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Knowonomics - The Economics of Knowledge Sharing

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KNOWONOMICS – THE ECONOMICS OF KNOWLEDGE SHARING

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Abstract

We propose an economic theory of knowledge sharing. The theory is grounded on game theory and experimental economics. This gives us a framework for analyzing knowledge sharing in different environments. The theory provides testable propositions about knowledge sharing. We used actual transaction data from a global knowledge management system to empirically test our hypotheses about free riding behavior. We additionally used an experimental environment to observe knowledge sharing behavior. The conducted experiments have been used to test our hypotheses about the free riding behavior and the conditional cooperation and reciprocity of knowledge sharing.

Keywords: Knowledge Sharing, Economics of Knowledge Management, Knowledge Management, Public-Good Games

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1 INTRODUCTION

In this paper we present an economic theory of knowledge sharing in the context of an open knowledge repository. To develop the theory we describe knowledge sharing as a public-good game. In the following, we shall show that knowledge sharing in an open knowledge repository can be viewed as a social dilemma (Cabrera & Cabrera 2002). We shall present an economic model for this knowledge dilemma: an n-person/one-period knowledge-sharing situation where each employee can decide how much time he wants to spend on knowledge sharing.

Such a situation has the characteristics of a public good game. Firstly, the shared knowledge can be accessed by everyone authorized to query the repository and be delivered for marginal costs. Secondly, the consumption of an asset by one person does not affect further consumption by other persons. Hence, the contribution of knowledge assets into an open repository without incentives can be viewed as a private (i.e. voluntary) contribution to a public good. The public-good theory predicts insufficient knowledge sharing, because each player only considers the individual benefits of contributing, but not how others would benefit from sharing. In public-good games, it has been observed that private contribution often leads to free riding and to an undersupply of the good (Samuelson 1954). In the context of an open-knowledge repository, we can call this a knowledge-sharing dilemma (Cabrera & Cabrera 2002). We shall apply the public-good theory (Bergstrom et al. 1986; Samuelson 1954) to the field of knowledge sharing.

2 MODEL

2.1 Assumptions

We make the following assumptions. There are n users of a shared knowledge repository. Each user i has a time budget of b_i hours. The user allocates the time to knowledge sharing activities s_i or other work x_i. In his time of knowledge sharing, the user enhances the knowledge base so that every user can benefit from it. There is no person-to-person knowledge sharing but all the knowledge transfers take place through a central knowledge repository.

The amount of useful knowledge K in the knowledge repository is a function of the time of knowledge sharing of each worker, i.e. $K = K(s_1, \dots, s_n)$. The useful knowledge increases with more knowledge sharing ($\partial K / \partial s_i > 0$), but there are diminishing marginal returns on knowledge sharing ($\partial^2 K / \partial s^2{}_i < 0$). We call $\partial K / \partial s_i$ the marginal knowledge externalization efficiency of employee *i*. The function K and the first derivative are sketched in Figure 1.

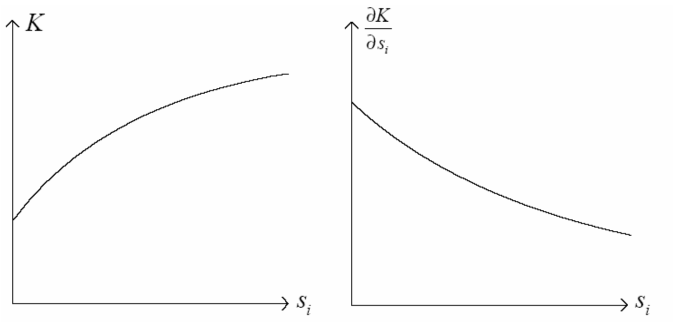


Figure 1. Amount of useful Knowledge in Repository (K) and Marginal Knowledge Externalization Efficiency ($\partial K / \partial s_i$) dependent upon Time for Knowledge Sharing (s_i)

We isolate two sources of the performance of the worker: the working time and the knowledge repository. The performance $P_i(x_i,K)$ of an employee *i* is therefore a function of the time the employee is working (x_i) and the shared knowledge in the knowledge repository (K). We assume normal properties of a production function that means: the more the employee works the better is the outcome ($\partial P / \partial x_i > 0$), but the marginal return is decreasing with higher work time ($\partial^2 P / \partial x^2{}_i < 0$). Also, the performance is dependent on the useful knowledge in the repository. We call the first derivative of the performance with respect to the useful knowledge in the repository ($\partial P / \partial K$) the *knowledge productivity* of employee *i*. Again we assume properties of a production function: The higher the amount of useful knowledge in the repository, the higher the performance of the employee ($\partial P / \partial K > 0$), but the marginal return of further knowledge is decreasing ($\partial^2 P / \partial K^2 < 0$).

We are assuming that nobody spends all the time on knowledge sharing without working and that the workers at least spend some time on knowledge sharing.

The utility function U_i of the worker *i* is equivalent to the income of the employee. The income of each worker is composed of two parts: A fixed base wage w_i and a variable component dependent on the individual performance. The performance *P* of each employee is fully visible to the management. The variable component is a φ fraction ($0 < \varphi < 1$) of his performance. φ and w_i are set by the company. We assume a one-period situation. The employees and the company are risk neutral. We therefore assume that the amount of salary is the only deciding factor for the employee:

$$U_i(x_i,K) = \varphi \, P_i(x_i,K) + w_i \quad . \qquad (1)$$

The company's objective function is the profit. It is calculated as the firm's fraction of the sum of all the output of each employee:

$$\pi_i(\varphi, w, x, s) = (1-\varphi) \quad P_j(x_j,K) + w_j \quad . \qquad (2)$$

2.2 Voluntary Knowledge Sharing

Proposition 1: Voluntary knowledge sharing is lower than the organizational desired optimum and the collective employee optimum (Pareto optimum).

Firstly, we analyze a distributed-decision-making situation in which the employees independently decide on their knowledge sharing level. The company offers the wages as described in Equation 1, i.e. the company decides on φ and w_i. In return the company gets the performance (output) P_i of each employee and the time for knowledge sharing. Every participant knows all parameters of the model and therefore can anticipate the behavior of others. The behavior is *ex post* visible.

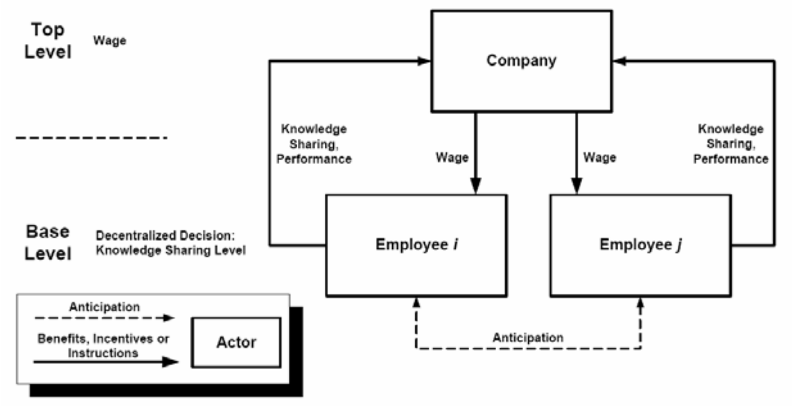


Figure 2. *Interrelations between Company and Employee Level in the Voluntary Knowledge Sharing Situation*

Figure 2 shows the interrelations between the company and the employee level. The figure displays the flow of benefits, incentives and instruction as well as the anticipation of actions (see Schneeweiss (2003), p. 17, for distributed-decision-making diagrams). In our model the level of the wage (φ and w_i) has no effect on the knowledge sharing level. Therefore, there is no anticipation arrow from the employees to the company. However, each employee anticipates the behavior of the other employees. The decision about the knowledge sharing level is done by the employees simultaneously.

Every employee tries to maximize his own performance by choosing how much he will work and how much knowledge he will share. So he will solve the maximization problem (Problem 1):

$$\max_{x_i, s_i} U_i = \max_{x_i, s_i} \varphi\, P_i(x_i, K) + w_i$$

s.t. $x_i + s_i = b_i$

$K = K(s_1, \dots, s_n)$

$x_i \geq 0$ (3)

$s_i \geq 0$ (4)

We have assumed that at least some knowledge sharing and work is happening, that means we have an inner solution, and that the equations (3) and (4) are not binding. The Lagrangian of the worker's problem (Problem 1) is then

$L = \varphi\ P_i(x_i,K) + w_i - \lambda\ (x_i + s_i - b_i) - \mu\ (K - K(s_1, \dots ,s_n))$.

We get the following optimality condition:

$$\underbrace{\frac{\partial P_i}{\partial K}\frac{\partial K}{\partial s_i}}_{\text{Marginal Individual Benefit of Sharing}} = \underbrace{\frac{\partial P_i}{\partial x_i}}_{\text{Marginal Benefit of Working}} \qquad (5)$$

Let $s^* = (s^*_1, , s^*_n)$ be the individual-optimal knowledge sharing level, that means the s_i that satisfies Equation 5. Then the knowledge stock is $K^* = K(s^*)$ and the working time is $x^* = (x^*_1, \dots, x^*_n) = (b_1 - s^*_1, \dots, b_n - s^*_n)$. In the individual optimum, the marginal benefit of working is equal to the marginal benefit of knowledge sharing. Shifting time to either knowledge sharing or working would only lower the individual utility.

2.3 Company Optimal Situation

In the company optimal situation we assume that the company can order the proper knowledge sharing time of each employee. This is a rather strong assumption. However, as a model variation or thought experiment we can thereby ensure a company optimal solution. Figure 3 shows the interrelation between the company and the employee level in this central control situation.

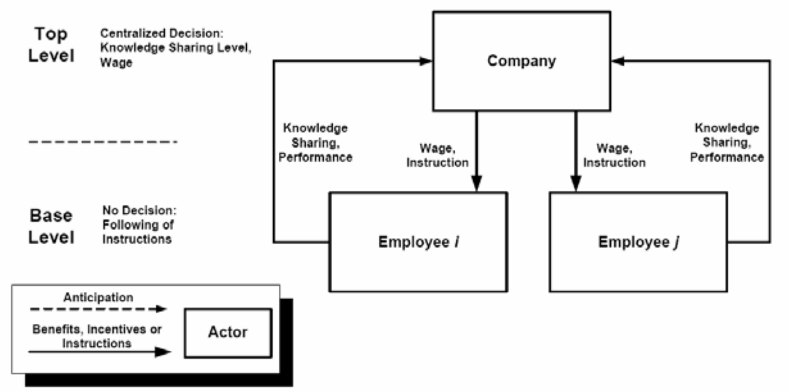


Figure 3. Interrelations between Company and Employee Level in the Company Optimal Situation

The company wants to maximize the profit. The optimum is defined by the solution of this maximization problem (Problem 2):

$$\max_{x_1,..,x_n,s_1,..,s_n} U_i = \max_{x_1,..,x_n,s_1,..,s_n} (1-\varphi)\sum_{j=1}^{n} P_j(x_j, K) + w_j$$

s.t. $x_j + s_j = b_j \quad \forall j$

$K = K(s_1, \ldots, s_n)$

$x_j \geq 0 \quad \forall j$

$s_j \geq 0 \quad \forall j$

We again only consider an inner solution. We get the following (inner) optimality condition for the company's solution:

$$\underbrace{\sum_j \frac{\partial P_j}{\partial K}\frac{\partial K}{\partial s_j}}_{\text{Marginal Collective Benefit of Sharing}} = \underbrace{\frac{\partial P_i}{\partial x_i}}_{\text{Marginal Benefit of Working}} \quad \forall i \qquad (6)$$

That means in the collective optimum the marginal benefit of working is equal to the marginal benefit of knowledge sharing for all workers. Let $s° = (s°_1, \ldots, s°_n)$ be the company-optimal knowledge sharing for the company, that means the s_i that satisfies Equation 6. Then the company-optimal knowledge stock is $K° = K(s°)$ and the company-optimal working time is $x° = (x°_1, \ldots, x°_n) = (b_1 - s°_1, \ldots, b_n - s°_n)$.

The increased productivity of the *other* workers is not considered in the individual optimization of the worker. The left hand side of Equation 6 is lower than the left hand side of 5, because we assumed $\partial P / \partial x_i > 0$ and $\partial^2 P / \partial x^2_i < 0$, x_i is higher in Equation 5 than in 6. Therefore, knowledge sharing in the individual optimum is too small from the company's perspective. Also, all employees could improve their situation in the company optimal situation.

Therefore, the switch from the individual to the company's optimum would also be a Pareto improvement for the employees; however, it is not an equilibrium and can therefore not be reached individually. We conclude that knowledge sharing in an open-knowledge repository is insufficient.

2.4 Conditional Cooperation

Fehr and Gächter (2000) have shown that many individuals in public-good experiments are conditionally cooperative, which means they are willing to cooperate if others cooperate as well, whereas they will stop the cooperation if others stop cooperating. This behavior can be observed, even if the participants know that they will not meet each other again. Therefore, *strategic reciprocity* (see Section 2.5) cannot be an explanation because it focuses on the self-interested benefits of cooperation in long-term interactions. The conditional cooperation motive in a way transforms the subjective game from a prisoner's dilemma into an assurance game. The *assurance game* (Kollock 1998) is similar to the prisoner's dilemma, but has two Nash-equilibrium strategies: both share their knowledge or both hoard their knowledge.

One thread of models explains conditional-cooperative behavior with *unfairness aversion* (Fehr 2002, Bolton 2000). A person is unfairness averse if he prefers an egalitarian payoff distribution or cares about the relative share of the payoff. He feels altruistic if another person's payoff is below an aspired equity level and he feels envy if it is above. Both situations will lower their utility. This theory is able to explain both positive and negative reactions to other people. They show that cooperative players "punish" (deduct payoff) uncooperative players even when it is costly for them to do so. Therefore, participants have a desire for equal contribution to a common knowledge pool and might react by withholding their own knowledge due to uncooperative behavior on the part of others.

Brandts and Schram (2001) present a *cooperative gain seeking* model in which part of the players will contribute if they believe that the total contribution will be high enough so that the payoffs will be higher than in a free-riding situation. Therefore, the expected cooperation of the others is critical to the behavior of the player. These expectations are formed and updated through past observed behavior.

These models can explain not only cooperative behavior in public-good games but also a spiteful reaction to previous uncooperative behavior.

Proposition 2: Conditional cooperation motives have a positive influence on knowledge sharing if there is a relatively high knowledge sharing level. If there are only a few employees who share their knowledge, it has a negative influence on knowledge sharing.

This knowledge-sharing motive would be consistent with the findings of Chua (2003): Chua elicited individual estimations of the payoff matrix in a knowledge-sharing situation. The resulting payoff matrix could be described as an assurance game.

Probst et al. (1997) recognized that a lot of knowledge management solutions suffer from a downward spiral of activity. Conditional Cooperation can explain this downward spiral, because of expectation update and unfairness aversion.

This motive would result in a downward spiral in knowledge sharing if the knowledge sharing starts at a relatively low level. The downward spiral emerges from an update of the expectations of the other contribution rates. We shall test if the knowledge sharing level has indeed a negative trend in Hypothesis 2.

2.5 Strategic Reciprocity

Davenport and Prusak (1998) suggest that employees are motivated to contribute knowledge because they expect to receive useful knowledge in return in the future. How can this be explained from a game-theoretic view?

Repetition of a game can lead to strategic cooperation. In a repeated prisoner's dilemma game, cooperation (i.e. knowledge sharing) can be an equilibrium. In this case, the participants will play the prisoner's dilemma game against each other several times. Thus the players not only try to optimize the outcome of the current round but of all rounds. They will anticipate that the current uncooperative behavior will trigger uncooperative behavior of others in the next round. So it is possible that all players cooperate in expectation of future benefits and fear of a possible triggered strategic punishment. In contrast to conditional cooperative motives, all players are only self interested, only care for their own payoff, and do not care about their relative share or how equally the burden of knowledge sharing is divided.

The Folk Theorem makes some statements about equilibria in infinite repeated prisoner's dilemma games (Fudenberg 1986). If the players are sufficiently patient—meaning they calculate with an internal interest rate that is sufficiently low—all *individual* rational solutions can be realized as a collective solution (Fudenberg 1986).

The power of reciprocal strategies was also shown by Axelrod (1981). He invited a large number of game theorists to a computer tournament of repeated two-person prisoner's dilemma games. A cooperative reciprocal strategy called „Tit-for-Tat“ from the game theorist Rapoport was the most successful one. Tit-for-Tat cooperates on the first move and then does whatever the other player did in the previous move. So if the opponent plays uncooperatively in the previous move, Tit-for-Tat „punishes“ the other with reciprocal uncooperativeness. Axelrod identified three prerequisites for the appearance of cooperation: (1) there are frequent and durable encounters, (2) the actors are identifiable and (3) there is sufficient information about the past actions of the actors.

The Folk Theorem as well as Axelrod's experiments show that long-term orientation, or—as Axelrod says—the „unlimited shadow of the future,“ makes it more likely that cooperation might occur in the future. Also, a previous positive experience with a certain partner in the past will increase the probability of future cooperation.

In public-good experiments, it has been observed that the player contributes more the more others contribute (Bardsley 2005, Weimann 1994). This can be explained by reciprocity (Bardsley 2005). Therefore, the generalization from two persons to many persons is legitimate.

It has also been discovered that the contributions in public-good experiments decline and reach their minimum in the final round (Ledyard 1995, Weimann 1994).

Proposition 3: Strategic reciprocity motives have a positive influence on knowledge sharing if there is a relatively high knowledge sharing level. If there are only a few who share their knowledge, it has a negative influence on knowledge sharing.

We have assumed that knowledge sharing in an open repository has a similar structure to a prisoner's dilemma. In repeated prisoner's dilemma experiments a tit-for-tat strategy can be strategically optimal. With a tit-for-tat strategy we would expect cooperation if all others also cooperate. However, if others do not cooperate, we would expect an ever increasing „punishment“ of the defectors, ending in mutual hoarding. Therefore, we expect an influence of strategic reciprocity on knowledge sharing and a corresponding behavior.

Also in public-good situations, it has been observed that the player contributes more the more the others contribute (Bardsley 2005, Weimann 1994) and that average contribution spirals downwards (Ledyard 1995,Weimann 1994). A similar behavior is expected in the knowledge sharing situation with an open repository.

Wasko and Faraj (2000) found that the participants of communities of practices help each other because of reciprocity—they anticipate valuable knowledge in return—which would support our Proposition 3.

There are situations where only one motive—strategic reciprocity or conditional cooperation—can explain cooperation. For example, in infrequent interactions strategic reciprocity is impossible and only conditional cooperation can work.

Strategic reciprocity as well as conditional cooperation has the same consequences for knowledge sharing: sharing if the others share, hoarding if the others hoard. We would also expect a downward trend in knowledge sharing and we test this in Hypothesis 2. In the empirical test we have not distinguished between a strategic reciprocity and a conditional cooperation component of the downward trend.

3 EMPIRICAL TEST

We use two different data sets to test our propositions. Firstly, it is the actual knowledge sharing behavior in a large knowledge management system. Secondly, it is the experimental behavior in a business simulation.

3.1 Field Data

We investigate the knowledge sharing behavior as it is recorded in the log of a multinational knowledge management system.

Data. We shall use actual transaction data from a global knowledge management system. This system, from an international company, has 17,944 registered users in 59 countries. The knowledge-sharing activities are recorded over a period of two years.

Results. Of the registered users, 4,316 actively published something by uploading documents, asking or answering questions or rating other contributions. This is only 24 % of all users. However, this counts also asking questions or rating of answers or documents. If we look at the number of documents published the free riding behavior is more severe.

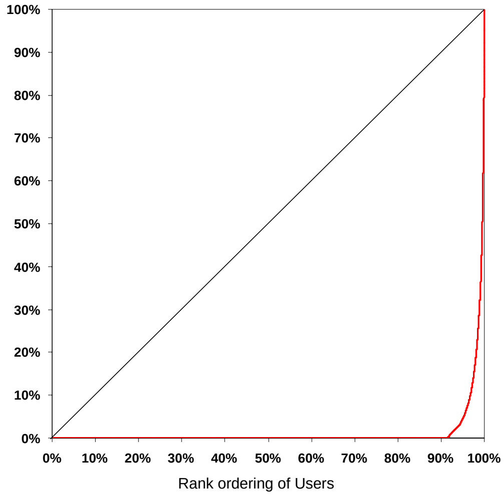


Figure 4. Cumulated Documents of ranked users

Figure 4 sketches the cumulated shared documents of the users. The users are rank ordered by the number of published documents. The data shows uneven publishing activity among the users. We see that over 90 % of the registered users have not published a document. 80 % of all documents come from less than 5% of the users. This may support our Proposition 1 which predicts high free riding behavior. However, this data is not sufficient to answer the question, if this situation is collaborative optimal or not. We do not know if the 90 % of the users that have not shared knowledge have valuable knowledge for the company.

Therefore we constructed an experimental setting where we could exactly determine the collaborative and Pareto optimal solution. Then we compare the actual behavior in this experimental setting with our Proposition 1.

3.2 Experimental Data

To evaluate knowledge sharing behavior, we experimentally test the hypothesis that knowledge sharing leads to an insufficient contribution of knowledge in an open knowledge repository. For this purpose, we have used the *Data Trader Game* (Müller et al. 2005). This is a computer-assisted game for testing different market mechanisms for knowledge assets and their effects on knowledge transfer. We used this game environment for testing the knowledge sharing behavior. The data-trader game consists of two elements: a business game and a knowledge sharing phase. In the business game, the players must solve a decision problem with uncertain information, as efficiently as possible. They may improve their decision by acquiring knowledge assets from others.

3.2.1 Experimental Environment

The Data Trader Game is a non-cooperative game—i.e. communication among the participants of the game is strictly prohibited, and the creation of obligatory agreements outside the market is not allowed either. The game consists of two parts: a business game and a knowledge sharing phase. The business game gives the player the motive for knowledge sharing because the more knowledge assets the player has the better he can solve the decisions in the business game. The knowledge sharing phase allows the player to transfer knowledge assets to other players.

Description of the Game Environment. The players act as managers from different countries. They all produce a different kind of product, which they want to sell to the other players' countries. For this reason they need to know the demand for their product in each foreign country. The other players own this information. However, each player knows the demand of all products including his own product in his own country. There is no competition between the players because the products from the different countries' markets do not compete with each other. Refer to Müller et al. (2005) for a detailed description of the game environment.

Experimental Realization. The motivation of test persons is a critical aspect in experimental economic research.. For this purpose the participants usually receive a financial reimbursement, to eliminate the risk of bias caused by individual preferences in non-monetary reward systems (Wendel 1996). The announced prize for the winner of the game was 40 Euros. Given a duration of the game of approximately 45 minutes with 8 players this means that the expected reward per hour was approximately 6.66 Euro. This is about the wage level of a student job. Therefore, the incentives are relevant for the players.

The software of this computer supported experiment is web-based. However, all experiments were conducted under laboratory conditions. We conducted two experiments: one in Berlin and one in Magdeburg. Within each experiment there were 24 rounds to play. It was possible to recruit 16 students as test persons for the two experiments. The participants were students from the Freie Universität Berlin, and from the Otto-von-Guericke Universität, Magdeburg. Although the participants were students, the transferability of our reasoning is warranted according to Davis and Holt (1993).

3.2.2 Experimental Results

The first two rounds of the game were not taken into account for analysis due to inertia effects, but were considered as test rounds (Seifert 2003). However, the test persons were not aware of this situation (Seifert 2003).

Measures. The measured variable is the *transaction ratio*. This is the ratio between the actually executed knowledge sharing and the amount of possible knowledge sharing.

Hypotheses. In Proposition 1 we predicted a high free riding proportion among the users and a knowledge sharing ratio less than the companies optimum. This leads to Hypotheses 1.

Hypothesis 1: The majority of the participants is free riding with respect to knowledge sharing (transaction ratio < 0.5).

Proposition 2 and 3 state that the conditional cooperation motive and the strategic reciprocity motive have a positive influence on knowledge sharing if there is a relatively high knowledge sharing level. If there are only a few participants who share their knowledge, they have a negative influence on knowledge sharing. In this case, this would result in a downward spiral in knowledge sharing.

Hypothesis 2: If the majority will free ride there is a negative downward trend for knowledge sharing.

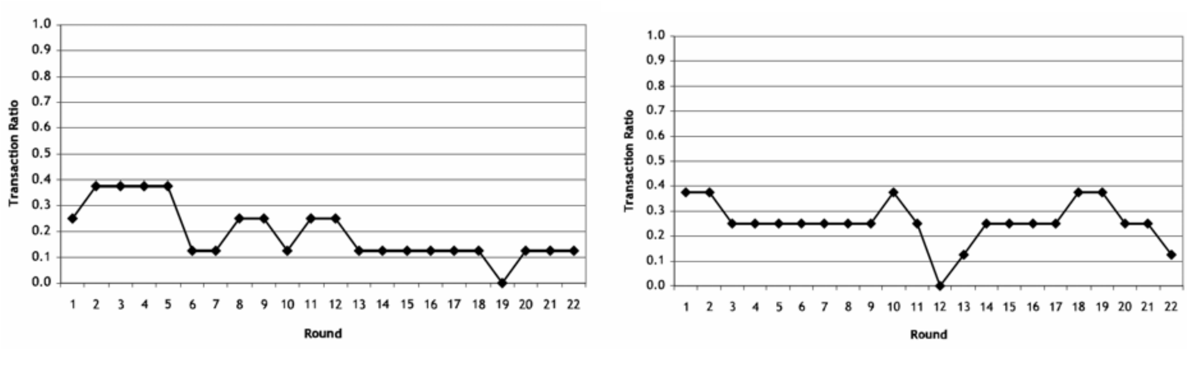
Results. We can see from the descriptive statistics in Table 1 that in both experiments the average knowledge sharing level is much less than the collective optima, which would be complete sharing. On average 75.2 % of the participants in Magdeburg and 81.7 % of the participants in Berlin are free riding. In the last round of both experiments (see Figures 5 and 6) only one participant (12.5 %) shares his knowledge.

Location	N	Mean	SD
Magdeburg	22	0.248	0.093
Berlin	22	0.183	0.112

Table 1. Descriptive Statistics of Knowledge-Sharing.

We use the t-test to examine whether the difference between the average knowledge sharing in an experiment and the threshold 0.5 is significant or not. For this test, we have to assume the normal distribution of the transactions.

We test the hypothesis of normal distribution of the transaction ratio of the two knowledge-transfer mechanisms with the Kolmogorov-Smirnov Test (KS Test). At a significance level of $\alpha = 0.05$, the hypothesis of normal distribution cannot be rejected. However, both public-good samples are not very well described by the normal distribution (Magdeburg: KS Statistics = 1.23, p = 0.097; Berlin: KS Statistics = 1.35, p = 0.053).



Berlin **Magdeburg**

Figure 5. Trend of Knowledge Sharing in Berlin and Magdeburg

The one-sided t-test shows that in both experiments the transaction ratio is significantly lower than 0.5 (Berlin: t = -13.30, df = 21, p = 0.000; Magdeburg: t = -12.77, df = 21, p = 0.000). Therefore, we conclude that our Hypothesis 1—that more than half of the participants are free riding—is well supported. Consequently knowledge sharing is also not collectively optimal. The public-good situation does not reach the Pareto Optimum, which would be mutual knowledge sharing, but triggers a high proportion of free riding.

The Figures 5 shows the trends of knowledge sharing in both experiments. From Hypothesis 1 we already know that the majority is free riding. Therefore, the question is whether there is a downward trend of knowledge sharing.

					Paired Differences				
Location	Rounds	N	Mean	SD	Mean	SD	t	df	p
Berlin	1-11	11	0.261	0.104	0.136	0.118	3.83	10	0.003
	12 - 22	11	0.125	0.056					
Magdeburg	1 - 11	11	0.284	0.058	0.0568	0.155	1.24	10	0.242
	12 - 22	11	0.227	0.109					

Table 2. Paired-Samples t-Test Statistics.

We use a paired t-test to check if there is a significant difference between the first half of the rounds (rounds 1 to 11) and the second half (rounds 12 to 22). For this purpose, we have to assume the normal distribution of the transactions. We have already checked both samples for normal distribution with the Kolmogorov-Smirnov Test. The results of the paired t-test are shown in Table 2. The paired t-test shows a significant difference between the first and the second half of the rounds for the public-good experiment in Berlin (p = 0.003). In the public-good experiment in Magdeburg there is also a decrease in the average transfer ratio; however, the difference is not significant (p = 0.242). Therefore, we find only partially supporting evidence for Hypothesis 2.

4 RELATED WORK

There are some papers that are related to our theory. Sundaresan and Zhang (2004) presented an economic model for the impact of IT investments and incentives on knowledge transfer. The model differs from our mathematical model because their model does not represent a public-good situation. Therefore, it is not possible in their case to transfer the results of public-good experiments to knowledge sharing, as we did. Cabrera and Cabrera (2002) coined the term „knowledge-sharing dilemma". They predicted a positive influence of reward, communication, and efficacy on knowledge sharing. However, they did not present a mathematical model of knowledge sharing, nor did they test their predictions empirically.

Chua (2003) elicited individual estimations of their own payoff matrix in a knowledge-sharing situation. The resulting payoff matrix could be described as an assurance game. Wasko and Faraj (2000) conducted a seven-week longitudinal study of three communities of practice. They found that the participants help each other because of generalized reciprocity, pro-social behavior, and community interest. Both papers would support our Propositions 2 and 3.

Connolly et al. (1992) experimentally analyze the behavior dynamics in a discretionary database. Rafaeli and Raban (2003) analyze how the subjective value of information is influenced by the ownership. However, both have not developed a detailed mathematical model of knowledge sharing as we did.

Constant et al. (1994) analyzed the effect of self interest and the belief of organizational ownership on information sharing in a vignette-based experiment. Vignette-based experiments ask the participants to imagine a situation, and then ask them how they would behave. They discovered a negative influence of self interest on information sharing. Also, they found out that the belief of organizational ownership of information has a positive influence on information sharing. They also found a positive influence of work experience on information sharing. Ford and Staples (2005) analyzed the effect of perceived value of knowledge on the intention to share the knowledge. They found a positive relationship between perceived value of knowledge and the intention to share. However, this relationship is also dependent on if the sharing is to distant colleagues or to close colleagues. Hall (2001) considered strategies for making intranet portals more „input-friendly“. She suggested explicit and soft rewards like economic rewards, career advancements, enhanced reputation, and personal satisfaction.

5 CONCLUSION

In this paper we have presented a novel economic theory of knowledge sharing. The theory models knowledge sharing as a public-good game. It is grounded on well-established game theory and experimental economics. The theory provides testable propositions about the free riding behavior and the downward trend in knowledge sharing situations. We present a field study of the knowledge-sharing activities in a real knowledge management system. This kind of study produces results that are more realistic than an experimental study. The hypotheses about free riding behavior are tested against real knowledge-sharing behavior observed in a multinational knowledge management system. We found support of high free riding. For the further detailed analysis of free riding and downward trends in knowledge sharing we used an experimental environment, called the *Data Trader Game*. This computer-assisted game was used for the real-life experiments of knowledge sharing. We found also support for free riding behavior and partial support for a general downward trend in knowledge sharing.

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