Study on the Relationship between the Team Commitment, Knowledge Sharing and Performance

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***Abstract*—Unlike most of the empirical analysis, this paper applies netlogo multi agent simulation software to explore the complex and dynamic relationship between team commitment, knowledge sharing and performance. Combined with related parametric evolution curves, concluding: teams with higher level of commitment have bigger scale and higher total output, average level of output and level of effort decrease with the increase of exaggerated commitment value.**

Keywords—commitment of research teams; knowledge sharing; multi agent simulation; research performance

I. INTRODUCTION

Knowledge sharing can help members to quickly acquire knowledge, to improve performance, Organizations must rely more on personal social psychological intrinsic motivation factors to encourage team members to share knowledge, and not just the traditional economic and social incentives. Hislop believes that organizational commitment is one of the important factors which affect knowledge [1]. Team commitment develops based on organizational commitment, which refers to the relative strength of an individual's identification with, and involvement in, a particular team [2].

There are fewer papers studying how team commitment affects performance in the context of knowledge sharing.Therefore, this paper will enrich research in this field, where empirical analysis is applied to study the relationships among concepts. Since it is appropriate to apply simulation to study such complex and dynamic relationships, this paper discusses the relationship through evolution curve of the relevant parameters output during simulation process using netlogo software.

II. LITERATURE REVIEW

Meyer et al. believe that different dimensions of organizational commitment have different impacts on employees' behavior. There is a positive correlation between affective and normative commitment and job performance. And affective commitment is stronger than normative commitment. However, continuance commitment has no significant or even negative impact on job performance [3]. Cuyper et al. believes that employees with high commitment levels have lower absence rate and separation rate, which increase organizational output [4]. Lin et al. draws team commitment can promote the innovation performance [5].

Chinese scholars Lu et al. studied the willingness of implicit knowledge sharing among knowledge workers from the angle of organizational commitment. They found a proportional relationship between affective and normative commitment and willingness of implicit knowledge sharing [6]. Wang finds that continuance commitment has a negative impact on knowledge sharing [7]. while Feldman holds that in order to avoid the loss incurred by leaving their organization, individuals are fully motivated to share knowledge to ensure the sustainable development of the organization and their safety [8]. Ng finds similar results from the angle of continuance commitment [9].

Based on the analysis of investigation into 80 research teams in key universities in Beijing and Guangzhou, Jin studies the impact of team member's disciplinary background and knowledge sharing and integration among team members on the innovation performance [10]. Wang et al. demonstrate knowledge sharing is markedly positive to Complex product development performance [11].

In conclusion, researchers have explored the relationship between commitment and knowledge sharing, between commitment and performance, and between knowledge sharing and performance. Due to different dimension dividing methods, different conclusions have been reached. Therefore, the relationship between team commitment and performance should be further explored in the context of knowledge sharing, hoping to enrich researches in this field.

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III. MODEL BUILDING FOR THE IMPACT OF TEAM COMMITMENT ON PERFORMANCE IN THE CONTEXT OF KNOWLEDGE SHARING

Currently, theoretical research and empirical research are applied in most researches in this field. However, the application of data analysis in most researches leads to certain disadvantages. For example, the source of samples is limited, data collected are subjective, the number of samples is limited. These problems can be effectively avoided when analog simulation is applied. In this paper, netlogo software is applied to carry out simulation, which is effective for modeling of complex systems with time evolution.

A. Hypotheses for Model Building

Agents within a team not only possess certain level of effort, but learn from each other. Since agents in the same research team have the same knowledge structure, there is no knowledge absorption during knowledge sharing. Assuming that knowledge acquired by agents can be fully transformed into effort level, total effort level consists of individual's effort level and knowledge acquired. Assuming that the amount of knowledge of agent i is I_i, newly added amount of knowledge is bi$\in$(0,1-I_i)after knowledge sharing. Hypotheses for simulation are as follows:

- Equal distribution is applied in team.
- Each agent has a Cobb-Douglas preference for income and leisure.
- Team effort level $e=\sum_{i=1}^{m} ei$,ei means effort value of agent, m means the number of agent in an team.
- Total knowledge acquired by agents $I=\sum_{i=1}^{m} b_i$, b_i means knowledge acquired by a agent, m means them number of agent in an team.
- Total team effort level E=e+I.
- Output level is a function of total effort level[12],O(E)=α*E+β*$(E)^2$, α≥0, β≥0(in this paper, α=1,β=1).
- All the output are for distribution. $U_i=[O(E)/m]^{\theta}(1-e_i-b_i)^{1-\theta_i}$ this is Utility function of agent i.

B. Simulation Process

The purpose of each agent is to maximize their utility during simulation process [13], and agent chooses whether to join the team according to this principle.

- Assuming that all the agents are in a square area, research team A is in the central circle, Initialization interface is shown in Figure 1. Detailed parameter settings are shown in table1.

TABLEI. SIMULATION PARAMETERS

	Simulation Parameters			
	Simulation interface size	***Range of A***	***Number of agent***	***Production function parameter***
Parameter Value	30*30	Circle, center coordinate(0,0) , radius	100	α=β=1

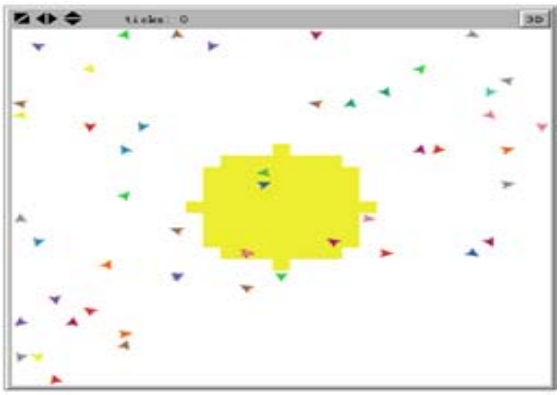


Fig.1. Initialization interface

- Vision value of agent. Vision value reflects the sphere of activity for an agent. At the beginning of simulation, vision value of agent can be set [0,5]. For example, if the vision value of an agent is 2, he can move to another check which is 2checks away. Such an assumption is in line with the actual situation. Different person has different capacity for action.
- Commitment value of team. Commitment level reflects the ability to share knowledge. During simulation process, if the commitment value of team is 3, agents can share knowledge with agents in neighboring 3*4 checks. Such an assumption is in line with the actual situation. The range of commitment value determines the range of Knowledge Sharing. Those with higher commitment are more willing to share their knowledge.
- Effort value of agent. Assuming that effort level of each agent is e_i, $e_i\in(0,1)$. During simulation process, each agent determines their own effort level. Effort level refers to the cost agents have to pay for a particular purpose, such as energy, psychological cost and time.
- Amount of knowledge of agent. Assuming that the amount of knowledge of each agent is proportional to effort level, namely $I_i=\lambda*e_i$. For easy operation, λ=1. Therefore, the amount of knowledge of each agent equals effort level.
- Each agent has a Cobb-Douglas preference for income and leisure, which was put forward by Axtell in 1999. $U_G^i=W_{G,i}^{\theta_i}L_{G,i}^{1-\theta_i}$, θ means preference for income of

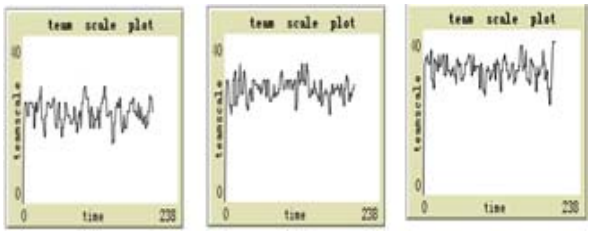
agent i in network G, w means the income of agent, L means leisure agent can have. By using gamma distribution function, this paper simulates different distribution characteristics of agent's preferences for income.

- Calculation of total output levels of the team. Based on computational method put forward by Robert, this paper holds that total output levels of the organization is a function of total effort levels. $O(E)= \alpha *E+ \beta *(E)^2$, $\alpha > 0$, $\beta > 0$. To simplify calculation, both α and β have a value of 1 in this paper.
- Judgment of the death of agent. When preference for income θ is less than 0.02 or more than 0.98, the agent can be set dead. Such an assumption is in line with the actual situation because a person's preference for income can't be too small or too big. The number of agent and distribution. More than 100 agents will be created and randomly distributed in the environment.
- Rules for agents' movement. If utility level of an agent in the network is lower than that of when work independently outside the network, the agent leave the network to work independently.

C. Analyses of Simulation Results

According to the above mentioned hypotheses and settings, 100 circles of simulation are set. By analyzing size of team, total output, individual's average effort level and output for each circle, this paper tries to explore how commitment affects performance in the context of knowledge sharing. Teams with commitment value of 0, 1, 3 are simulated in the environment. By analyzing the output, size, member's average output and effort level, this paper studies how performance of research teams change with the change of commitment value.

1) The impact of commitment on team size in the context of knowledge sharing

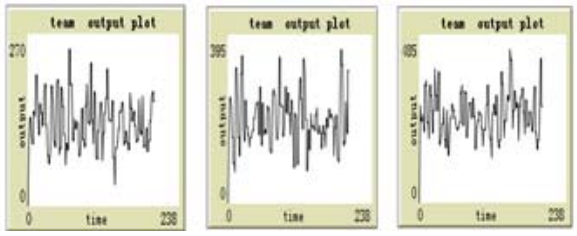


Commitment=0 Commitment=1 Commitment=3

Fig.2. Team size under commitment values

The simulation results show that team size grows with the increase in level of commitment and that more scientific research personnel will join the team. It's clear that teams with higher level commitment have stronger cohesiveness.

2) The impact of commitment on total output in the context of knowledge sharing



Commitment=0 Commitment=1 Commitment=3

Fig.3. Total output of team under different commitment values

It is shown in the figure that the total output fluctuates which is in accordance with the facts. The simulation results show that teams with higher level of commitment have higher total output.

3) Impact of commitment on average level of output and level of effort of team members

TABLEII. COMPARISON TABLE OF AVERAGE LEVEL OF OUTPUT AND LEVEL OF EFFORT IN 100 CIRCLES

Commitment Value	Average Level of Output	Average Level of Effort
0	7.54	0.56
1	11.08	0.61
3	7.56	0.44

Due to the application of average distribution, team members tend to thumb a ride. However, commitment will promote knowledge sharing and improve knowledge of individuals with low amount of knowledge. As a result, they will work harder and the negative effect of free riding is reduced to a certain extent. As shown in the second and third columns of the following table, average output increases with the increase in commitment level. Though commitment can depress free riding to a certain extent by promoting knowledge sharing, it cannot eliminate free riding fundamentally. Compared with team 1, average level of effort in team 2 doesn't increase noticeably.

However, as shown in the third and fourth columns of the following table, average level of output and level of effort decrease with the increase of commitment value, which indicates the aggravation of free riding in the network. This is probably because hitchhikers believe in team members with higher knowledge amount. Free riding is unfavorable for the development of scientific research and deserves more attention in future research.

IV. CONCLUSION AND PROSPECT

A. Conclusion

According to the simulation results, by analyzing size of team, total output, individual's average effort level and output for each circle, this paper tries to explore how commitment affects performance in the context of knowledge sharing. Coming to conclusions, equal distribution is applied in team, commitment promote size of team, total output, beyond a certain range, average level of output and level of effort decrease with the increase of commitment value.

B. Prospect

Although this paper simulates the relationship between commitment and team performance, there are still some limitations in this paper.

1) The hypotheses that equal distribution is applied limit the simulation results.

2) Simulation circle of 100 is not enough for the study of the team in the long run.

3) This paper only studies the impact of commitment on team performance. However, how to control the level of commitment and create a system for commitment suitable for the development of the team in the long run are not mentioned.

C. Suggestions

It can be seen from the simulation results, team Commitment, knowledge amount affect performance. In order to promote team, this paper puts forward the following Suggestions:

1) Cultivating good atmosphere of commitment

According to the research, commitment can promote the performance. At the time of creating team, the team members present their goals, when there is contradiction and conflict between members, judging right and wrong behavior based on goals, so conducive to understand between members, further enhancing the team's commitment.

2) Creating a good study atmosphere

If one agent believe another agent to be able to do a good job and effectively complete, it does not have the ability, choose to let another agent completely work, When the environment changes, agent that has the ability may leave the team, work like this also can't be well solved, this is why the team have a training course.

According to the research, agent with high knowledge amount is good for the output, how to increase the number of agents with high knowledge, which is deserved to de considered for managers. Managers carry out the corresponding activities to encourage everybody to learn, enhance the level of knowledge.

3) Establishing reasonable mechanism of commitment

Through the establishment of reasonable commitment mechanism, making the agent with high knowledge amount stay in team, the agents with low knowledge amount reduce free riding behavior, better regulate fusion between the agent with high knowledge amount and the agents with low knowledge amount.

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