

# Incentive Mechanisms for Tacit Knowledge-Sharing in Master-Apprentice Pattern Based on The Principal-Agent Theory

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**Abstract.** Continual knowledge sharing is the key to improve the competitive ability, operation ability and innovative ability of the organization. Through the comparison of the game theory, knowledge market theory and the principal-agent theory, the principal-agent theory is more suitable for the research on the incentive mechanism of tacit knowledge sharing in master-apprentice Pattern. During the process of tacit knowledge sharing in master-apprentice Pattern, different types of tacit knowledge determine the different design of incentive mechanisms. When the master and the apprentice share the inexpressible tacit knowledge, the organization does not need to design any incentive mechanism for promoting the master's knowledge sharing. When master and apprentice share the expressible tacit knowledge, the organization needs to design different incentive mechanisms for the master and the apprentice respectively. Moreover the organization needs to take into account the different master-apprentice models in different departments. So the organization needs to design different incentive mechanisms for different departments in order to furtherance the tacit knowledge sharing in master-apprentice pattern.

## 1 Introduction

In the era of knowledge economy, the competition among organizations has evolved into the competition of knowledge products or knowledge services [1]. But the knowledge within the organization will not appear in the air. Knowledge of the organization comes from the individual based on the practical knowledge theory. Therefore, knowledge within the organization is mainly derived from the mutual influence of individual knowledge in the organization [2]. Lawson et al. (2009) defined the interaction process within the organization as the knowledge sharing process, namely, the process of exchanging knowledge and creating knowledge [3]. The acquisition and accumulation of knowledge in the organization can not be separated from the knowledge sharing among individuals in the organization. Knowledge sharing within the organization is more effective, the more likely that the organization can survive in the fierce competition and keep higher productivity [4]. So knowledge sharing is the key to the successful implementation of knowledge management. Knowledge sharing can not only improve the application ability and innovation ability in order to enhance competitiveness of the organization, but also can accelerate the development of new products through reducing the

production cost of the organization [5]. Thus how to promote knowledge sharing in the organization becomes the key to enhance the competitive ability, the operation ability and the innovation ability of the organization.

## **2 State of the art**

### **2.1 Incentive mechanism**

Kimbal(2012)considered that information technology can promote knowledge sharing in the organization to a certain extent [6].But the effect of knowledge sharing is not significant. The reason is that information technology can create more convenient conditions for knowledge sharing among individuals. But it can not really improve the individual motivation of knowledge sharing. Thus knowledge sharing is still not easy to occur.Knowledge is a symbol of the individual rights or organization rights. Knowledge is embedded in the individual's thinking. In the organization which is full of a wide competition, in the rational behavior, employees with knowledge reject knowledge sharing in order to maintain their competitive advantage in the organization [7].But the success of the organization is based on the individual knowledge in the process of knowledge sharing.Employees must be willing to share knowledge. Individual knowledge can be transformed into organizational knowledge and intellectual capital of the organization. Accordingly, in order to improve the competitive advantage of the organization, the organization is bound to promote the knowledge sharing in the organization through the designing of incentive mechanisms.Based on the analysis of people's motives and needs, incentive mechanisms emphasizing the rational behavior of people, can enable employees to generate the motivation of knowledge sharing,and ultimately realize the knowledge sharing between individuals in the organization.

Compared with information technology, why incentive mechanisms are more capable of promoting knowledge sharing within the organization? The main reason is the existence of information asymmetry in the process of knowledge sharing].Managers can not directly monitor the level of individual share effort in the process of knowledge sharing. Just because of the difficulty of monitoring the degree of individual share effort, it is to raise the speculative opportunity of the individual. Therefore it is needed to design the incentive mechanism from the perspective of organization to heighten the degree of individual share effort in order to solve the problems caused by information asymmetry.

As a form of knowledge sharing in organizations, knowledge sharing in master-apprentice pattern is the process of the tacit knowledge transferring from the master to the apprentice. The master generally refers to the senior staff with the long work experience in the organization. And the apprentice generally refers to the junior staff with a lack of work experience in the organization [8]. At present, the knowledge sharing in master-apprentice pattern is still the main form of knowledge transferring, especially tacit knowledge transferring in most organizations in China.Compared with the explicit knowledge, the tacit knowledge is more invisible [9].The employee needs to pay greater efforts in the process of tacit knowledge sharing than that in the process of explicit knowledge sharing. Therefore, organizations need to design special incentive mechanism for tacit knowledge sharing in master-apprentice pattern.

### **2.2 Research methods of incentive mechanisms**

At present, the research on the incentive mechanism for knowledge sharing in the organization mainly focuses on three methods. These are the game theory, knowledge market theory and the principal-agent theory.

Although the game theory is of great significance in understanding the strategic relationship between the knowledge provider and the knowledge receiver in the organization. But the research hypothesis of the game theory, which is that each participating subject has the same sharing cost and sharing benefit, is not in conformity with the actual situation of the organization. Because there are different individuals in the organization, and different individuals with different private knowledge have different sharing costs and benefits in the process of knowledge sharing. For example, in the process of tacit knowledge sharing in master-apprentice pattern, Whether the sharing cost or the sharing benefit, that of the master with the long work experience is obviously much higher than that of the apprentice with a lack of work experience.

Despite knowledge market theory is helpful to understand which knowledge of the organization can be used in the knowledge transaction, and the interests of the two parties in the process of knowledge transaction. But the premise of the knowledge market theory is that the knowledge is a kind of tangible goods, and the process of knowledge transaction can be directly monitored by the organization, which is clearly not consistent with the characteristics of information asymmetry in the organization. In other words, the organization is not directly monitoring the knowledge sharing behavior of the individual.

The principal-agent theory is generally used to analyze the information asymmetry between the two economic entities in Economics [10]. Although the organization manager as the principal is difficult to directly monitor the degree of individual effort as the agent. But the degree of individual effort can be affected by the incentive mechanism in the organization. Also, according to incentive mechanism in the organization, the employee as the agent can maximize his benefits through the choice of different degree of individual effort [11]. Therefore, in order to research the incentive mechanism for knowledge sharing in master-apprentice pattern under the condition of asymmetric information, compared with the game theory and the knowledge market theory, the principal-agent theory is more suitable because of the explicit consideration of the non-observable behavior of the agent to solve the incentive problem.

In addition, the knowledge sharing in master-apprentice pattern is more practical knowledge sharing. On the basis of the division of the explicit knowledge and the tacit knowledge of Nonaka (1994) [12], Blair (2002) divided the tacit knowledge into two categories. One is the inexpressible tacit knowledge; the other is the expressible knowledge [13]. It is obvious that there are the inexpressible tacit knowledge and the expressible tacit knowledge during the process of knowledge sharing in master-apprentice pattern. But, during these two kinds of tacit knowledge sharing process, individuals pay a different level of shared effort due to the different tacit knowledge types. To this end, the organization needs to design different incentive mechanisms according to different types of tacit knowledge sharing in master-apprentice pattern. So, on the basis of existing research, this paper will discuss the incentive mechanism for tacit knowledge sharing in master-apprentice pattern by taking into account the different types of tacit knowledge based on the principal-agent theory.

### **3 The principal-agent model**

There are three main bodies during the process of tacit knowledge sharing in master-apprentice pattern, the organization, the master as the knowledge provider and the apprentice as the knowledge recipient. Based on the principal-agent theory, the organization is the principal. The master and the apprentice are agents. The task of the principal is to design a reasonable incentive mechanism according to the observed information, and to encourage agents to choose the beneficial behavior strategy for the principal.

#### **3.1 Output of tacit knowledge sharing in master-apprentice pattern**

The process of tacit knowledge sharing in master-apprentice pattern is actually the process of knowledge transferring from the master to the apprentice. Obviously, the efforts of the master or the apprentice to choose the cooperative behavior, such as knowledge sharing, is much higher than that to choose the non-cooperative behavior, such as knowledge hoarding or knowledge rejecting. So we define the degree of shared effort paid by the master in the choice of knowledge sharing strategy as  $m_h$  and define that paid by the master in the choice of knowledge hoarding strategy as  $m_l$ . Likewise, we define the degree of shared effort paid by the apprentice in the choice of knowledge sharing strategy as  $a_h$ , and define that paid by the apprentice in the choice of knowledge rejecting strategy as  $a_l$ . It is obviously that  $m_h > m_l$  and  $a_h > a_l$ .

Moreover, for the organization, only when the master and the apprentice choose the cooperative behavior, the tacit knowledge of the master can be translated into the intellectual capital of the organization by virtue of the absorption and reuse of the apprentice. Therefore, from the perspective of the output of tacit knowledge sharing in master-apprentice pattern, we assume that the total output of tacit knowledge sharing in master-apprentice pattern is a linear function of the master's knowledge sharing output and the apprentice's knowledge sharing output. Furthermore the master's knowledge

sharing output is a linear function of the master's knowledge sharing efforts. And the apprentice's knowledge sharing output is a linear function of the apprentice's knowledge sharing efforts. The total output of tacit knowledge sharing in master-apprentice pattern can be expressed as  $\Pi(m, a) = \Pi(m) + \Pi(a)$

When the master pays a higher degree of sharing effort, that is "mh", the master's knowledge sharing output has two results, one is the higher output of knowledge sharing, that is  $\Pi_h(mh)$ , and the other is the lower output of knowledge sharing, that is  $\Pi_l(mh)$ . That is the same with the apprentice's efforts.

### 3.2 Cost of tacit knowledge sharing in master-apprentice pattern

In the process of tacit knowledge sharing in master-apprentice pattern, whether the master or the apprentice needs to pay a certain cost of knowledge sharing.  $C(m)$  is the knowledge sharing cost of the master.  $C(a)$  is the knowledge sharing cost of the apprentice. The master or the apprentice will obtain different sharing costs in different levels of sharing efforts. Obviously, the share cost in the high degree of sharing effort must be greater than that in the low level of shared effort. That is  $C(mh) > C(ml)$  and  $C(ah) > C(al)$ .

### 3.3 Optimal reward incentive

The principal needs to provide the agent with a certain reward in order to encourage the agent to pay a higher degree of sharing effort in the process of knowledge sharing. The reward of the principal should reflect the difference of the agent's reward in consideration of the different degree of sharing efforts. In the process of tacit knowledge sharing in master-apprentice pattern, the reward of the master is  $R(m)$ . And the reward of the apprentice is  $R(a)$ . However because the organization as the principal is unable to monitor directly the agent's sharing efforts. The organization provides the agent with the corresponding rewards according to the sharing output. So the reward of the agent is the function of the sharing output. That is  $R(\Pi(m, a)) = R(\Pi(m)) + R(\Pi(a))$

$R(\Pi(m))$  is the reward of the master.  $R(\Pi(a))$  is the reward of the apprentice. Because the reward of the agent is the function of the sharing output, the reward of the high sharing output is higher than that of the low sharing output. That is  $R_h(\Pi_h(m)) > R_l(\Pi_l(m))$ ,  $R_h(\Pi_h(a)) > R_l(\Pi_l(a))$ .

### 3.4 Expected utility

Assuming that both the principal and the agent are risk neutral, the expected utility of the organization, the master and the apprentice is equal to the respective expected return. The expected utility of the organization is

$$\Pi(m, a) - R(m) - R(a) = \Pi(m) + \Pi(a) - R(m) - R(a)$$

The expected utility of the master is  $R(m) - C(m)$ .

The expected utility of the apprentice is  $R(a) - C(a)$ .

We assume that when the master or the apprentice chooses the cooperative behavior and pays a higher degree of sharing efforts, P is the possibility that the master or the apprentice creates the higher knowledge sharing output. And (1-P) is the possibility that the master or the apprentice creates the lower knowledge sharing output. When the master or the apprentice chooses the non-cooperative behavior and pays a lower degree of sharing efforts, Q is the possibility that the master or the apprentice creates the higher knowledge sharing output. And (1-Q) is the possibility that the master or the apprentice creates the lower knowledge sharing output. It is obviously that  $P \geq Q$ . In addition, the organization as the principal expects the master and the apprentice to choose the cooperative behavior in the process of knowledge sharing in master-apprentice pattern. Only when the master and the apprentice choose the cooperative behavior, the organization can achieve the maximum expected utility. That is

$$\begin{aligned} \text{Max} \quad & P \times [\Pi_h(mh) + \Pi_h(ah) - R_h(\Pi_h(m)) - R_h(\Pi_h(a))] \\ & + (1-p)[\Pi_l(mh) + \Pi_l(ah) - R_l(\Pi_l(m)) - R_l(\Pi_l(a))] \end{aligned}$$

### 3.5 The basic incentive model

Based on the principal-agent theory, the maximum expected utility of the organization as the principal is constrained by the individual rationality constraint and the incentive compatibility constraint of the agent. The individual rational constraint is that the maximum expected utility obtained by the agent from the acceptance of the incentive contract can not be less than that from the non-acceptance of incentive contract. The maximum expected utility obtained by the agent from the non-acceptance of the incentive contract is general represented by  $\bar{U}$  [14]. The incentive compatibility constraint is that when the agent chooses the cooperative behavior in accordance with the way the principle is expected to, the best efforts of the agent is the satisfactory efforts for the principal, and is to maximize the benefits of the agent. The realization of the maximum benefit of the principal can be realized through the maximum utility of the agent. The incentive mechanism of the principal should ensure that the benefits obtained by the employee from the cooperative behavior are greater than that of the non-cooperative behavior [15]. To this end, the basic incentive model of the organization can be expressed as follows.

$$\begin{aligned} \text{Max } P \times [ & \Pi_h (mh) + \Pi_h (ah) - R_h (\Pi_h (m)) - R_h (\Pi_h (a))] + (1 - p)[ \Pi_l (mh) + \Pi_l (ah) \\ & - R_l (\Pi_l (m)) - R_l (\Pi_l (a))] \end{aligned} \quad \text{S.T.}$$

$$\begin{aligned} P \times R_h (\Pi_h (m)) + (1 - p)R_l (\Pi_l (m)) \\ - C(mh) \geq \bar{U}_m \end{aligned} \quad (1)$$

$$\begin{aligned} P \times R_h (\Pi_h (a)) + (1 - p)R_l (\Pi_l (a)) \\ - C(ah) \geq \bar{U}_a \end{aligned} \quad (2)$$

$$\begin{aligned} P \times R_h (\Pi_h (m)) + (1 - p) \times R_l (\Pi_l (m)) \\ - C(mh) \geq Q \times R_h (\Pi_h (m)) + \\ (1 - Q) \times R_l (\Pi_l (m)) - C(ml) \end{aligned} \quad (3)$$

$$\begin{aligned} P \times R_h (\Pi_h (a)) + (1 - p) \times R_l (\Pi_l (a)) \\ - C(ah) \geq Q \times R_h (\Pi_h (a)) + \\ (1 - Q) \times R_l (\Pi_l (a)) - C(al) \end{aligned} \quad (4)$$

Formula (1) and (2) is called the individual rationality constraint of the master and the apprentice (IR). Formula (3) and (4) is called the incentive compatibility constraint of the master and the apprentice (IC). In addition, taking into account the tacit knowledge sharing in master-apprentice pattern, the types of tacit knowledge are ordered by the inexpressible tacit knowledge and the expressible tacit knowledge.

## 4 Incentive mechanisms

### 4.1 The inexpressible tacit knowledge sharing in master-apprentice pattern

The main feature inexpressible tacit knowledge is the highest degree of obscure. The knowledge owner is not even aware of the existence of this kind of tacit knowledge in the working process, so it is difficult to use the system language to express it. For this type of tacit knowledge, regardless of whether the master will pay a high degree of sharing efforts or low level of sharing efforts, the organization can only monitor a lower sharing output. The probability of producing a high sharing output is almost zero. That is  $P=0$  and  $Q=0$ . So when the master provides the tacit knowledge  $Q$  which is difficult to express, the incentive model can be expressed as the incentive mechanism for the master. That is

$$\text{Max } \Pi_l (mh) - R_l (\Pi_l (m))$$

$$R_i(\Pi_l(m)) - C(mh) \geq \overline{U}_m \tag{5}$$

$$R_i(\Pi_l(m)) - C(mh) \geq R_i(\Pi_l(m)) - C(ml) \tag{6}$$

We can see from formula (6) that when the master is supported by the same incentive mechanism, the sharing cost in the high degree of sharing effort is not more than that in the low level of shared effort. That is  $C(mh) \leq C(ml)$ , which is inconsistent with  $C(mh) > C(ml)$  as mentioned above. So we can draw the following conclusions.

When the master shares the inexpressible tacit knowledge, the organization does not need to design any incentive mechanism for the master. The reason is that when the master shares the inexpressible tacit knowledge, regardless of the master to pay a high or low level of sharing efforts, the shared output of the organization is always little, and even zero. The incentive mechanism is designed in the light of the sharing output, rather than the degree of sharing efforts. So in the case of the little sharing output or zero sharing output, the organization will not spend a certain amount of costs to motivate the master to share tacit knowledge. Moreover in the case of lack of organizational reward incentive, the master will give up inexpressible tacit knowledge sharing in the face of higher sharing costs naturally.

#### 4.2 The expressible tacit knowledge sharing in master-apprentice pattern

The expressible tacit knowledge is between the inexpressible tacit knowledge and the explicit knowledge. Although the expressible tacit knowledge has certain obscure too, but can be translated into explicit knowledge through hard work and shared with other people. When the expressible tacit knowledge is shared between the master and the apprentice, there is the higher uncertainty between the degree of sharing efforts and the sharing output. For example, the master or the apprentice with the high degree of sharing efforts may produce a high sharing output or a low sharing output. And the master or the apprentice with the low degree of sharing efforts may produce a high sharing output or a low sharing output. Therefore the values of P and Q are varied, and are not determined. From the foregoing, we can see that  $0 < P < 1$  and  $0 < Q < 1$ . In the process of expressible tacit knowledge sharing in master-apprentice pattern, the sharing output is not only related to the sharing output of the master, but also related to the sharing output of the apprentice. Therefore, the incentive model for expressible tacit knowledge sharing in master-apprentice pattern can be expressed as follows.

$$\text{Max } P \times [\Pi_h(mh) + \Pi_h(ah) - R_h(\Pi_h(m)) - R_h(\Pi_h(a))] + (1 - p) [\Pi_l(mh) + \Pi_l(ah) - R_l(\Pi_l(m)) - R_l(\Pi_l(a))]$$

$$P \times R_h(\Pi_h(m)) + (1 - p) R_l(\Pi_l(m)) - C(mh) \geq \overline{U}_m \tag{7}$$

$$P \times R_h(\Pi_h(a)) + (1 - p) R_l(\Pi_l(a)) - C(ah) \geq \overline{U}_a \tag{8}$$

$$P \times R_h(\Pi_h(m)) + (1 - p) \times R_l(\Pi_l(m)) - C(mh) \geq Q \times R_h(\Pi_h(m)) + (1 - Q) \times R_l(\Pi_l(m)) - C(ml) \tag{9}$$

$$P \times R_h(\Pi_h(a)) + (1 - p) \times R_l(\Pi_l(a)) - C(ah) \geq Q \times R_h(\Pi_h(a)) + (1 - Q) \times R_l(\Pi_l(a)) - C(al) \tag{10}$$

In consideration of the objective function, the organization always expects to obtain the maximum expected profit by paying the less reward for employees. Therefore, in order to meet the optimal of the objective function, individual rationality constraints and incentive compatibility constraints of the master and the apprentice should be binding. In other words, when formula (7), formula (8), formula (9) and formula (10) is the equation, the expected profit of the organization is biggest.

Firstly we analyze the constraints of the master. Formula (7) and formula (9) is transformed into the equation as follows.

$$P \times R_h(\prod_h(m)) + (1 - p)R_l(\prod_l(m)) - C(mh) = \overline{U}_m \tag{11}$$

$$\begin{aligned} P \times R_h(\prod_h(m)) + (1 - p) \times R_l(\prod_l(m)) - C(mh) & \tag{12} \\ \geq Q \times R_h(\prod_h(m)) + (1 - Q) \times R_l(\prod_l(m)) - C(ml) \end{aligned}$$

The solutions of equation (11) and equation (12) are as follows.

$$R_h(\prod_h(m)) = \overline{U}_m + \frac{(1 - Q) \times C(mh) - (1 - P) \times C(ml)}{P - Q} \tag{13}$$

$$R_l(\prod_l(m)) = \overline{U}_m + \frac{P \times C(ml) - Q \times C(mh)}{P - Q} \tag{14}$$

The solutions of equation (13) minus equation (14) are as follows.

$$R_h(\prod_h(m)) - R_l(\prod_l(m)) = \frac{C(mh) - C(ml)}{P - Q} \tag{15}$$

From equation (13) , it is seen that the reward of the master is not only related to the sharing cost, but also related to the values of P and Q under different shared outputs. As the foregoing, because of  $C(mh) > C(ml)$  and  $P > Q$ , we can infer  $R_h(\prod_h(m)) > R_l(\prod_l(m))$  from equation (15), which shows that the more sharing cost of the master, the more sharing output can be created, and the organization will provide more rewards to make up the sharing cost of the master.

In addition, it can also be seen from the formula (13) and type (14) that with the increasing value of P, the possibility of creating the high sharing output by paying a high degree of the master’s sharing efforts is increasing. When the value of P is close to one, the master can create a high sharing output by paying a high degree of sharing efforts only. So we can assume that  $Q=0$ , and  $P=1$  and  $Q=0$  are taken in equation (13) and equation (14) respectively.

$$R_h(\prod_h(m)) = \overline{U}_m + C(mh) \tag{16}$$

$$R_l(\prod_l(m)) = \overline{U}_m + C(ml) \tag{17}$$

It is seen from equation (16) and equation (17) that there is the positive correlation between the master’s rewards provided by the organization and the master’s sharing costs. In other words, the higher the master’s sharing costs, the greater rewards provided by the organization. It is obviously consistent with the idea of more pay for more work in China and is also most advantageous to the organization.

With the increasing value of Q, the possibility of creating the higher sharing output by paying a lower degree of the master’s sharing efforts is increasing. When the value of Q is close to one, the master can create a high sharing output by paying a low degree of sharing efforts only. As time goes on, the master will give up the sharing efforts, which will lead to the lower value of P. So we can assume that  $Q=1$ , and  $P=0$  and  $Q=1$  are taken in equation (13) and equation (14) respectively.

$$R_h(\prod_h(m)) = \overline{U}_m + C(ml) \tag{18}$$

$$R_l(\prod_l(m)) = \overline{U}_m + C(mh) \tag{19}$$

It is seen from equation (18) and equation (19) that there is the negative correlation between the master’s rewards provided by the organization and the master’s sharing costs. In other words, the higher the master’s sharing costs, the lesser rewards provided by the organization. And the lower the master’s sharing costs, the greater rewards provided by the organization. So the master will give up the high sharing costs in order to gain the high rewards provided by the organization, which is clearly consistent with the idea of gain without doing any work in China and is unfavourable to the organization.

Analysis of the apprentice’s constraints is the same with the master, so we will not repeat .

It can be seen from the analysis of master's constraints and the apprentice's constraints that the rewards of the master and the apprentice provided by the organization are related to the sharing costs of agents, but also to the value of P and Q. Only when  $P > Q$ , incentive mechanisms of the organization are consistent with the idea of more pay for more work in China and are also most advantageous to the organization. In other words, incentive mechanisms of the organization should allow agents to deem that the higher sharing output can be created only by expending a higher degree of sharing efforts, and then the organization will provide higher rewards for the agent's higher output.

## 5 Conclusion

It can be found through the aforementioned that in the process of tacit knowledge sharing in master-apprentice pattern, any organization may not have one general incentive mechanism, which can be applicable to all processes of knowledge sharing in master-apprentice pattern.

One reason is that tacit knowledge in master-apprentice pattern can be divided into the inexpressible tacit knowledge and the expressible tacit knowledge. The organization needs design different incentive mechanisms according to the different types of tacit knowledge in master-apprentice pattern. For example, the organization does not need to design any incentive mechanism for the inexpressible tacit knowledge sharing in master-apprentice pattern. But for the expressible tacit knowledge sharing in master-apprentice pattern, incentive mechanisms of the organization need to be divided into incentive mechanisms for the master and incentive mechanisms for the apprentice. Furthermore the design of incentive mechanisms is related to the sharing cost of the master and the apprentice and the value of P and Q. Only when  $P > Q$ , incentive mechanisms of the organization are most advantageous to the organization.

The other reason is that there are also different types of tacit knowledge in different departments within the organization. For example, although there is the expressible tacit knowledge in R & D department, marketing department, financial department and so on. But there are different sharing costs and the different estimated value of P and Q in different departments. Because incentive mechanisms are not only related to the sharing cost, but also the value of P and Q. So in order to design incentive mechanisms for tacit knowledge sharing in master-apprentice pattern within different departments, first of all, the organization should estimate the sharing costs of different departments, and the value of P and Q value, and then design corresponding incentive mechanism for different departments. Therefore how to estimate reasonably the sharing cost, and the value of P and Q value, is the key to the design of incentive mechanisms for tacit knowledge sharing in master-apprentice pattern.

Since the organization does not expend the greater rewards for the master and the apprentice with the lower sharing costs. So how to reduce the sharing cost of the master and the apprentice is one of the keys to design incentive mechanisms of the organization. For the master, the focus of the organization is on the mining and re-organizing of the master's tacit knowledge, and on making the master's tacit knowledge transformed into explicit knowledge, which is contributing to the knowledge absorption of the apprentice. Moreover the organization should pay attention to the training of the master's skills in imparting tacit knowledge. Even if it is necessary, the organization should set up the special training department, whose aim is how to impart tacit knowledge of the master. Therefore, owing to the master having had the imparting tacit knowledge during the process of tacit knowledge sharing in master-apprentice pattern, sharing costs of the master and the apprentice are greatly reduced.

For the apprentice, the organization can improve the apprentice's ability to learn by educating and training in terms of learning methodology for the apprentice. For example, the organization can provide lectures with the different content and demonstration about different positions for the apprentice in order to reduce the apprentice's sharing cost.

As for the estimated value P and Q, the organization should take advantage of a large amount of information about sharing outputs, sharing costs and rewards and so on in the past of tacit knowledge sharing in master-apprentice pattern with the help of information technology. How to use the past information to estimate accurately sharing costs and the value of P and Q is another problem that needs to be studied.

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