible.

2) System design: The leader of this criminal syndicate adopts the dual-track system of pyramid selling and formulates the following rules:

A: Everyone can only develop two direct subordinates, who would become their own left market and right market, and it is forbidden to develop more subordinates. If they develop the third subordinate, it is required to put it in the left and right markets of the subordinates.

B: There is no limit to the levels. A superior can have hundreds of levels.

C: The profits obtained by superiors from subordinates shall be subject to the total score of the subordinates in the side with the lower score, and the score of the subordinates in the side with the higher score shall be taken as accumulation to the next calculation cycle.

D: When the scores of the two subordinates are equal, they would get a large match award.

3) Analysis :

For instance, if a member's left market is 100 points and the right market is 30 points, his/her reward is calculated according to 30 points, and the weekly distribution reward can be implemented. Therefore, the extra 70 points in the left market cannot be obtained by him/her this week, but these points can be accumulated to the next week. In this case, only if can another 70 points of subordinates be developed in the right market, those 70 points in the left market could be earned back. At this time, in order to balance the 70 points accumulated in the left market, they shall make every endeavor to pull more people to a certain position in the subordinates of their right market. Only in this way can the left and right markets reach a one-one balance at the settlement next week. Actually, although each person has the identity of desperately developing a subordinate in addition to being the superior in order to balance the two markets, they just want to desperately develop a subordinate regardless of the motive of balancing the superior market. Therefore, this makes it impossible for the left and right markets to achieve balanced development. The market with more scores has more bonuses, which, however, would not be obtained by most of these members. These accumulated bonuses are the profit of this criminal syndicate.

From the above cases, it can be seen that the core of the Self-splitting structure lies in making the subordinates and superiors form a relationship of cooperation, game and competition. When the subordinate develops freely, the left and right sides of the superior would get unbalanced, which forces the superiors to work hard.

3.2.1.4 One-many / Many-one Structure

Definition: When one side of the structure is a single individual and the other side is a participant composed of an uncertain number of individuals, its structure is One-many and Many-one structure. In this structure, the individual of the party with many participants only has relationship with the party of a single participant. There is no relationship among themselves. The number and specific object of the party with many participants cannot be determined by the party with a single participant.

Superintendents are defined as a group with many participants, and their profits come from the violation of rules by those participants to be supervised, which makes it impossible for those participants to be supervised to cooperate or trade with a single superintendent.

Case:

1) Management background and purpose: Instant noodles from China are popular in American prisons, and all prisoners like this food very much. The prison warden thinks that this food interferes with the daily management order of prisons and needs to be banned. As a result, he/she issues a strict prohibition order and rewards informants and discoverers, but the effect is not favorable.

2) System design:

On the ground that there are several criminal syndicates in the prison, and the leader of each criminal syndicate wants to replace the position of the chief prison bully, the prison warden specially stipulates as follows, namely that if anyone secretly reports that the chief prison bully eats instant noodles, the criminal syndicate leader leading this informant can replace the position of the chief prison bully.

3) Analysis :

In this structure, the game participant A is the chief prison bully, while the game participant B is all the prisoners, which is the Many-one structure, thus forming the supervision. When the prison bully cannot eat instant noodles, he/she will make all the prisoners in the prison be unable to eat instant noodles, which forms a One-many structure.

3.2.1.5 Many-many Structure

Definition: There are many independent participants in a system, each participant plays two completely opposite roles at the same time, and different participants randomly play completely opposite roles and then perform gaming and competition.

Case:

1) Management background and purpose: Marijuana abuse is serious in a prison, and almost every prisoner smuggles marijuana from outside and hides it secretly. The prison warden wants to reduce this phenomenon.

2) System design: The prison warden stipulates as follows:

Anyone who can find the location of another person's marijuana stash and report it, the found marijuana belongs to the informant and can be legally used by the informant (only limited to the seized marijuana);

Those who are reported will lose their qualification forever. Even if they could find other people's marijuana stash, there will be no reward and the seized drugs and marijuana shall belong to the prison.

Those who have previously obtained legal qualifications due to reporting will also lose their smoking qualifications if they are reported to hide marijuana illegally.

3) Analysis :

Every prisoner has two opposite roles: hider and discoverer. In this Many-many game and competition structure, everyone makes their endeavors to play the role of discoverer to confront the role of another hider.

3.2.2. Multiple Structure

Definition :

In the relatively complex management problems, the application opportunities of a simple game and competition structure are relatively low. To eliminate the problem, it is necessary to apply more complex structures by combining simple structures. When two or more simple structures appear in a management system at the same time, which are related and embedded with each other and could operate at the same time, it can be defined as multiple structure.

The multiple structure refers to an arbitrary combination of the above five simple structures, with quadratic and tertiary overlapping or parallel embedding. The result produced by the subordinate game is the participant or parameter of the superior game, which would participate in the superior game. Compound multiple structure has the following two characteristics:

1) The main structure contains more than one simple structures, which is defined as the simple substructure embedding model. Any sub-game structure can be extended to include secondary sub-game structure or even tertiary sub-game structure.

2) In the time dimension, the main structure and sub structure almost occur at the same time, and structures at all levels will repeat the game many times.

Case:

1) Management background and purpose: In a private prison in a certain country, there are many criminal syndicates. The prison warden connives at the collusion between some prison guards and prison bullies of various criminal syndicates, and hence the ordinary prisoners are persecuted and squeezed by prison bullies. This fact has caused serious public dissatisfaction.

The headquarters of the prison operation group delegates a new prison warden to improve this phenomenon. The new prison warden finds that the relationship between the prison bullies and their protective umbrellas was secret, and no one dares to expose it. The prison warden shall deal with the protective umbrellas first and improve the prison bullying phenomenon.

2) System design: The new prison warden has implemented the following measures:

Each prisoner is distributed with a watch with photographing functions, which can be adopted secretly to take photos of misconducts from other prisoners, such as bullies and so on;

After prisoners take photos, the photos would be automatically uploaded to the prison warden's office. According to the number of uploads, the prison warden ranks prisoners as individuals. The higher the ranking, the more the commutation.

Prisoners are divided into fifty groups on a voluntary basis, and fifty prison guards are responsible for the supervision, with random shifting every two months to ensure that different prison guards supervise prisoners from different groups. The ranking would also be performed by the total number of misconducts of prisoner groups every month, and the top three groups with the largest number will be severely punished. Meanwhile, the performance bonus and various welfare benefits of the prison guards in charge of the group with an increased number of misconducts compared with last month shall be deducted jointly. Besides, those in charge of the top three groups were particularly severely punished, even exceeding the illegal income they could obtain from prison bullies.

3) Analysis :

In this case, the sub-structure of the multiple model is a Many-many structure, in which mutual reporting occurs among prisoners, and the participants are individuals. The result of reporting becomes the measurement indicator of the main structure, which would be upgraded to the superior main structure. In the main structure, there are two games: one is the game between prisoner groups and groups, with the participants being groups, which is obvious and easy to understand; The other is the game between prison guards and the group to be supervised this month, with the participants being prison guards and prison bullies in the groups, which is more secret and difficult to understand.

As per this rule, the method of voluntarily forming groups actually implies that prisoners will form groups according to the criminal syndicates in the prison, and the prisoners from two criminal syndicates would not exist in one group. Therefore, there are two situations between prison bullies and prison guards: the prison bullies (maybe he/she is the leader of multiple groups) are in the same group as the prison guards who colludes with him/her, or they are not in the same group. Under the condition that they are in the same group, due to the relationship between both parties, the prison guards will order the prison bullies to behave themselves for two months, during which the number of misconducts in the group will be relatively small. Under the condition that they are not in the same group, the number of reported cases will probably increase. Conversely, when the bonus and welfare benefits of prison guards who are not the prison bully's protective umbrellas are deducted in the first month, they will double their retaliation against the prison bullies of this group in the second month (even not in this group, but the prison guards know the prison bully in the group). The random shifting every two months makes this game phenomenon appear repeatedly, and finally the purpose of reducing the phenomenon of bullying can be achieved and the corresponding protective umbrellas of prison bullies would be determined.

3.3. The Game and Competition Participant

The setting of participants is conducted based on the types and attributes of structures. In the context of specific management problems of enterprises, the structures can be revitalized by filling in the structure models with appropriate people or groups either directly or after

secondary restructuring. One of the most prominent features of participants is that the internal components have a unified interest pursuit.

It is particularly emphasized that the setting of participants is not only performed based on the existing organizational system and employee groups, but also conducted by breaking the original organizational boundaries, mixing multiple departments, secondary restructuring and creating new participants. The integration and splitting are often required in the process of creating new participants, and the core lies in forming a community of shared interests by sharing profits or losses. For example, both the "punishment system applicable to relevant persons" in history and the "bonus pool for a department" in daily management integrate the divided organizational individuals.

The participant setting based on the existing system is generally based on organizational anatomy and business process splitting. The organizational anatomy is divided into horizontal anatomy and vertical anatomy, which are the division of enterprise level and organizational system; The business process division takes the business process as the object and participants of division, and it is divided according to the division of labor in internal processes and the value chain of enterprises. The differences between business process division and department division lie in that the department division method is based on the existing division of labor to perform the splitting or integration of the existing department groups, with the aim of forming new game and competition participants; While the process division method is to re-bind the process links to be improved with different organizational individuals, such as individuals or departments, in the form of interest relationship, with the aim of forming game and competition participants with process links as the core rather than organizational individuals.

Under some special circumstances, the innate relationship between the introduced participants would exert significant impacts on the operation, and even reverse the results. For example, the solution to grave robbing cases is to introduce the father-son relationship into the relationship between the person under the grove and that above the grove, and the innate strong interest relationship is adopted to replace the completely selfish and independent relationship of each subject in the structure.

3.4. The Application of Game and Competition Method

The solution to management problems often requires a process. When the game and competition structure operate in the actual enterprise environment, it often cannot solve the problems at one time. Its dynamic operation mode can be divided into five scenarios:

1. Structure are no longer carried out after one cycle, such as the classic prisoner's dilemma, in which the game ends with the confession of two prisoners.
2. Although the game is conducted repeatedly, the participants and results in the previous game will not affect the next game. For instance, in the above case with the Many-many structure.
3. The game is conducted repeatedly. As the results come into being, the current structure would be dissolved, and some participants would form a new structure. However, the last game result would not be deferred to the next game. For example, the competition system of promotion competition in sports competition: the winner enters the next round, and the result of the last round would not affect that of the next round.
4. The game is conducted repeatedly. With the end of the last game, the game participants would not change, but the result of the last game, as an important measurement indicator or parameter, would enter the next game. For instance, in the above case with the self-time dimension structure, a new game is conducted once a month, and the performance of last month becomes the basic indicator of this month, which would be deferred over time.

5. The game is conducted repeatedly. The participants and results in the last game would enter the next game. The next game can be equipped with new structures and rules, which are relatively complex.

In the next part, this paper would provide with a case of a Chinese company to better illustrate the application of game and competition method.

3.4.1. Background of HY Inc

HY Inc was established in August 2007. This company possesses more than 400 employees and mainly engages in the manufacture of travel luggage with various materials. Due to the lack of its own brand and market influence, the majority of its products are sold in the low-end market. About 40% of the sales come from the own-brand luggage, and other sales come from OEM orders, such as Taobao online retailers and offline brands. Their products are characterized by novel styles, with more than 100 styles designed every year, in an attempt to make achievements in the fierce competition among online retailers under the absence of strong brands.

There are four employees in the purchasing department of this company. The purchasing manager is responsible for coordinating the work of employees, supervise the delivery term and registry date of raw materials, and coordinate PMC scheduling.

The primary raw materials of HY Inc contain leather, ironware keel and plastic accessories. Among them, leather materials include genuine leather, PVC artificial leather, PU artificial leather, eva artificial leather, canvas materials and so forth. There are many kinds of surface treatment technology, such as embossed surface, bright surface, flat surface and woven surface. Every year, more than 200 kinds of fabrics are purchased for this company, with an amount of more than 40 million CNY. The main fixed suppliers contain more than 10 factories, and HY Inc has long-term cooperation agreements with them.

At the end of 2016, the price of genuine leather and pvc artificial leather has not decreased since the purchasing price was greatly raised two years ago. The general manager was furious due to the supply quality problem of a batch of PU artificial leather from a factory, and removed the supply qualification of this factory. The factory reported that an employee of the purchasing department of HY Inc had received kickbacks through indirect channels, and hence the problem of kickbacks in the purchasing department of HY Inc appears gradually. The general manager encountered the following problems in the process of eliminating the problem of inflated purchasing price and failure to prohibit kickbacks.

1) It is difficult to determine the real market price

Most of the leather materials of HY Inc are petrochemical products, and the fluctuation of oil price will exert significant impacts on the price of leather materials. The core of the impact lies in that whenever the price of raw materials rises, suppliers will ask for rising prices at the first time; While, after the market price decreases, they are prone to be silent. The general manager noticed this phenomenon that the price only keeps rising, tried to verify the true price of raw materials, and even went to the leather wholesale market (Shiling Town, Guangzhou City) many times to investigate the actual price and select suitable suppliers. It could be preliminarily concluded that the overall fabric price was inflated. Therefore, when this problem was handed over to the purchasing manager for elimination, the purchasing manager replied after two days that the low price verified in the leather market of Shiling Town was caused by the small scale of the supplier's factory, the defective materials and the unstable delivery date. The original supplier was a big factory with reliable quality and guaranteed delivery date, and some price reduction had been achieved. This problem finally ended up with nothing definite.

2) It is difficult to formulate a performance incentive system for the purchasing department

The general manager consulted the management plan of purchasing department of other peer companies, and supplemented the task of purchasing price comparison of raw materials

regularly to KPI of the purchasing department. On the KPI evaluation of this task, the purchasing manager scored 95 to 100 points for all three subordinates, but the purchasing price did not decrease.

3) It is difficult to control the product quality risk of new suppliers

Just like all factories in the world, HY Inc is unwilling to replace raw material suppliers when the price gap is not particularly large for the stability of product production after a raw material has formed a stable quality assurance for the final product.

In particular, the manager and employees in the purchasing department are most reluctant to take this risk. If the raw materials are replaced randomly, there would be the following two risks. First, whether the new supplier has enough production capacity to successfully meet the delivery date; Second, whether the old suppliers will report kickbacks.

4) It is difficult to establish a supervision system for purchasing kickbacks.

The general manager once recruited an assistant to serve as an administrative supervisor to investigate the kickback problem. Indeed, it has achieved certain results in purchasing raw materials with a small batch, relatively transparent price and little space for price reduction. For instance, in terms of the product brochure of HY Inc, the market price is 1 CNY, while the purchasing price is 1.95 CNY.

However, for the main raw materials, such as leather, pvc and so forth, it is difficult to detect the kickback in the purchasing process in this way. When the purchasing amount is relatively large, the final quotation that the actual supplier can provide is closely related to the requirements of purchasing quantity, distribution period, quality requirements and payment period, which contributes to a quite flexible quotation at the end. This enables kickbacks to be returned to the purchasing department through various forms, and the process is imperceptible.

5) It is difficult for the general manager to manage the relationship of the purchasing manager. Similar to most companies in China, the purchasing manager is either a relative or a friend of the boss. The purchasing manager of HY Inc is a primary school classmate of the general manager, and they have established a close relationship for many years.

However, like all bosses, the general manager may also estimate that the purchasing manager would be involved in taking kickbacks, and reluctantly tolerate them to do so. Moreover, each kickback case in China is solved, the boss would not expect that the purchaser would get so many kickbacks.

3.4.2. Implementation of Game and Competition Method

The manager adopted the suggestions provided by a consulting company and made reforms to the company's purchasing system. The specific scheme is as follows:

1) Establish a supplier classification system:

About forty to fifty raw materials whose purchasing amount accounts for more than 80% of the total purchasing amount are listed, and three suppliers would be selected for each category, respectively. The purchasing would be performed according to the arrangement of 70% from the primary suppliers, 20% from the secondary suppliers, and 10% from the tertiary suppliers. Besides, the suppliers at all levels can supply various kinds of raw materials. The original fixed suppliers of these mainstream categories will become the primary suppliers, with the purchasing quantity decreased to 70%.

2) Create new functional groups

Assign three purchasers to the finance department. Call one person from the original purchasing department, and recruit another two purchasers to be the subordinates of the financial manager. These three purchasers are only responsible for exploring the new secondary and tertiary suppliers for those forty to fifty major raw materials.

3) Establish a dynamic entry and exit mechanism for suppliers

The original purchasing department is still responsible for the primary suppliers. If a single raw material product is very special and cannot be purchased with other kinds of raw material products from the same manufacturer, and the annual purchasing amount is less than 200,000 CNY, so that there are only primary and secondary suppliers in this category, the purchasers of the finance department shall select the secondary suppliers, without selecting the tertiary suppliers.

As for the price comparison between the primary suppliers and tertiary and secondary suppliers, when the price of primary suppliers is higher than that of secondary and tertiary suppliers and the primary suppliers are unwilling to decrease their price to the same level, the purchasing quantity from the secondary and tertiary suppliers can be gradually increased and that from the primary suppliers can be decreased under the condition of ensuring the quality of supply and delivery date. When the purchasing quantity from the secondary supplier exceeds 50%, it will be upgraded to the primary supplier and managed by the purchasing department. As a result, the original primary supplier will be eliminated, and the tertiary supplier will be upgraded to the secondary supplier.

The finance department continues to select new tertiary suppliers.

4) Establish a self-incentive mechanism in the purchasing department

A: Take two months as a measurement cycle. The total wages of three purchasers in the finance department are taken as the bonus base for the establishment of a total bonus pool. The purchasing unit price of forty to fifty mainstream categories in secondary and tertiary suppliers is accumulated as a simple total price (excluding the purchasing quantity, not the total purchasing amount). Besides, a comparison would be made with the total purchasing price in the previous cycle, there will be 10% bonus for every 1% reduction, and another 10% bonus for more than 1% reduction in the second cycle, and so on. The bonus pool of the whole team will be limited at 50% of the total salary.

It shall be noted that it is emphasized that the purchasing cost shall be reduced continuously in two months. If the purchasing price does not decrease in one of the two months, the bonus in the total bonus pool will decrease by 10% on the basis of the previous one. If the price does not decrease in the second two months, the bonus will decrease by another 10%, and so on. If the purchasing price decreases by another 1% in the second two months, the bonus will increase by 10% on the basis of the previous two months.

B: The financial manager's bonus is calculated at twice the bonus of each of these three subordinates, and the floating method is the same.

C: The financial manager adopts the horse racing management for three purchasers, with 50%, 30% and 20% of the bonus pool distributed to the personnel with performance ranking first, second and third according to the price reduction contribution every two months.

3.4.3. Result

After two months, the mainstream categories have been equipped with secondary and tertiary suppliers, and the factory has established a complete supply chain game and competition system.

After two quarters, about 60% of the secondary and tertiary suppliers have provided lower purchasing prices than the original primary suppliers.

During the price reduction of secondary and tertiary suppliers, primary suppliers have also begun to reduce prices at the same time, and the lowest price in 40% of purchasing categories was still provided by the original suppliers. From the perspective of price, the purchasing cost of this company has decreased by 12%.

Cost calculation

The salary and floating bonus of three purchasers in the finance department (one from the purchasing department) are 15,000 CNY per month (higher than the average level of this position), and the bonus of the financial manager is 18,000 CNY per month. A total of more than 100,000 CNY has been spent in the two quarters, with the purchasing costs saved for more than 2 million CNY.

3.4.4. Discussion

1) The key to eradicating purchasing kickback: the original supplier shall be equipped with a monthly real-time price competitor, and the bidding supplier could force the original supplier to reduce the price. After the price reduction, the supplier will not provide kickbacks to the purchaser.

However, the bidding suppliers will not appear automatically. Besides, even if there are bidding suppliers, they will not be willing to make profits in real time. Therefore, the scenario can only be achieved by the game and competition method.

2) The game and competition method applied in the new implementation scheme generally belongs to the multiple game and competition structure. In this structure, there is a main structure and three sub-game structures:

First, the first sub-structure is the self-time dimension game of three purchasers under the finance department (taking two months as a cycle): the collective of the three purchasers is the game participants, and the decreased percentage of the total purchasing price compared with the previous cycle is taken as the measurement indicator.

Second, the game and competition mechanism of the competition system implemented by the three purchasers makes it impossible for them to cheat or adopt the passive working attitudes as a group.

Third, the financial manager and the three purchasers also perform a game, whose function lies in promoting the three purchasers to reduce the purchasing prices. The effectiveness of the three people would exert impacts on the associated profits or losses.

Fourth, in the primary game and competition structure, the results of the above three sub-game structures have brought three levels of suppliers to compete with each other around the price, delivery date and quality. Meanwhile, this method brings an open and transparent purchasing price system.

In terms of the control of newly supplied products, the small batch purchase from the secondary and tertiary suppliers at the beginning could reduce the error trial cost and verify the product quality and supply ability of secondary and tertiary suppliers during the actual supply.

The kickbacks have always been a worldwide problem. The only approach to eliminate this problem is to allow the external supplier system to conduct organic competition. External competition originates from the internal competition between game and competition management systems. This case fully manifests the effect and various characteristics of the aforementioned management method, and also presents that there is no clear boundary between game and competition. Besides, it also demonstrates that the crucial obstacle of game and competition management system lies in the establishment of game participants and structure, while the establishment of the other two elements is a relatively well-solved problem.

4. Conclusion

Game and competition management contributes to the transformation of the external competitive environment into the enterprise reasonably, thus constructing an internal game and competition mechanism. Moreover, the organizational relationship can be emancipated from the "game and confrontation between subordinates and superiors" and transformed into the game and competition relationship among employees and departments, which could reduce

the management cost and simultaneously achieve the management effect of competitive incentive and control for employees.

Further, through dynamic competition, some absolute competitive advantages resulted from the asymmetry of employees' abilities in enterprises would be eliminated, which can be embodied as: everyone has an opportunity, but no one can achieve it with a guarantee.

In conclusion, game and competition method has four main values to managers:

1: It can significantly stimulate the enthusiasm of the team via the marketing incentive, which can lead to the enterprising situation like that in the sports competition.

2: It can generate new approaches to remove the internal management problems, from minor details to some worldwide problems. For instance, the kickback in the purchasing department is a difficult problem in enterprise management all over the world. In the appendix of this paper, a real case that the conundrum is completely overcome by a Chinese manufacturing enterprise with the game and competition method would be elucidated, in an attempt to make readers fully understand the application of this management method in practice.

3: It can motivate all brilliant inspiration and enthusiasm of the research and development department.

4: It can allow the managers to be emancipated from heavy management labor.

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