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& Alfredo Virgillito**

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in hospitals**

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Uwe Wilkesmann & Maximiliane Wilkesmann & Alfredo Virgillito

## Requirements for knowledge transfer in hospitals How can knowledge transfer be supported in hospitals?

### **Abstract**

Much literature exists about knowledge transfer in general, but very little deals with the link between the micro-perspective of learning in organizations and structural, cultural, and cognitive constraints caused by the organization - particularly with regard to prerequisites of knowledge-transfer within groups in knowledge-based working processes. The main question of this article is: How can knowledge transfer be supported? We exemplify this theoretical question with the help of an investigation we accomplished in German hospitals. The aim of our article is to fill two detected gaps in the existing literature: First we analyze knowledge transfer as a double-sided process of providing and obtaining knowledge. Second we link structural, cultural, and cognitive perspectives together and give a theoretical underpinning of knowledge transfer. We will give empirical evidence from our survey which supports five of our six hypotheses: Possibilities of interaction, organizational culture, and intrinsic motivation are relevant requirements for knowledge transfer. Only team size is not a significant factor for transferring knowledge in hospitals. In detail we show in this article that different factors support providing or obtaining knowledge.

**Keywords:** knowledge transfer, knowledge management, collective action, organizational culture

### **I. Introduction<sup>1</sup>**

Modern organizations can not produce goods or services without knowledge. Therefore knowledge must be transferred between employees as owners of the knowledge. In this article we analyse a specific type of organization, hospitals. Our main question asks how knowledge transfer can be supported in hospitals. Much literature exists about knowledge transfer, but there are two gaps:

1. Knowledge transfer is analysed only as a process in which Ego provides knowledge to Alter. But no literature reflects the reverse process of obtaining knowledge. We fill the

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gap by taking both sides of knowledge transfer into account: providing and obtaining knowledge.

2. Many studies about knowledge transfer exist concerning the structural factors, but the cognitive and cultural factors of learning in organizations via knowledge transfer has received less attention, and virtually no research has examined the integrative perspective. To investigate knowledge transfer in this kind of context we will link structural, cultural, and cognitive perspectives together.

Argote and Ophir (2002) summarize that “research on knowledge transfer is more balanced across the components of organizations than on knowledge creation or retention. We see this as a positive feature and encourage more research on how all of the components of organizations affect knowledge transfer” (Argote and Ophir 2002: 195). Plenty of research has been done on that topic. The aim of our study is to fill the gap Argote and Ophir identified: We will show the structural, cultural, and cognitive constraints under which actors change their choices from a free rider position to a cooperative position, and transfer their knowledge. Therefore, we will discuss the behaviour of organizational actors as behaviour and choices under constraints. From the individual point of view, knowledge transfer is not the most favoured choice, but under structural, cultural, and cognitive constraints, knowledge transfer becomes the most preferred choice.

Before answering the main question knowledge transfer must be defined. Then we review prerequisites of knowledge transfer that have been identified by previous research. Next, we analyze knowledge transfer as collective action. With this theoretical underpinning, we develop hypotheses regarding requirements for knowledge transfer. We then evaluate these hypotheses using empirical evidence from our research project concerning prerequisites for knowledge transfer between and within different occupational groups in hierarchical organizations. Our sample contains two occupational groups: nursing staff and doctors taken from 11 hospitals in Germany. The survey will take into account the difference of social status between doctors and nurses in Germany, which is higher than in other countries. The aim of the study is to differentiate the prerequisites for knowledge transfer, as a double-sided process of providing and obtaining knowledge, for two occupational groups, nursing staff and doctors.

## **II. What is knowledge transfer?**

First we define the terms ‘knowledge’ and ‘transfer’. In the literature dealing with knowledge management (e.g. Willke 1998) there exists a general distinction between data (the basic material of knowledge transfer), information (the data is placed in a reasonable context), and

knowledge (information is perceived in a second relation of sense, i.e. in a historical or developmental process). From this point of view the term ‘knowledge transfer’ is easily mistaken: Only data or information can be transferred. It is not a transfer such as when someone transfers a material good. The receiver must build this information in his or her own context of his or her personal knowledge and through this process create new knowledge. If this is taken into account, knowledge transfer signifies the creation of new knowledge through exchange of information. Normally in the literature the term “knowledge transfer” is used, even though information transfer is meant. Therefore we use the term knowledge transfer too, but in the sense of “information transfer”.

When we discuss knowledge transfer, we define it according to Nonaka and Takeuchi (1995). They understand knowledge transfer as a transfer of tacit or explicit knowledge in interaction between individuals (for groups cf. Hansen 1999). Nonaka and Takeuchi (1995) distinguish between intra- and interpersonal aspects of knowledge transfer. Interpersonal aspects are socialization and combination. Intrapersonal aspects such as internalization and externalization are not relevant for our investigation, so we focus on interpersonal aspects. Socialization is defined as the process that converts tacit knowledge from one person into tacit knowledge of another person. Combination is defined as the process of providing explicit knowledge for explicit knowledge. Explicit knowledge is cognitive, can be expressed in formal speech, and exchanged in the form of data. Tacit knowledge includes individual, context related, analogous, and practice related knowledge. Tacit knowledge can only be transferred in face-to-face situations. In our study we investigate cases of vocational knowledge transfer in which the transfer is linked to human interaction that is embedded in organizational contexts.

### **III. Detected prerequisites of knowledge transfer**

In recent years many assumptions about knowledge transfer have appeared in literature. Two points of view can be distinguished: barriers and supports of knowledge transfer.

There are several barriers of knowledge transfer as an exchange of information: “Such exchange may be less effective when the source and the recipient have a difficult relationship, the source lacks motivation to share, the source is not perceived as reliable, the recipient lacks motivation to share, lacks absorptive capacity, or lacks the ability to discard old practices and sustain new ones, and finally, when organizational context does not provide incentive or support for the exchange” (Szulanski et al. 2002: 9).

Knowledge transfer can be supported by individual or organizational factors. An individual factor is personnel movement (Gruenfeld et al. 2000, Almeida and Kogut 1999), when mem-

bers move from one group to another it is possible that they transfer tacit as well as explicit knowledge (Berry and Broadbrent 1987). Not only personal but also organizational characteristics are important for knowledge transfer (Cohen and Levinthal 1990; Szulanski 1996, 2000; Szulanski et al. 2002). Greve (2005), for example, assumes that knowledge transfer belongs to the susceptibility of the destination of the organizational unit, infectiousness of the source in the organizational unit, and the social proximity of the social structure between the origin and destination. In this regard social networks especially are important: all-channel networks lead to the highest performance of knowledge transfer (Shaw 1954, 1964). Hansen (1999) combines network theory and the notion of complex knowledge. Weak ties between organizational units help a team searching for useful knowledge in other organizational units but impede transferring complex knowledge. Knowledge transfer is greater when direct social contact exists (Baum and Berta 1999). Knowledge that is embedded in routines is easier to transfer than knowledge that is not codified (Argote and Darr 2000) and when the transfer is embedded in experts' work contexts (Hsiao et al. 2006). Knowledge transfer by routines must balance leveraging current knowledge with developing new knowledge (Collinson and Wilson 2006).

As above-mentioned our study fills two gaps in the literature: the lack of analysing knowledge transfer as a mutual process of providing and obtaining knowledge and the integrative perspective of structural, cultural, and cognitive constraints which control knowledge transfer. However first we must develop a theoretical underpinning for knowledge transfer in order to generate hypotheses, especially those factor in support for knowledge transfers in organizations.

#### **IV. Knowledge transfer as part of knowledge management and collective action**

In the literature three widespread theoretical underpinnings of knowledge transfer are discussed. The typology of Schultze and Stabell (2004), Antonelli's (2005) differentiation of three approaches for knowledge management, and Cabrera and Cabrera (2002; cp. Kollock and Smith 1996) definition of knowledge sharing as a social dilemma situation. Whereas we subsume sharing under transfer, because sharing is not possible without transfer. None of these concepts provides a usable theoretical underpinning of knowledge transfer: The first two are theoretical frameworks characterizing existing theories. The last one only explains providing knowledge. Knowledge transfer is a double-sided process, made up of providing *and obtaining* knowledge. From our point of view, knowledge transfer is a collective action that in-

volves the problem of free riding. Collective action is a double-sided process and takes the strategy of all actors into account. Only if most employees take part in this process, knowledge transfer is useful. Thus, we follow in some sense the third differentiation by Antonelli (2005; knowledge as a collective activity) but with the addition of technical possibilities to transfer knowledge and Cabrera's and Cabrera's definition of knowledge transfer as a social dilemma situation. We will define knowledge transfer as a collective action in the sense of Olson (1965). The requirements of knowledge transfer are best explained with the help of this approach. The approach is used as a heuristic device, rather than as a description of real situations. In the 'real world' many requirements are implemented to overcome the free riding situation. With the help of this approach, requirements and prerequisites can be explained in-depth. On the one hand, knowledge transfer is a collective activity, because only a group of people can share something. On the other hand, transfer knowledge cannot be taken for granted, because a person will fear losing something (e.g. power, working time). This approach also includes a perspective which is lacking in all other literature: knowledge transfer must be differentiated into providing knowledge and obtaining knowledge.

We will now examine a person in a knowledge transferring situation and his or her choices.

## V. Dilemmas of collective action in hospitals

Why should Ego provide knowledge to his or her colleagues? He has to, because he has to produce a common good, the health of the patient. The health of the patient is a private good, both for the patient and the hospital. Therefore everyone else maybe excluded. However the production of this product is non-rival, which means it is only possible as a joint production process<sup>2</sup>. Hechter (1987) defines a private good, which can only be produced in collective production processes, as joint goods, or "...*excludable jointly produced* goods – goods whose attainment involves the cooperation of at least two (but usually far more) individual producers" (Hechter 1987: 10). For the production of this good, collaboration among nursing staff, among doctors, and between these two groups is necessary. Collaboration in this context means the transfer of knowledge. From the employee's point of view knowledge is power. If I provide all my information to other people, I will lose power in relevant bargaining situations. Why should I provide my knowledge to other people? Knowledge is my power-resource. I thus have no interest in transferring my knowledge. I expect rewards for my willingness to share my knowledge. In addition, there are costs in the form of time etc. In this situation each

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<sup>2</sup> The characteristics of the good "health of a patient" fits not in the typology of public or club goods (Cornes and Sandler 1996), it is "only" a joint good that means a common produced good.

employee has four different choice situations depending on the number of cooperating colleagues (Wilkesmann and Blutner 2007):

In the first situation Ego knows that the joint production process will work without his contribution, because there are enough other employees who will contribute to the production. The patient will recover without knowledge provided by Ego, as a doctor, for the diagnosis, or by Ego as a nurse for the nursing process. In this case, Ego will choose the free rider position, because he can save costs (i.e. time, if he does not care about the patient).

In the second situation Ego knows that the joint good will not be produced, because too few employees will participate. Ego will not collaborate, because his contribution is not necessary: With or without his or her contribution, in any case, it is clear that the goal of the joint production will not be reached. In this situation, Ego can save costs if he does not participate. The patient will not recover, because no one is interested in this case and no one will commit to the knowledge transfer for the diagnosis. Ego calculates contribution as waste of time.

In the third situation Ego does not know if the joint production will work, because only some employees will contribute. The employee will choose the defection strategy, because he will save costs in this insecure situation.

In the fourth situation Ego recognizes that exactly one contribution for the joint good is missing. Ego's knowledge (or the knowledge of another employee) is necessary for the achievement of the objectives. Ego will provide his knowledge, if he recognizes that exactly his knowledge is missing for the achievement of success. In this case the cost of his contribution is lower than the expected benefit.

The dilemma in this situation is that the individual calculation does not fit with the collective calculation: The individual calculation is to choose the free rider position, while the collective perspective is to overcome the defection strategy. If all the employees are cooperating then at the level of the individual, cooperation is the dominant strategy. Nevertheless, if the joint good must be produced (the health of the patient), it is necessary to overcome the free rider position. Especially in the third situation, it is necessary to overcome the free rider position, if the hospital will produce the joint good. Now we must examine whether there are some differences by changing the perspective: Does Ego have the same calculation for obtaining knowledge?

In the first situation, when enough actors contribute, Ego will expect that he can obtain knowledge from colleagues, because contributing means transferring knowledge. Therefore, he is interested in maintaining situations in which the free rider position of his or her colleagues is overcome: Only when they are not free riding, can he or she obtain knowledge.



In the second situation Ego cannot expect that he will obtain knowledge, because of the lack of contribution from all of his or her colleagues. He or she will not have any illusions about the knowledge transfer.

In the third situation only some of Ego's colleagues cooperate. Ego will expect to gain some knowledge from others. If he wants to obtain more knowledge, he is interested in overcoming the free rider position of his or her colleagues in this situation.

In the fourth situation Ego knows that all others will cooperate without him or her. Thus, he expects to obtain a lot of knowledge.

For both situations, providing and obtaining knowledge, the overcoming of the free rider position is necessary, because from the individual point of view knowledge transfer will not be accomplished. In this article we choose a theoretical underpinning for knowledge transfer that explains the situation mentioned above and in turn explains the overcoming of the free rider position. This requirement is fulfilled by the well known approach of Olson's (1965) logic of collective action as well as the ongoing discussion and expansion of this approach. Olson's solution for overcoming the free rider position is twofold:

1. In small groups the free rider can be punished by a group member, who has to be rewarded for that punishment by all other group members. This situation describes the second-order-free-rider problem (Coleman 1990), which is easier to overcome than the first order problem.
2. In large groups selective incentives (i.e. money, social status) prevent free riding.

The second solution is not applicable to the knowledge transfer problem, because knowledge transfer cannot be monitored and rewarded. To sum up, there are at least three problems (cf. Weibel 2004):

1. The main problem is that the common development of new knowledge and the transfer of knowledge are not observable by a third party. If a third actor can not monitor the process, he will not be willing to use selective incentives to reward new knowledge development and to reward the transfer of knowledge.
2. Another problem concerns multi-tasking. When work tasks are complex, all employees must fulfill several tasks. Each selective incentive rewards only one task. A rational actor will then only accomplish that single task, all other tasks will be neglected (Frey and Osterloh 2002: 19). On the other hand, it is not feasible to provide selective incentives for every task. It would become too complex and implies that every action must be rewarded.

3. These problems can produce an expectation cycle (cf. Frey and Osterloh 2002). If I receive a reward of  $Z$  this year for knowledge transfer, I will expect a reward of  $Z + X$  next year.

Subsequently we will discuss the first solution of the small group situation and present two other solutions, from the ongoing discussion of this approach, which can overcome the dilemma of knowledge transfer as collective action. All solutions have in common, that the choices of the actors are bounded through constraints. Constraints could be institutions (Greenwood and Hinings 1996) like rules and norms (Nee 1998) or cognitive schemata (Zucker 1977; Roberts and Greenwood 1997; Scott 2001). Institutions are constraints for the behaviour and choices of organizational actors. Therefore institutions coordinate action of organizational participants. Wezel and Saka-Helhout (2006) support this thesis with data from Major League Baseball in the period from 1920 to 2001. They are reporting about institutions in the organizational field. We will apply this assumption to the field of intra-organizational institutions. From this point of view, "Institutions, defined as webs of interrelated rules and norms that govern social relationships, compromise the formal and informal social constraints that shape the choice-set of actors. Conceived as such, institutions reduce uncertainty in human relations. They specify the limits of legitimate action in the way that the rules of a game specify the structure within which players are free to pursue their strategic moves using pieces that have specific roles and status positions" (Nee 1998: 8).

## **VI. Overcoming the dilemma**

In alignment with Scott (2001) we will distinguish between three constraints: (1) structural constraints, (2) cultural constraints, and (3) cognitive constraints. We will assume that these constraints will affect the choices against free riding for both transfer relations: providing and obtaining knowledge. The double-sided knowledge transfer process is not defined as an exchange process. We do not focus on reciprocity; therefore we do not stress the following perspective: Only if Ego provides Alter some information, will Alter return some information. We stress Ego's point of view: He or she has to transform Alter's information into knowledge, thus only Ego can decide if Alter's information is relevant for his or her knowledge. The following theoretical underpinning asks, under which constraints does Ego perceive that he or she will provide or obtain more or less knowledge. Therefore the hypotheses are defined for both sides of knowledge transfer.

**(1) structural constraints:**

First of all, knowledge transfer requires opportunities where people can meet. Without such possibilities of interaction, knowledge transfer can not take place. Knowledge transfer needs freedom to develop interaction - without possibilities and leeway for interaction, transfer is not possible. Some companies create special events or places where employees can meet and interact, like coffee corners, social events, or meeting points. One big barrier is shortage of time – with a tight schedule no one will transfer knowledge, because it takes some extra time. This leads to the first hypothesis.

(H1) The more possibilities that exist for interaction within organizations, the more knowledge can be shared.

All the possibilities mentioned above are face-to-face interactions. If employees are not in the same place at the same time, knowledge transfer must be supported by computer-mediated interaction. There are several IT-tools on the market that support knowledge transfer within organizations. In this sense, computer-mediated communication increases the possibility of interaction, because a new channel for interaction is added. With the support of this channel only explicit knowledge can be transferred. Therefore hypothesis two states:

(H2) The more computer-mediated communication is available, the easier knowledge transfer is.

The most important factor for managing knowledge transfer is the size of the network or group (Olson 1965). If the size of the network increases, some employees can resort to an individual calculation of the kind mentioned above, and free riding will occur. In the case of a small network this dilemma is easy to overcome, because every peer can monitor, evaluate and assess the work of other peers. But monitoring and evaluating are related to a group size where face-to-face interaction between all peers is possible. In this case peers can punish defection. Punishing peers generates costs, because it is awkward to speak with a colleague about his or her failures. Most people will feel psychologically stressed. The free riding dilemma is raised to a second level: No one will punish peers, and therefore the free rider position at the second level is chosen (Coleman 1990). Overcoming the second-order-free-rider-problem is easier, because it produces fewer costs than overcoming the first-order-free-rider problem. Only one sanctioner is needed to punish the defector. All others can reward the sanctioner. This is cheaper than if all members were to punish the defector (Coleman 1990). With group size the cost of monitoring increases (Hechter 1987). If monitoring is too costly, the problem of cooperation emerges. Peers can choose the free rider position when they perceive that their action cannot be monitored by others (Heckathorn 1996).

(H3) The smaller the network or team is, the better knowledge can be transferred.

**(2) normative-cultural constraints:** Organizations do not only persist through reward and punishment, but also through organizational culture, which is an important aspect. The debate in the 1980's about organizational culture (e.g. Allaire and Firsirotu 1984) gains new importance in the context of knowledge transfer. If an actor commits to an organizational culture which involves norms for cooperation and for helping each other, knowledge transfer is more probable than in hierarchical cultures in which colleagues compete to win superiors' favour. Therefore culture is a relevant constraint for everyone's choices: If I commit to a norm of cooperation, free riding will be out of range of my options.

One of the important factors for knowledge transfer is a high care atmosphere (Zárraga and Bonache 2005). Free riding can be overcome by a special culture of this type. In the literature this topic is often emphasized but very seldom linked to empirical evidence. Ouchi (1979: 838) for example defines in his theoretical framework culture as a constraint for social control. Therefore social agreements, shared values and beliefs are prerequisites for successful knowledge transfer. Zárraga and Bonache (2005: 665) define a high care atmosphere as one with mutual trust, active empathy, lenience in judgment, courage, and access to help. Ngoc (2005) also emphasizes this culture for knowledge transfer. Both last mentioned publications are among the few examples of empirical surveys about this topic. The items used in this survey are partly the same items Denison and Mishra (1995) primarily used in their survey. Fey and Denison (2000) analyse the correlation between organization culture and efficiency. Culture is defined with the factors involvement, consistency, adaptability, and mission. The involvement of the organizational culture leads to the following effect: "Executives, managers, and employees are committed to their work and feel that they own a piece of the organization. People at all levels felt that they have at least some input into decisions that will affect their work and that their work is directly connected to the goals of the organization" (Fey and Denison 2000: 7). Consistency is important, because "(B)behavior is rooted in a set of core values, and leaders and followers are skilled at reaching agreement even when there are diverse points of view. This type of consistency, is a powerful source of stability and internal integration that results from a common mindset and a high degree of conformity" (Fey and Denison 2000: 7). Adaptability is the next factor of culture according to Fey and Denison: "Adaptable organizations are driven by their customers, take risks and learn from their mistakes, and have capability and experience at creating change. They are continuously changing the system so that they are improving the organizations' collective abilities to provide value

for their customers” (Fey/Denison 2002: 7/8). Last but not least a mission is important for them, because organizations must be directed to organizational goals and strategic objects. For the topic of knowledge transfer we focus on the two aspects of involvement and consistency. These are the most relevant factors for an organizational culture that supports people in cooperation. Involvement is operationalized in the dimensions empowerment, team orientation, and capability development. In our questionnaire we used all items for involvement, but in regards to the topic, team orientation is the most important factor for knowledge transfer, because it belongs to trust by peers. If all peers are orientated to reach a common goal, knowledge transfer is easy. Rather than the success of individuals, the success of teams takes centre stage. Team-orientation is related to common action, the joint production and both means of knowledge transfer. Therefore the fourth hypothesis is:

(H4) Team-orientation is a cultural trait that will be positively related to knowledge transfer.

Consistency is also an important factor for an organizational culture with successful knowledge transfer. If all employees are committed to shared core values and to a clear agreement about the way to do things in the organization, then it is more probable that they will transfer knowledge. In the literature about knowledge management, this phenomenon is well known as a community of practice (Wenger et al. 2002). “Communities of Practice are groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger et al. 2002: 4). Developing new knowledge is closely related to the existence of this kind of group. Robertson et al. (2003) also show through two case studies that coordination of knowledge work at consulting companies requires the additional development of collective core values and agreement that are based on professionalism and elitism. Elitism is founded through a selection process with high symbolic thresholds.

(H5) Consistency or the degree of normative integration, as a cultural trait, will be positively related to knowledge transfer.

A variable which moderates this relationship is organizational tenure. It is to be assumed that the tenure is positively correlated with normative and cultural socialization. A newcomer in an organization needs time to behave like a normatively integrated employee would.

**(3) cognitive constraints:** In organization studies we can recognize a cognitive shift: Organizations are analysed as rules which are rooted in cognitive taken-for-granted beliefs. All these phenomena are well known and have been explored in detail elsewhere (e.g. DiMaggio 1997).

In our study we will emphasize the cognitive constraints, because from our point of view one of the most important aspects of this framework is the motivation of actors. As discussed before, knowledge work cannot be managed by selective incentives, so the occurrence of intrinsic motivation is very important. In the absence of monitoring, intrinsic motivation is the only way to motivate people to transfer knowledge and to develop new knowledge together.

Intrinsic motivation is defined by Heckhausen (1991) as follows: “Action is intrinsic if the means (the act) thematically corresponds to its ends (the action goal); in other words, when the goal is thematically identical with the action, so that it is carried out for the sake of its own objectives. For example, achievement behaviour is intrinsic if it is engaged in merely to accomplish a desired outcome, because it solves a problem or leads to a self-evaluation of competence. Here, the outcome, a particular accomplishment, is not a means toward some other nonachievement-related end” (Heckhausen 1991: 406).

If all group members are intrinsically motivated, the free rider problem does not appear (Frey and Osterloh 2002)<sup>3</sup>. While the resource expenditures, which are necessary to develop solutions for the given problems, are registered as costs in the original calculation situation, they do not appear as costs when the actors are intrinsically motivated. Solutions are found, because to work is fun and the solution process is interesting. Therefore, an intrinsically motivated actor does not deduct these expenses from his profit, but views them as an extra profit. As a result, the cooperation strategy becomes individually rational. Here again, the actors' subjective perception transforms the starting situation (Kelley and Thibaut 1978).

Taking into consideration that intrinsic motivation is not a selective incentive, it is not possible to produce it directly. Motivation is a cognitive attribute of each participant, but as motivational psychology tells us, the attribute is linked to work situation. In similar work situations, it is probable that the same attribute occurs. The only way is to arrange the structural prerequisites in a manner that stimulates intrinsic motivation. Research in work psychology finds a positive correlation between freedom of action and intrinsic motivation. Freedom of action is defined as work enrichment, to do a task from the beginning to the end, and to decide on the work schedule autonomously. In the literature two models are discussed: the Demand-Control-Support model (Karasek 1979, for further details see Tummers et al. 2006) and the Job Characteristic model (Hackman and Oldham 1980). Here we use the last model, because it stresses the link between (perceived) work structure (and the organizational environment of the work structure), and cognition.

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<sup>3</sup> Frey and Osterloh (2002) or Weibel (2004) label that self-control. More importantly, both intrinsic motivation and self-control are describing an internal locus of control.

Hackman and Oldham (1980) have analysed the relationship between five core dimensions of the work environment and the occurrence of intrinsic motivation. The core work environment dimensions are skill variety, task identity, task significance, autonomy, and job feedback (Hackmann and Oldham 1980: 78-79). They distinguish three individual dispositions caused by different attribution processes: knowledge and skill, the strength of the need for growth, and context satisfaction. If employees have these individual dispositions and if they work in one of the situations defined above, it is very likely that they will develop intrinsic motivation. In the model of Hackman and Oldham (1980) context variables are very important, because the perception of a work situation is linked to the working context. One of the key context factors is salary. In our sample, taken from German hospitals, the context factor of salary satisfaction is very important too. During our survey the biggest strike of doctors in the history of Germany took place. The doctors' dissatisfaction with their wages was a topic of public discussion with huge public debates about the strikes for higher wages occurring. We took this into account and kept an eye on the factor 'salary satisfaction'. The five core dimensions are defined here as a wide scope of action. As an institution it is important that all actors assume everybody else is intrinsically motivated – and that everyone takes this for granted. In such a work situation, everyone perceives everyone else as mutually intrinsically motivated. Work environment can lead to intrinsic motivation, and is in context of knowledge transfer, only a moderate, third variable. More relevant is the relation between intrinsic motivation and cooperative action. If actors are intrinsically motivated they cooperate; they share their knowledge because they are used to it and it is fun. They do not calculate how to derive a profit from the cooperation (for evidence see Wilkesmann and Rascher 2005).

(H6) The more employees are intrinsically motivated, the more they will engage in knowledge transfer.

Under the structural, cultural and cognitive constraints or frameworks outlined above, free riding can be overcome, and knowledge transfer is more likely to occur. Table 1 summarizes our definition of the requirements of knowledge transfer.

**Table 1: Hypotheses**

<b>Structural constraints</b>	<b>Normative-cultural constraints</b>	<b>Cognitive constraints</b>
<p>(H1) The more possibilities for interaction within organizations that exist, the more knowledge can be shared.</p> <p>(H2) The more computer-mediated communication is available, the easier knowledge transfer is.</p> <p>(H3) The smaller the network or team is, the better knowledge can be transferred.</p>	<p>(H4) Team-orientation is a cultural trait that will be positively related to knowledge transfer.</p> <p>(H5) Consistency or the degree of normative integration, as a cultural trait, will be positively related to knowledge transfer.</p>	<p>(H6) The more employees are intrinsically motivated, the more they will engage in knowledge transfer.</p>

## VII. Some empirical evidence from a survey

### Sample Size

All in all 11 hospitals took part in our survey which we conducted from February to May 2006 in Germany. At that point in time the participating hospitals were sized between 145 – 618 beds. In Germany it is common to differentiate between small hospitals (up to 250 bed capacity), medium-sized hospitals (up to 500 bed capacity) and large hospitals (more than 500 beds capacity). Five hospitals fall into the “small” category, five hospitals fall into the “medium-sized” category, and one into the “large” category. Altogether 3,024 questionnaires were distributed and 1,047 returned. The rate of return amounts to 34.62%. If we distinguish the response rate between the two occupational groups, we received 30.34% of the distributed questionnaires from doctors and 36.00% from the nursing staff. The dataset contents 19.4% questionnaires from doctors and 80.6% from nursing staff. The proportion of the two employed occupational groups in hospitals in general is equivalent to the distribution in our survey data. 975 of the 1047 returned questionnaires were usable, and were incorporated in our analysis. The mean age of the doctors is 40.8 years and 39.2 years in the case of the nursing staff. The average duration of the current organizational membership is 6.8 years for the doctors and 14.4 years for the nursing staff. 55% of the responding doctors and 24.9% of the responding nurses are male. The distribution of age and sex reflects the situation of employees in hospitals in general. The sample is representative in this respect.



## Measurement

For the dependent variable we use 7 items to measure tacit or explicit forms of knowledge transfer. Respondents answered on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). We asked if the respondents provide knowledge, as well as if they receive knowledge from colleagues. The items measure how and in which direction knowledge transfer is accomplished (see appendix). In Nonaka and Takeuchi's terms (1995), we only use items for socialization and combination as part of transferring knowledge from one person to another. Internalization and externalization are intrapersonal aspects of knowledge 'transfer'. To reduce the items and to test if a difference in providing and obtaining knowledge can be found in the data, the principal components analysis is chosen. The factors are defined by a eigenvalue greater than one according to the Kaiser-criterion. An orthogonal rotation following the varimax method with Kaiser-normalisation makes it easier to interpret the factors. With a KMO-value of 0.8 and an explained variance of 64.3% the following factors can be distinguished:

The first factor describes the socialization aspect where, in situations of face-to-face interaction knowledge is given from the participant to other persons. This scale ('providing knowledge') has a high reliability with Cronbach's Alpha =.86. The second factor describes the socialization aspect where in situations of face-to-face interaction the participants obtain knowledge from other people (learning aspect). The scale 'obtaining knowledge' is highly reliable (alpha =.79).

These factors show the difference in providing and obtaining knowledge. These scales are the constructs we wish to explain, using an OLS-regression. To this end, we construct the independent variables, also using factor analysis, to test the above mentioned hypotheses.

In order to operationalize our first hypothesis, we characterize the channels of social interaction. Drawing on Denison and Mishra (1995) and on Ngoc (2005), we measure social interaction by items they used in their questionnaires. These items are valid and are partly adapted in our questionnaire. A comparison of different questionnaires is discussed by Delobbe et al. (2002). A principal components analysis with varimax rotation could not differentiate the items successfully. The reasons are partly because the factors didn't differ very well, but more importantly because some statements of the construct were too close to our dependent variable. We chose four statements as examples for communication channels. Only two items produced significant effects and therefore are included in our model. Those two are: 'I participate in all important meetings held in my hospital.' And 'I usually take opportunities to discuss work related things in my work break with colleagues.'

This approach was also chosen for the second hypothesis and results in using 'use of internet' and 'use of databases' as indicators<sup>4</sup> for computer-mediated communication.

To test our third hypothesis, we controlled the size of the team, including doctors and nursing staff. The item for team size is: „With how many do you work together day by day (only doctors and nursing staff)?” This variable is coded 0 for teams that consist of less than nine members and 1 for teams with nine and more members. Initial results in an earlier phase of our research suggested that nine was a crucial number, especially for doctors, who acted as threshold: Groups with nine or more members transferred more knowledge. These findings didn't hold for long, as one can see below.

We measured the fourth hypothesis by drawing on the team orientation and involvement items of Denison and Mishra (1995). For the involvement dimension we used items for the scales: empowerment and capability development. A main component analysis with varimax rotation differentiates the items into three scales with a KMO-value of 0.89 and explained variance of 54.3%: 'interdisciplinary team orientation' (alpha =.71), 'strategic capability development' (alpha =.8), and 'intradisciplinary team orientation' (alpha =.72). The scale of 'team orientation' measures hypothesis 4, while the scale of 'strategic capability development' describes the normative integration factor from hypothesis 5.

To further test hypothesis 5 we also use items of Denison and Mishra (1995) for the other organization culture dimension of 'consistency'. The 'consistency' dimension is measured by the scales of 'core values', 'agreement', and 'coordination/integration'. A main component analysis differentiates the items into three scales with a very weak reliability. Therefore we combined the items to one scale 'consistency' (alpha =.83). Hypothesis 5 is thus measured by the scales 'strategic capability development' and 'consistency'. Since these two scales were very highly correlated and created collinearity problems in our regression-model, we omitted one. This was 'strategic capability development', since the consistency scale fits the model better (i.e. created fewer collinearity problems with other variables). So hypothesis 5 is tested by the scale measuring 'consistency'. Additionally we use organizational duration to control for cultural and normative socialization. We assume that knowledge transfer will increase with occupational duration,.

The last Hypothesis, the impact of intrinsic motivation, is measured with five items. One of these items proved to be not very reliable and was therefore deleted. The intrinsic motivation scale was then acceptably reliable with alpha =.62.

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<sup>4</sup> Both were coded as follows: 0 = not using, 1 = using once a week, 2 = using thrice a week, 3 = using once a day, 4 = using several times per day.

**Table 2: Descriptives**

	Cronbach's alpha	Doctors (n=192)		Nurses (n=783)	
		Mean	Sd	Mean	Sd
providing knowledge	0.86	3.75	0.95	3.68	0.82
obtaining knowledge	0.78	3.36	0.89	3.53	0.74
meetings	-	3.48	1.14	3.36	1.12
breaks	-	3.61	1.10	3.31	1.07
intradisciplinary team culture	0.72	3.29	0.76	3.47	0.67
interdisciplinary team culture	0.71	3.70	0.82	3.75	0.79
consistency	0.83	2.81	0.64	2.94	0.54
intrinsic motivation	0.6	4.02	0.68	3.95	0.61
internet use	-	1.97	1.46	0.39	0.90
database use	-	1.80	1.33	1.39	1.25
satisfaction with wages	-	2.14	1.17	2.29	1.04
organizational duration	-	6.78	6.72	14.36	8.79
		0	1	0	1
group size (0: <9, 1: >8)	-	32,29%	67,71%	60,79%	39,21%
Gender (0: female, 1: male)	-	44,27%	55,73%	75,10%	24,90%

## Data

We use OLS-regression analyses to test our hypotheses. We estimate four models: Knowledge provided by doctors, knowledge obtained by doctors, knowledge provided by nurses and knowledge obtained by nurses. Table 3 shows the results for the regression models. Effects shown are the standardized beta-coefficients.

**Table 3: Regression of providing and obtaining knowledge for doctors and nurses on structural, cultural, and cognitive requirements**

	Doctors		Nurses	
	providing	obtaining	providing	obtaining
Meetings	<b>0.125+</b>	- 0,036	<b>0.123**</b>	0,047
Breaks	0,08	<b>0.169*</b>	<b>0.099**</b>	<b>0.11**</b>
internet use	<b>0.201**</b>	0,055	<b>0.079*</b>	0,008
database use	- 0,035	<b>0.133+</b>	<b>0.092**</b>	- 0,043
group size (0: <9, 1: >8)	0,081	- 0,001	0,031	- 0,036
intradisciplinary team culture	<b>0.193*</b>	0,11	0,037	<b>0.234**</b>
interdisciplinary team culture	0,051	0,038	<b>0.076+</b>	0,034
Consistency	- 0,011	<b>0.188*</b>	<b>0.072+</b>	0,067
organizational duration	<b>0.274**</b>	- <b>0.131+</b>	<b>0.067*</b>	- <b>0.086*</b>
intrinsic motivation	<b>0.223**</b>	<b>0.157*</b>	<b>0.133**</b>	0,044
satisfaction with wages	- <b>0.118+</b>	- 0,090	- <b>0.16**</b>	<b>0.075*</b>
Gender (0: female, 1: male)	0,044	- 0,104	<b>0.123**</b>	- 0,042
N	192	192	783	783
adj. r <sup>2</sup>	0.288	0.215	0.156	0.14

\*\* p < 0.01 \* p < 0.05 + p < 0.1

Hypothesis 1, which states that the more possibilities of interaction exists, the more knowledge can be transferred, is supported. We find positive and significant effects for both indicators, meetings and breaks. A closer look reveals that both of our distinctions – doctors vs. nurses and obtaining vs. providing knowledge – are differently affected by the explanatory variables. While meetings only refer to providing knowledge, we presume that the more informal kind of breaks strongly affects knowledge obtaining for doctors. For nurses meetings affect providing knowledge and breaks affect providing as well as obtaining.

Hypothesis 2, more knowledge transfer with rising use of computers, shows a similar picture: Computer mediated communication positively affects knowledge transfer. Only obtaining knowledge by nurses does not show significant effects. For doctors internet use spurs knowledge providing, while the use of databanks affects the obtaining of knowledge. For nursing staff only knowledge providing is encouraged by computer mediated communication channels and only to a small degree. Computer mediated communication does not seem to be very important for nurses to transfer knowledge; this is probably primarily because they still do not have regular access to computers (see table 2).

Hypothesis 3, in smaller teams more knowledge is shared, is not supported by our data. The size of the team has no significant effect in any of our models.

For Hypothesis 4, that team culture stimulates knowledge transfer, we find some support, but the term “culture” must be differentiated: ‘intradisciplinary team culture’ has strong effects on providing knowledge for doctors, while it strongly affects nurses in obtaining knowledge. Interdisciplinary team culture has virtually no effect on the transfer of knowledge: the small effect on knowledge providing for nurses is only significant at the 10% level and should be dismissed (with  $n = 783$ ). It seems that both doctors and nurses value working with members of their own occupational group more highly, but to different ends.

Hypothesis 5, with a rising level of ‘consistency’ or ‘shared organizational values’ more knowledge is transferred, can only partially be supported: Only for doctors a strong and significant effect for obtaining knowledge exist. Our second independent variable, ‘organizational duration’ yields interesting results: As predicted, with longer duration, more knowledge is shared. This can be observed for both occupational groups, but for doctors to a much larger extent than for nurses. Knowledge obtaining, however, is negatively associated with the duration. The longer people work in a specific hospital the less they feel they can learn from others. This shows the transition from learning to teaching.

Our findings support Hypothesis 6, that intrinsic motivation instigates knowledge transfer. With the exception of nurses obtaining knowledge, intrinsic motivation always shows strong positive effects on knowledge transfer.

The control variable gender shows significant and strong effect on knowledge providing by nurses. Male nurses provide more knowledge to colleagues than female nurses. Since our theory does not contain a 'gender bias' this should be considered when advancing the theoretical background.

Satisfaction with wage deals with the context factors. The original wording of the item is: "I'm satisfied about the amount of pay I receive in relation to how hard I work." Nurses and doctors who work more than others and are more involved in providing knowledge than others but are less rewarded than others, are often not satisfied with their salary *in relation* to others who choose the 'free-rider position'. This is especially true for the nurses who face similar conditions as the doctors but, in contrast to the doctors, do not have any real options to do substantially better in the future. This situation worsened with the doctors' strike and the subsequent lack of attention to the nurses' situation.

## **Discussion**

Except for hypothesis 3, our analyses provide some support for all of our hypotheses. We now have to 'fine tune' our theory to different incentives for providing and obtaining knowledge, for doctors as well as for nursing staff.

The general fit of our models show that our leading assumptions – the distinctions between providing and obtaining knowledge and between doctors and the nursing staff – are supported. The adjusted  $r^2$  is greater for doctors than for nurses and it is also greater for providing than for obtaining knowledge.

The difference between doctors and nurses cannot be explained by assuming that the doctors' work contains more knowledge-intensive processes than the work of nurses. Though the models for nurses do not fit the data as well as the ones for doctors, it is not only the size of the  $r^2$  that differs. For example the intradisciplinary team culture raises knowledge obtaining for nurses; while for doctors it is associated within providing knowledge.

If we go further into detail, the most important factors for doctors to provide knowledge are: Computer mediated communication (H2), team orientation (H4) and intrinsic motivation (H6). To obtain knowledge, face to face interactions (H1) are important for doctors, as well as shared organisational values (H5) and intrinsic motivation (H6).

Nursing staff transfers more knowledge if there are many communication channels, especially face to face and computer mediated ones (H1 + H2) and if they are intrinsically motivated (H6). Obtaining knowledge depends mostly on face to face communication (H1) and team orientation (H4) for nurses.

This shows that, upon closer inspection, no model supports the same set of hypotheses. From this point, we conclude that not only do obtaining knowledge and providing knowledge draw on different sources but they also differ – and not only weaken – for different levels of knowledge intensive working processes.

The channels which promote knowledge transfer can - at least for doctors - be relatively clearly distinguished: Meetings encourage providing knowledge, while communication during breaks is associated with obtaining knowledge. Participating in formal meetings supports knowledge providing, because it fits the expectation of a meeting. While more informal occasions support obtaining knowledge, because often the informal context can be more easily adapted to individual needs. Intradisciplinary team culture positively stimulates providing knowledge while the level of shared organizational values has that effect on obtaining knowledge. Feeling at home in a team causes doctors to provide more knowledge while feeling at home in the organisation as a whole makes obtaining knowledge easier. Doctors who often access the internet can provide more knowledge, while the use of databases increases obtaining knowledge. The internet is known from experience as a sharing medium while databases are associated with the expectation of finding answers to pointed questions. It seems that even the channels of knowledge transfer are promoted either obtaining or providing knowledge. So, we find substantial support for our insights, namely that it is useful to distinguish in detail not only providing and obtaining knowledge and different levels of knowledge intensity at work, but also the different channels and constraints of communication.

One major finding for the theory of collective action is the rejection for H 3: Contrary to Olson's assumption, the team size is not a significant factor for transferring knowledge in hospitals.

## VIII. Conclusion

Knowledge is one of the key resources for nearly all modern industries. To create new knowledge, it is necessary for people to work together and transfer their knowledge. In the actual discussion about knowledge transfer, we identify two shortcomings:

1. If knowledge is a power resource, knowledge transfer is subject to the free rider problem. Most studies focus on structural constraints to overcome the free rider problem.

Only a few address cultural and cognitive constraints, and virtually no study integrates these different approaches. To understand and describe the different requirements for knowledge transfer we link the structural, cultural and cognitive perspectives together.

2. While most theoretical literature stresses the transfer aspect of knowledge transfer (i.e. requires a sender and a receiver), empirical studies concentrate on the providing of information. In our view, not only sharing knowledge and probably losing power in this process is a problem, but rather the act of learning, of obtaining knowledge is also problematic. Since transferring knowledge consists not only of giving information, but also receiving information, both sides of the transfer process have to be observed. We examine the obtaining of knowledge with the same theoretical perspective as providing knowledge. Our study is therefore the first empirical test of a comprehensive view which links knowledge management and organizational learning.

To test our assumptions we conducted a survey in 11 German hospitals, distinguishing between doctors and nursing staff. These two groups are different in the level of the knowledge intensity in their work and in their hierarchical status.

The main results of the survey support our hypotheses. All perspectives contribute to understanding how the free rider problem can be overcome: For doctors, structural, cultural, and cognitive constraints together help to transfer knowledge, i.e. providing and obtaining knowledge. For nurses, our findings show that the different perspectives complement each other. While the structural and cognitive constraints support providing knowledge, the cultural constraints instigate obtaining knowledge.

The results lead to recommendations for action for both groups, doctors and nursing staff. Both groups need leeway for interaction, access to computer-mediated possibilities of knowledge transfer, they must be intrinsically motivated, and they need a strong team culture. Nevertheless, the survey shows that only intradisciplinary team culture has a significant effect. Due to the hierarchical structure of German hospitals, interdisciplinary team culture has no significant influence. In the future, knowledge transfer between both groups will become more important, therefore hospital management must support the interdisciplinary transfer.

The differentiation of doctors and nurses shows that knowledge transfer follows different rules for different level of knowledge intense processes. On a high level of knowledge intensity a combined perspective of already formulated hypotheses can explain knowledge transfer quite well. At a medium level those theories do not fit as well. Results from our survey show that these level differences are likely due to different mechanics of knowledge transfer at those different levels of the knowledge intensity of working processes. More research needs

to be done to explain knowledge transfer in a medium knowledge intense work environment, since most theories implicitly deal with high level knowledge intense work environment.

Our survey is not only a contribution to the knowledge management discourse but also to the debate about organizational learning (Argyris and Schön 1987; Hedberg 1981). Learning in organizations contains fewer factors than providing knowledge. People with a higher occupational duration learn less than newcomers. The most important factors for learning in organization are organizational culture (intradisciplinary team culture for the nursing staff and consistency for the doctors) and informal breaks. We can deduce from these findings that organizational learning is less manageable than knowledge management, because it depends more on soft factors which are only indirect controllable.

To sum up, knowledge management and organizational learning depend on “second level management”, i.e. management can only provide opportunities where people can provide or obtain knowledge. Management can create constraints that support knowledge transfer, but employees or members of organizations have to act by themselves. Therefore managers have to treat them as the most valuable assets the organization has. Organizational culture and intrinsic motivation are vulnerable factors. It is easier to undermine them than to build them up. Redundancies, for example, will destroy these soft factors. No manager can lay off employees on the one hand, and expect that they transfer their knowledge on the other hand.

The survey includes only the situation in German hospitals. To see if our findings can be generalized it is necessary to do additional research. Other countries with different organizational structures and cultures must be included before a general theory of knowledge transfer can be written.

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## X. Appendix

### main component analysis with varimax-rotation

#### knowledge transfer

	factor 1	factor 2	alpha
I show colleagues special procedures so that they can learn them.	0.868	0.073	'providing knowledge' 0.860
I support colleagues to gain work experience.	0.834	0.111	
Colleagues learn a lot by watching me on the job.	0.817	0.130	
I learn a lot by observing colleagues doing their job.	0.089	0.797	'obtaining knowledge' 0.775
I turn to colleagues for advice regarding special procedures so that I learn	0.100	0.779	
Colleagues support my efforts to gain work experience.	0.127	0.739	
I learn a lot by asking colleagues.	0.007	0.714	

#### teamculture

	factor 1	factor 2	alpha
Most employees in this hospital are highly involved in their work.	0.722	0.200	'intradisciplinary teamculture' 0.724
Everyone in this hospital believes that s/he can have a positive impact.	0.694	0.248	
Decisions in this hospital are usually made at the level where the best information is available.	0.655	0.315	
This hospital delegates authority so that people can act on their own.	0.586	0.268	'interdisciplinary teamculture' 0.708
Teams of my occupational group (doctors among themselves / nursing staff among themselves) are the primary building blocks of this hospital.	0.561	-0.288	
This hospital relies on horizontal control and coordination to get work done, rather than hierarchy.	0.379	0.350	'interdisciplinary teamculture' 0.708
Interdisciplinary teams of (doctors and nursing staff) are the primary building blocks of this hospital.	0.127	0.791	
Cooperation and collaboration across functional roles (nursing staff <-> doctors) are actively encouraged in this hospital.	0.118	0.693	
Working in this ward is like being part of a team.	0.438	0.606	

#### Items for consistency (alpha=0.83)

It is easy to coordinate projects across functional units in this organization.

There is a good alignment of goals across levels of this organization.

This organization has a 'strong' culture. It is easy for us to reach consensus, even on difficult issues.

People from different organizational units still share a common perspective.

When disagreements occur, we work hard to achieve 'win-win' solutions.

The managers in this hospital 'practice what they preach'.

There is a clear and consistent set of values in this hospital that governs the way we do business.

This organization has an ethical code that guides our behavior and tells us right from wrong.

There is a clear agreement about the right way and the wrong way to do things in this organization.

Our approach to doing business is very consistent and predictable.

We seldom have trouble reaching agreement on key issues.

Ignoring the core values of this hospital will get you in trouble.

Working with someone from another part of this organization is not like working with someone from a different company.

Items for intrinsic motivation (alpha=0.6)

I'm proud about doing a good job

I feel comfortable if I'm doing a good job.

I feel sad and unlucky if I realize that I didn't work well.

My job is joyful.

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