

# Stability Analysis of Community and Enterprise's Partnering Model for Elderly Canteens

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**Abstract:** With the progress of society and economy, the problem of population aging has gradually become prominent. As a developing country, China has also entered an aging society at an early stage. Premature population aging has brought considerable pressure and challenges to social harmony and economic development. This study analyzes and calculates whether the partnering model can achieve a stable state in the old canteens between the community and enterprises, and illustrates the feasibility of the partnering model in community-enterprise cooperation.

## 1. Introduction

The aging of the population is an inevitable additional effect of technological development and social progress, and is an inevitable development trend of human population reproduction in the 21st century. The United Nations International Population Organization defines the country or region where proportion of the population over 60 years old or exceeds 10% of the total population as "ageing society". According to this standard, when the fifth population census was conducted in 2000, the proportion of the elderly population aged 60 and over in China has reached 10.45%. Since then, China entered the ranks of the aging society early [1].

With the continuous improvement of productivity and rapid economic development, the society has gradually reduced the size of the family, weakened family kinship. In addition, because of the busy work, people do not have enough time to take care of the elderly, which has brought a certain impact on the traditional aged care model. "Aged care" has become the current social hot spot, and it is also a major event for many families. It is worth mentioning that the dietary status of the elderly is a key factor affecting old people's health and quality of life. Therefore, the construction of the old canteen is a key measure for the community to implement home old-age care services. The Chinese government emphasized that it is necessary to focus on the development of home-based old-age care services, and establish the old-age service network of towns and communities. Therefore, it is important to choose the right enterprises to enter the community and provide professional elderly canteen services, which can facilitate the elderly and continuously improve the happiness index of the elderly.

## 2. Community and enterprise partnering model

### 2.1 The definition of partnering model

The UK Ministry of Construction and Industry points out that the "partnering model" is based on specific business objectives, a long-term commitment, mutual trust, mutual recognition of goals, values and willingness to cooperate established by multiple companies or institutions [2]. The partnering modern is more common in the supply chain, firms usually practice cooperation with

partners to sustain their competitive advantage [3]. With the economic development and social progress, the concept of "partnering model" has been applied to more fields. To sum up, the "partnering" model is a long-term agreement based on sharing, trust, commitment, and goal alignment. The reason why the two parties are willing to adopt this partnering mode is because such a long-term, mutual trust relationship is conducive to the realization of the goal and can bring benefits to both parties.

## **2.2 The need for communities and companies to adopt a partner model**

The community home-based care model belongs to the newly formed old-age care model in recent years, and the corresponding service of the elderly canteen is one of its important components. The human, material and management level of the community is limited, and it is more inclined to introduce professional social enterprises to provide services for the elderly. The enterprises that enter are often determined after the bidding activities held by the community in the early stage. The contract is stipulated by a certain service period, and the general period is based on the year. It takes a period of time to promote its service for companies to enter the community. Short-term operation is often not conducive to the company's expected benefits. If the company's short-term profit is lower than its choice to engage in other related work, it will require high subsidies from the community. For the community, high subsidies obviously increase the cost. In addition, the search fee generated by each bidding, the cost of the relevant information of the competing enterprise, the decision-making cost incurred in the bid evaluation and the change of supervision costs are increased due to frequent replacement of cooperative enterprises. Moreover, the elderly need to adapt to the services provided by the new enterprises, and it is not conducive to the creation of a long-term, stable atmosphere of community-based care for the elderly. In addition, when the community frequently holds bidding for the elderly canteen service, the companies participating in the bidding become more, some companies will find the choice preferences of the community, and attempts to over-emphasize certain focused factors to obtain a contract by reducing other service quality. Therefore, the community is more inclined to find a fixed partner in the service of the elderly canteen, so that the two sides can maintain long-term partnerships to jointly provide high-quality services for the elderly. But for the community, whether this long-term partnership can continue steadily and whether it is beneficial to maintain this relationship is a key issue that should be considered by the community in the choice of cooperation methods for the elderly canteens.

## **3. Stability analysis of community and business partnering model**

### **3.1 Community and enterprise cooperation game theory model**

Whether the community and enterprises can establish and maintain long-term, stable and trusting partnerships is actually a question of the game and countermeasures between the two parties. In fact, it is a repetitive game between the two sides. According to game theory, the benefit of a member depends not only on his or her own behavior, but also on the behavior of another member associated with it [4]. If the community and the enterprise reach a partnership, and both parties adopt a cooperative behavior that conforms to the agreement within the agreed cooperation period, mutual trust will be enhanced and good service will be provided. Not only did the company obtain good operating income, but it also shaped its good social image. At the same time, the community also gained recognition from the elderly, increased social performance, and achieved a win-win situation.

Assume that both parties can obtain the income of 5 units in the state of mutual cooperation; if one of the communities or enterprises considers it privately to achieve higher income, they will not cooperate when operating the elderly canteen, resulting in the benefit of the party choosing the cooperation cut back. At this point, it is assumed that the benefit of the party making the cooperative effort is 4 units, and the benefit of the party who evades the responsibility to make the uncooperative move is 6 units; if both parties take selfish actions and do not cooperate, the canteen

will be operated in a bad situation. Not only can the community not be praised for opening the canteen, and the company is likely to suffer economic losses due to poor business operation. In the state where the two parties do not cooperate, assuming that both parties' income is one unit. The game matrix is used to represent the income of both parties as shown in Table 1.

Table 1. Community and enterprise cooperation game income matrix

		Enterprise	
		Cooperate	Non-cooperative
Community	Cooperate	(5,5)	(4,6)
	Non-cooperative	(6,4)	(1,1)

### 3.2 Community and enterprise single game

Suppose that the community and the company only play one game, that is, sign a short-term contract for the elderly canteen service. Since both parties are rational economic people, they are often selfish when they do not know the actual actions of the other party, that is, they seek the maximum self-interest and do not care about the interests of the other participants [5]. Just as the classic game theory case--the Prisoner's Dilemma experiment shows that due to information asymmetry, it is feared that their cooperative behavior will be less than the non-cooperative behavior of the other party, so both social enterprises are more inclined to choose not to cooperate. Therefore, both the community and the enterprise can only get 1 unit of income, failing to achieve a win-win situation.

### 3.3 Community and enterprise repeated games

When the community and the company choose to sign a long-term contract to operate the community's old canteen, it is actually repeating the game again and again in a long cooperation cycle. If one party takes cooperative action in the last round of the game and receives a response from the other party's cooperation, in the next round of the game, it is likely that the two parties will continue to achieve mutual cooperation due to trust; if one party takes uncooperative action in the last round of the game, the other party will respond in a non-cooperative response in the next round of games, and the trust between the two sides will be reduced. Because of the sociality and influence of the elderly canteen, it is generally not easy to change partners during the cooperation cycle. For the community, sudden suspension of cooperation will lead to the interruption of the service; for the enterprise, the temporary termination of the service will not only face liquidated damages, but also affect the social credibility of the enterprise. Therefore, the repeated game in this study only considers the situation in which the partner does not change during the cooperation cycle.

$$\begin{aligned}
 W &= W_1 + \partial W_2 + \partial^2 W_3 + \dots \\
 &= \sum_{t=1}^{\infty} \partial^{t-1} W_t
 \end{aligned}
 \tag{1}$$

Suppose  $w$  is the benefit of the partner after multiple games. After considering the time value, the total return of one party is:

$W_t$  is the game income of the  $t$  stage under a certain equilibrium;

$\partial$  is a discount factor that considers the time value of the return, and is generally considered in terms of the market benchmark yield, between (0, 1).

$$W_{t0} = 5 + \partial 5 + \partial^2 5 + \dots = \frac{5}{1 - \partial}
 \tag{2}$$

If the two parties have been in a state of mutual cooperation, the total return  $W$  can be expressed as:

If one party only pays attention to short-term gains, it will adopt a non-cooperative betrayal strategy at the beginning of the game and will get 6 units of income in the first game. However, in the subsequent game, the other party will take retaliatory actions against the first round of non-cooperation, and it will not cooperate. Therefore, the two sides will always be in the situation of (uncooperative, non-cooperative), and the profits of both parties are one unit. The first party who chooses not to cooperate will have the total return after  $t$  games:

$$W_{t1} = 6 + \delta + \delta^2 + \dots = 6 + \frac{\delta}{1-\delta} \quad (3)$$

When  $W_{t0} > W_{t1}$ ,  $\frac{5}{1-\delta} > 6 + \frac{\delta}{1-\delta}$  ( $\delta > \frac{1}{5}$ ) the income of the choice of cooperation will be greater than the income of betrayal. Therefore, for the benefit maximization, the community and the enterprise will always cooperate. Otherwise, the two sides will not cooperate after the first betrayal.

If the two sides have maintained the state of cooperation in the previous period, and suddenly one party chooses to betray in one round of the game, the other party will make a retaliatory response after this round, and the two sides will continue (uncooperative, non-cooperative) until the end of the cycle. At this time, the total profit of the party who chooses to betray in the  $n$ -round game in the process after the  $t$ -game is the following:

$$W_{t2} = 5 + \delta 5 + \delta^2 5 + \dots + \delta^n 6 + \delta^{n+1} + \delta^{n+2} \dots = \frac{5}{1-\delta} - \delta^n \frac{1+5\delta}{1-\delta} = \frac{5 - \delta^n - \delta^{n+1}}{1-\delta} \quad (4)$$

In this case, it is not difficult to find that in the case of  $\delta > \frac{1}{5}$ , at one stage of the cooperation process, one party deviates from the move and does not cooperate according to the contract, and will get the retaliatory and uncooperative behavior of the other party in the next round of the game. After that, even if the party wants to return to the state of mutual cooperation through an activity, but because of the lack of trust, it will eventually stabilize (uncooperative, non-cooperative) until the end of the cycle. It can be seen that if the community and the enterprise maintain a long-term cooperative partnership, the two sides, as rational economic people, will consider the maximization of their own interests, and cooperation (cooperation) will be the inevitable result. It also can be a feasible measure for the successful operation and cooperation mode of the "elderly canteen".

#### 4. Conclusion

For the community and enterprises, the two sides can reach a long-term partnership on the operation and maintenance of the elderly canteen. The benefits brought by this friendly and trustworthy state will make this cooperation last for a long time without any behavior violating the contract. The long-term cooperative partnership of the elderly canteen is also conducive to the promotion and sustainable development of the elderly canteen in the community, thus benefiting the elderly, alleviating the difficulty of eating for the elderly. At the same time, such a partnering model can be applied to other community home care services, which can promote the construction of community home care system and promote social stability and harmony.

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