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## Self-governance and slowness as prerequisites for knowledge management

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## Self-governance and slowness as prerequisites for knowledge management

The aim of this paper is to show that self-governance is the only way to create knowledge in organizations. We will show that knowledge can only be developed and preserved by self-governance. As self-management is not a natural process, it needs structures to support the development of this kind of action. Management is only able to create these structures at a second level. Thus a distinction between two different levels has to be made: the level of performance and the structural level. The latter determines whether a certain form of action is either supported or destroyed.<sup>1</sup> The management, however, is not able to create these structures alone, it is a negotiation process between the powerful actors and groups. In Germany, one of these powerful groups in the internal organizational negotiation process is the works council.

First of all it is necessary to define the terms knowledge management, self-governance, and slowness.

Knowledge management can be defined by the three following criteria:

1. The development of new knowledge,
2. the exchange and storage of data,
3. the negotiation process which is to create those structures that support self-governance for the development of new knowledge and the free exchange of information.

The most important task of knowledge management is to develop new knowledge. Therefore certain forms of learning are needed and, at the same time, an exchange of those pieces of information which are necessary for the development. We will show that the development of knowledge and an exchange of data is only possible under certain working conditions.

Self-governance can be defined as a structure which sustains self-management. Slowness is defined as self-management of time. Thus it is a dimension of self-governance and we show that it is an important factor for intrinsic motivation.

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<sup>1</sup> For the relationship between action and structure see Giddens (1984) or Coleman (1990)

## 1. Development of new knowledge

How is it possible for companies to create new knowledge? First of all it is a fact that individuals learn in organizations<sup>2</sup>. Nevertheless, for the whole organization it is irrelevant whether Mrs. Smith learns how to use the new software program or not. If she does, Mrs. Smith has created new knowledge for her own use, but not for the company. The classical psychological theories cannot explain how new knowledge is developed. They merely explain how a person reaches a defined knowledge goal. In collective learning situations, however, it is possible that new knowledge occurs, because the contribution of one person can be linked with that of another one and hence create a new perspective which could not occur in a single learning situation. Most of the relevant knowledge in a company cannot be attributed to one single person. For example, developing a new product, reengineering the company or creating new working structures is not the work of a single employee. In the case of knowledge development the employees have to solve complex problems. Complex problems are defined as problems (Wilkesmann 1999)

1. which could not be solved with the information of only one person,
2. which do not have criteria for a correct solution,
3. which lack a well-known solution path and
4. which need the development of new adaptation steps.

Complex problems can only be solved in collective learning situations. Collective learning is defined as a situation in which all participants exchange different perspectives (that means data) which are afterwards integrated into one solution. Therefore input and process variables are relevant. An input variable is, for example, my knowledge (in this case data is exchanged), the process variable is the group-interaction. A common example is a project-group. From the employee's point of view knowledge is power. If I give all my information to other people, I lose power in relevant bargaining situations. Why should I give my knowledge to other people? My knowledge is my power-resource. Despite all cheap talking about knowl-

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<sup>2</sup> Individual learning is described in the psychological concepts of classical conditioning, operant conditioning and social learning. For organization studies only the two latter concepts are relevant. In a classical hierarchy the superior has to evaluate the inferior. If I want to make a career, I better do what my boss wanted, despite of what I think about his assignments. Thus learning routines will be established. This is not only the case in a classical hierarchy but also with all selective incentives. For example pay by performance will produce the same learning routines. If there exists an incentive for the number of insurance policies I have sold, the only action that counts is selling a large number of insurance policies, nothing else, neither quality nor information or communication with the customer. Individual learning only solves simple problems.

edge management, I'm not interested in sharing my knowledge. I expect rewards for my willingness to share my knowledge.

A company's survival is dependent on the development new knowledge, but from the point of view of each employee it is rational that other employees pay for the costs of creating knowledge. From "ego's" perspective it is rational to invest nothing in the creation of knowledge, if "alter" freely renders his information and is highly engaged in developing new knowledge. Thus when all others are cooperating, ego declines to help. The first condition of a n-person-prisoner-dilemma is fulfilled [ $D_{(n)} > C_{(n)}$ ]<sup>3</sup>. The second condition [ $C_{(n-1)} > D_{(0)}$ ] is fulfilled as well, because ego is not able to produce profit, if nobody develops new knowledge. The company will drop out of the market and ego will lose his job. Thus it is rational for ego to cooperate, if n-1 employees cooperate, too. As a result, the third condition [ $D_{(n)} > D_{(0)}$ ] is fulfilled as well, because the loss caused by the defecting of all employees in the process of creating new knowledge is greater than when only a few employees are cooperating.

### 1.1 How is it possible to overcome the prisoner's dilemma?

Traditionally, there are two ways to overcome the prisoner's dilemma: either a third actor rearranges the game by placing selective incentives (e.g. Hobbes), or the cooperative strategy is stabilized internally.

In the case of knowledge development the prisoner's dilemma cannot be overcome by selective incentives (Osterloh/Frost/Rota 2001). The basic problem is that the development of new knowledge cannot be perceived from an external point of view. If a third actor is not able to monitor the process, he will not offer a reward with selective incentives. The second reason is the problem of multiple tasking. In working processes with complex problems all employees have to fulfil a lot of tasks. Every selective incentive rewards only one task. A rational actor will then only complete that single task, all other tasks will be neglected (Frey/Osterloh 2002). On the other hand it is not possible to assign a lot of incentives. It is too complex and every action will then be rewarded.

There are two ways to stabilize the cooperative strategy internally: by social norms and by intrinsic motivation.

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<sup>3</sup> The N-individuals-prisoner's dilemma is defined by the following three conditions:

- (1)  $D_{(n)} > C_{(n)}$
- (2)  $C_{(n-1)} > D_{(0)}$
- (3)  $D_{(n)} > D_{(0)}$

D and C are Ego's chosen strategies (defection or cooperation). The number of cooperative individuals is given in brackets. The inequations reflect the utility relations from Ego's point of view.

A group can reward cooperative action, if the social group norm supports cooperative action (second-order-free-rider-problem; see Heckathorn 1989, 1993, 1996). Thus self-governance is an important solution to the prisoner's dilemma. Therefore a group requires monitoring and sanctioning capacity. The ability to observe others has to be increased by creating groups with a small number of group members. Only in a group with up to 7 or 8 members everyone can monitor the others. If one member neglects his contribution, all the others feel the deficit, because it is a common production. The sanction capacity is influenced by two variables: on the one hand by the number of people carrying out sanctions and on the other hand by power differences.

1. The more defective actions are sanctioned by group members, the more the value of social norms is increased. There is also a second way to overcome the second-order-free-rider-problem. Only one individual is required to punish the defector. This person can be rewarded by all the others. This method is cheaper than the one which provides a punishment of the defector by all members (Coleman 1990: 283).
2. Coleman defines 'power' as an interaction category: "The power of an actor resides in his control of valuable events. The value of an event lies in the interests powerful actors have in that event" (Coleman 1990: 133). Karen Cook expands this definition and includes the network structure, especially the local scarcity of a resource at a certain position in the network (Cook 1977; Yamagishi/Gillmore/Cook 1988; Cook/Whitmeyer 1992)<sup>4</sup>. The scarcity of a resource depends on the supply of the resource in the network – it is not only dependent on the demand. Valuable goods in companies are e.g. knowledge, skills, incentives or the control over the company's staff. If there exists a great power difference between the actors, a group norm could be easily sanctioned by the powerful actors, but the costs for leaving and objecting decrease compared to the low powerful actors. If the low powerful actor is punished all the time, his costs to leave will decrease. At a certain point it is even easier for him to find a new group than to stay in the first group. A further reason for not having a great power difference between the actors is connected to the first

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<sup>4</sup> "(1) In networks that consist of negative connections alone and in which resources do not flow beyond immediate exchange partners, the availability of resources from alternative exchange relations determines the distribution of power. ... (2) In networks consisting of positive connections alone, the local scarcity of resources determines the distribution of power. The local scarcity is, in turn, determined jointly by the total or aggregated supply of resources in the network and the distance of each point from the source points. (3) In mixed networks, in which both positive and negative connections are involved, the negative connections determine the total supply levels of the resources introduced into positively connected subnetworks, and these global scarcity levels (together with the distance

level of the dilemma. It would not be possible to solve the dilemma of collective learning. Even a powerful group member could not make the other employees release their information, if they do not want to.<sup>5</sup>

The structural conditions supporting a social group norm are: small groups and low power differences between the actors. These conditions support collective learning on the first (the production) level<sup>6</sup>. They only explain the domination of social norms, they do not give any information about the contents of the norm (whether the norm prescribes cooperative or defective action).

The second way to overcome the problem of generating common knowledge is intrinsic motivation. Intrinsic motivation is defined by Heckhausen 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 behavior 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 actors have intrinsic motivation, there is no prisoner's dilemma. (Wilkesmann 1994). While the expenses, which were necessary to work out solutions for the given problems, have been registered as costs in the original prisoner's dilemma situation, these do not appear as costs when the actors are motivated intrinsically. The solutions are found, because working is fun and the solution process is interesting. Therefore an actor, who is motivated intrinsically, does not deduct these expenses from his profit, but adds them up as an extra profit. As a result, the cooperation strategy becomes individually rational. Here, again, the actors' subjective perception transforms the starting matrix. (Kelly/Thibaut 1978).

Taking into consideration that intrinsic motivation is not a selective incentive it is not possible to produce it directly. The only way is to arrange the structural prerequisites in a manner that intrinsic motivation might be stimulated. Work psychological research defines 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.

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of each point from the source points in those subnetworks) affect the distribution of power within the subnetworks." (Yamagishi/Gillmore/Cook 1988, S. 849/850)

<sup>5</sup> Another argument for stabilizing a social norm is the well-known shadow of the future (Axelrod 1984).

<sup>6</sup> The management has to structure project groups with that scope.

Hackman and Oldham (1980) have analysed the relationship between five core dimensions and the occurrence of intrinsic motivation. The core dimensions are:

1. skill variety: "The degree to which a job requires a variety of different activities in carrying out the work, involving the usage of a number of different skills and talents of the person." (Hackman/Oldham 1980: 78)
2. task identity: "The degree to which a job requires completion of a "whole" and identifiable piece of work, that is, doing a job from beginning to end with a visible outcome." (Hackman/Oldham 1980: 78)
3. task significance: "The degree to which the job has a substantial impact on lives of other people, whether those people are in the immediate organization or in the world at large." (Hackman/Oldham 1980: 79)
4. autonomy: "The degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling the work and determining the procedures to be used in carrying it out." (Hackman/Oldham 1980: 79) In this sense slowness is part of the core dimension autonomy. Without autonomy in organizing one's schedule intrinsic motivation cannot appear.
5. job feedback: "The degree to which carrying out the work activities required by the job provides the individual with direct and clear information about the effectiveness of his or her performance." (Hackman/Oldham 1980: 80)

Hackman and Oldham distinguish three individual dispositions caused by different attribution processes: knowledge and skill, growth need strength, 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. If all group members are intrinsically motivated, the prisoner's dilemma does not appear (Frey/Osterloh 2002).

The core dimensions of Hackman and Oldham describe a self-management structure which is a form of self-governance. But creativity will only occur, if also the time management is controlled individually. Creativity is not possible under pressure of time. A very tight schedule will be perceived as a selective incentive by which the superior wants to exert control. Therefore time pressure will be perceived as a controlling method and thus produces a crowding out effect of intrinsic motivation.<sup>7</sup> The actors will reduce their intrinsic motivation. Thus individ-

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<sup>7</sup> Frey (1997) recapitulate under which conditions the crowding out effect appears: "(1) External interventions *crowd out* intrinsic motivation if the individuals affected perceive them to be *controlling*. In that case, self-determination, self-esteem and the possibility for expression suffer, and the individuals react by reducing their intrinsic motivation in the activity controlled. (2) External interventions *crowd in* intrinsic motivation if the individuals concerned perceive it as *supportive*. In that case, self-esteem is fostered, and indi-

ual time-management has to be added to the core dimensions. It is a prerequisite for intrinsic motivation.

The generation of new knowledge is only one major function of knowledge management. The following chapter deals with its second function and its structure of self-governance.

## 2. Storage and exchange of data

The second function of knowledge management is the storage and exchange of data. If every employee is to use the new knowledge, it will have to be stored and made accessible for everyone. Different types of preservation and internal channels of communication exist: report papers, dossiers, personal memory, but also newspapers, bulletin boards and routines. Here a current channel is analysed, the database.

### 2.1 The dilemma of data storage

The storage of knowledge is a prisoner's dilemma.<sup>8</sup> We characterize it as a two person dilemma. The cooperative strategy illustrated below is to put data in the database. The defective strategy is not to put data in the database (fig. 1). Another defective strategy is not to put all the data in, so that the user is not able to understand the document without additional information from the author.

employee I	employee II	
	puts in	does not put in
	puts in	R / R
does not put in	T / S	P / P

Fig. 1: PD of storage knowledge in a database

viduals feel that they are given more freedom to act, thus enlarging self-determination." (Frey 1997: 18)

<sup>8</sup> Every player has got two strategies: either to cooperate with the other player or not to cooperate. The first strategy is called cooperation (C), the second defection (D). The payment at the left shows the benefit for player I, the one at the right for player II. The letters can be replaced by various numerical values, which only have to be sufficient for the following order:  $T > R > P > S$  and  $R > (T+S)/2$ . The dilemma is that the individually rational strategy is defection. If both players choose this strategy, then the solution will be P/P, which is pareto-suboptimal. Hence to act individually rational does not lead to a collectively rational result. In order to produce this, a method has to be found which makes the cooperative strategy to be individually rational and brings about the result R/R. This happens when the payment conditions are in the same order as those of the assurance-game:  $R > T > P > S$ .

The reward is:  $T > R > P > S$  and  $R > T+S/2$

If both players put data in the database, they can use it mutually. Both of them get new information, thus they receive a reward of  $R$ . If employee I does not put his data in the database, but employee II does, the first one receives the highest reward ( $T$ ) and hence he is a free-rider: he does not share his knowledge in order to be able to use it in strategic bargaining situations to be quickly promoted and he will not spend time on putting data in. Moreover, he can use the information of employee II. Employee II receives the lowest reward ( $S$ ), because he spent time on putting the data in, shared his knowledge with employee I and thus he loses his most important resource of power. Employee I, for example, could use the information of employee II in order to create an important presentation for the board, which could push his career even further. If both players defect, the database won't work ( $P$ ).

The prisoner's dilemma does not occur in every database. We have to distinguish between different types of databases. The following categories can be distinguished:

1. technical database: Here, the data is necessary to control the production process. The production process will be structured by the data and no prisoner's dilemma is to be expected. Despite the data is essential, the database in the case study is not up to date.
2. service database: All users have to put data in *voluntarily*. The contents of the database could for example be: the results from project-groups; consulting experience and solutions, so that the same consulting process could be sold twice; urgent requests from sales personnel, whether a new customer solution exists or someone in a different country has developed anything similar; exchange of experience in newsgroups etc. The prisoner's dilemma might occur with this type. The case study below will be an example for that.
3. process database: Here, the data input does *not* take place *voluntarily*. The database is only used to monitor a project. All milestones and minutes are stored. Only the project-group members are allowed to use it. The prisoner's dilemma will probably not occur.
4. meta database: This type is only a technical solution, it's a search machine which retrieves information from different databases, like yahoo on the internet.
5. yellow pages/skill database: This is a subtype of no. 2 (service database) which contains only personal data from all employees. It is possible to search for people with certain skills, which are needed, for example, to solve computer problems. The specific problem here is to choose which kind of personal information should be saved in

the database. If the input of information is realized on a voluntary basis, the prisoner's dilemma might occur.

The prisoner's dilemma of information saved in databases could be solved by intrinsic motivation and (sometimes) by external interventions.

## **2.1 How to overcome the prisoner's dilemma?**

### **2.1.1 Intrinsic motivation**

The first possible solution of the prisoner's dilemma is intrinsic motivation (see Heckhausen's definition (1991) mentioned above). If intrinsic motivation is present, the prisoner's dilemma will not occur. The cooperative strategy is dominant and it is fun to join the database and to put data in. The actor does not take into consideration possible rewards, he derives benefit from his action. Intrinsic motivation is closely linked with small groups in an organization, which are organized by specific topics, skills etc. These are called 'communities of practice' (Lave/Wenger 1991). "A Community of Practice is a group of people who are linked together by a common ability or a shared interest, and consequently possess common practical experience, specialist information and intuitive knowledge. They share information, experience and insights and are supported by various tools" (Enkel/Heinold/Hofer-Alfeis/Wicki 2000: 87). Communities of Practice are necessary for creating an efficient bottom up implementation process. These communities belong to the Mode-2 science (Gibbons et al. 1994).

Thus a database has to be planned and introduced by the help of knowledge communities. Otherwise the database won't be used because of wrongly anticipated needs.

The following two hypotheses are a summary of the current discussion:

H 1: The more scope the actors have, the more likely it is that intrinsic motivation arises.

H 2: The more scope the actors have, the more the user cooperates.

Employees can develop intrinsic motivation, even if their actions don't support the goal-achievement of the whole company, for they have different goals. The individual goals might not coincide with the company's goal. The individual might have intrinsic motivation, but only reaching as far as his private preferences are reflected in his job. These actions are not efficient for the company. Therefore external interventions are needed as well (Frey/Osterloh 2002).

### 2.1.2 External intervention

The management can intervene in the prisoner's dilemma as a third actor. It might reward the cooperative strategy with an extra bonus  $X$ . The rewards for the cooperative strategy will be changed like this (fig. 2):

employee I	employee II	
	puts in	does not put in
	puts in	$R + X / R + X$
does not put in	$T / S + X$	$P / P$

Fig. 2: PD of storage knowledge in a database with external intervention

The cooperative strategy will be dominant individually, if  $X \geq T - R$ . And if  $X$  is added to the rewards  $R$  and  $S$ , an order of rewards can be established:  $R > T > S > P$ . It is a mix of assurance and chicken game.

In the company's point of view it is also efficient to award a bonus, because the dilemma is overcome and all employees put their data in the database. The function of storage and exchange of data is fulfilled. The company does not reinvent the wheel. Knowledge is there, where it is needed. Not only the contributor ("giver of knowledge") has to be rewarded but also the re-user ("taker of knowledge"; see Gibbert/Jonczyk/Völpel 2000). The evaluation and monitoring process can be constructed in analogy to the evaluation process of the well-known internet auction company E-Bay.

External rewards<sup>9</sup> could be books, mobile phones, and days off. But there are some problems with such selective incentives:

1. They might produce a cycle of expectations (see Frey/Osterloh 2002). If I receive a reward of  $Z$  this year, I will expect a reward of  $Z + X$  next year.
2. The problem of multi-tasking: "If a company pays its employees on the basis of certain targets which have to be achieved (e.g. sales and customer satisfaction) and the targets in question are different to a certain extent, as it is either easy or difficult to measure them (for instance, sales can be measured more easily and clearly than customer satisfaction), then extrinsically motivated employees will concentrate on those

<sup>9</sup> "Conversely, behavior is extrinsic when the means (action) and the ends (action goals) are thematically incongruent; when the goal is thematically different, and the action and its outcome constitute a means for bringing about a different kind of goal. The means character is merely external and essentially arbitrarily selected. For example, aggression is extrinsic if one attacks people not to do injury (that would be intrinsic) but to rob them. Aggression research calls this "instrumental" aggression, which should not be confused with actual (i.e., in our terms, intrinsic) aggression." (Heckhausen 1991: 406)

areas which can be measured best. Activities which are less easily quantifiable will be neglected." (Frey/Osterloh 2002: 19)

3. External interventions may not always enhance intrinsic motivation. Considering the problem of the crowding-out effect (over justification; see Heckhausen 1991: 408), external interventions lower motivation. Extrinsic incentives might even destroy intrinsic motivation<sup>10</sup>.

The following incentives are important and do not induce the crowding-out effect:

- The **social status** (all other employees consider you to be an expert)
- The **perception of usefulness** (which belongs to the norm of reciprocity)

Generally speaking selective incentives are only useful when the size of a database has reached a critical mass of documents. In other cases it is very likely that the problem of crowding-out will increase. Thus incentives have to be used very carefully.

Our third hypothesis is:

H 3: The external incentives "social status" and "perception of usefulness" enhance intrinsically motivated cooperative action.

### 3 Case Study: Siemens' database ShareNet<sup>11</sup>

Now we want to present the database ShareNet, developed by Siemens ICN. Siemens Information and Communication Networks (ICN) provides networks and solutions for the internet of the coming generation – prerequisites for mobile business. With a basis of 220 million connections in the network segment and more than 70 million connections of corporate clients Siemens is leading in the language and data network branch. ICN had a turnover of 9 billion Euro in the year 2000.

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<sup>10</sup> The hidden costs of rewards are based on three psychological processes (Frey 1997: 16-17): Impaired Self-Determination: When people are intrinsically motivated, the focus of control shifted by external rewards from inside to the outside. They no longer feel responsible for themselves, but make the actor, who gives the rewards, responsible for the action. Impaired Self-Esteem: The recognition of an action of intrinsically motivated personnel could be destroyed by external rewards, because the rewards deny the primary motivation. The individual might get the impression that his / her original action was not good enough. Impaired Expression Possibility: External rewards might deprive one of the possibility to show one's intrinsic motivation to other employees.

<sup>11</sup> We want to thank Dr. Michael Wagner, Andreas Manuth (both ShareNet-managers) for their help, as well as the other members of the ShareNet project team and Heribert Fieber (works council chairman) and Peter Kloeber (member of the works council and chairman of the ADV-committee).

### 3.1 Data and Method

The empiric survey described below was carried out in autumn 2001 and spring 2002. It consists of two parts: a preliminary phase combined with qualitative interviews, and a quantitative online-survey.

The online-survey was addressing those users of the database who had an internet connection and who had access to the database. As the number of employees in major companies is varying to a very high degree, the number of users of the database cannot be determined exactly. During the time of the survey the database ShareNet could be accessed by approximately 8.500 employees. This is the number of people who got a password. This amount can be considered to be the basic total of the survey. Those responsible, however, think that the number of active users is only thirty-five per cent.

The first part of the online-questionnaire included professional and demographic criteria like sex, age, working area (subdivision), country, and duration of employment. Hence this part refers to the basic structuring criteria of those taking part. The third part of the survey includes questions concerning the evaluation of working with the database. Similar to the empiric study by Hackman and Oldham (1980) the five core dimensions are operationalized. Every dimension is found out individually through two or four evaluative questions. The operationalisation of the dimensions has been made in accordance with the Hackman and Oldham's (1980) questionnaire. Variations are due to the fact that Hackman and Oldham's questionnaire was to analyse a production situation. Here, the single items are referring directly to the work with the database. The dimensions were operationalized by the following items:

Skill variety is operationalized in the dimensions of required knowledge and acquiring this knowledge by training (otherwise the actor would not recognize diversity or he would feel overemployed) in form of the following items:

"I need a variety of specific knowledge and skills for my activities";

"I was well trained with ShareNet".

As this examination analyses a database and not a physical product, task identity concerning the development of the database and the responsibility for one assignment is operationalized by means of the following items:

"I feel sufficiently involved in the development of ShareNet";

"I feel responsible for my assignment";

"I am involved in the efforts to improve ShareNet which affect my working place".

The dimension of task significance is divided into three areas – significance for the company, individually perceived significance derived from a just payment, and the independence of the individually attributed significance through the colleagues' criticism (this is necessary, because task significance has to be connected with the work itself and it must not come from an external position, as it should not be an extrinsic incentive):

"How significant or important do you consider your position at ShareNet for the company";

"I feel paid off fairly for my contribution to ShareNet";

"My superiors or colleagues rarely give me feedback concerning the quality of my work".

The employee's autonomy is operationalized through the given choices and a clear attribution of responsibility. The latter is particularly important as otherwise it might be possible that someone else tries to influence the decisions. The following items define this dimension:

"I can decide to manage my tasks in a certain order“;

"I have a clearly defined job description";

"I'm able to manage all activities which belong to my assignment to ShareNet".

Slowness is a part of the dimension of autonomy. A very tight schedule which is not managed by the actor himself will be perceived as external control. A tight schedule which cannot be changed or planned by the actor reduces his scope of decision and action to a very high degree. As the meeting of the appointments is supervised, there is control all the time. Very often the employees' payment takes into consideration their customers' account; this method reflects the logic of the market in the organisation. The scope of autonomous decisions is limited considerably by this means ("Three customers have to be dealt with until Friday – no matter, how!"). Unfortunately, this dimension of autonomy has become evident only after the questionnaire had been developed; therefore it is not included.

The dimension of feedback is operationalized by either feedback from the working process (similar to the case described above, the feedback must not come from other people, as it is an extrinsic incentive then) or goal orientation:

"I am included in specifying goal-agreements."

"Working with ShareNet shows me how well I did – independently of my co-workers' and superiors' feedback."

The following questions in section IV are referring to information concerning the organisation structure. Four questions are to find out how the employees evaluate the hierarchical structures and the interdependence of passing on knowledge and a loss of power. An evaluation of the incentive system, which is part of working with the knowledge database, is the subject of

the following questions in part V. The focus lies on an analysis of how the incentive system effects the employees' motivation. A just wage system, support of intrinsic and extrinsic motivation and the interdependence of both kinds of motivation are important here. In addition, an evaluation of the cost-benefit relations in dealing with the knowledge database voluntarily is to be made. The effects of the incentive system on the dissemination of information and the teamwork are also part of the questionnaire.

Extrinsic motivation is operationalized by means of two items concerning the effect of Shares:

"For stronger motivation the Shares should be increased regularly."

"Additional Shares encourage me to set higher goals."

As it is difficult to ask directly for intrinsic motivation when data is passed on, it is asked for indirectly. It is operationalized through the crowding-out effect. Hence it is also easier to demarcate it from extrinsic motivation.

"I believe that Shares motivate my colleagues to be more concerned about their own benefit."

"If Shares are assigned, the superiors have better control over my performance."

In addition, two items are used which describe both intrinsic and extrinsic motivation without any crowding-out effect. This is true when the employee earns praise ("Instead of giving Shares my superiors should let me know how satisfied they are with my performance") and when the Shares are taken, although they are not considered to be necessary ("I am happy with receiving Shares as an additional reward, but however I do not find it necessarily to motivate me").

In section VI the questions deal with the working situation in general. It is asked, whether there exist clearly defined profiles of qualification and work specifications. Also communication structures and employee-superior-relationships are at stake. In part VII of the online-questionnaire the participants of the survey have to evaluate knowledge management in general and in their company. The final part VIII contains short questions concerning working with the database. The participants have to state how long they have been working with the database and whether they received introductory training. Finally they have to make a general assessment of the quality of information which can be retrieved from the database and of its structure.

The participants have seven different possibilities (based on the Seven-Likert-Scale) to answer these questions, from "I do not agree at all" (1), over "neutral" (4) to "I fully agree" (7)

(Diekmann 2000: 209). In order to make it easier all the possible answers follow the same scheme.

### 3.2 Results of the Interviews and of the Online-Survey

The database is part of the corporation's sales department. It was developed because of the experience that a lot of knowledge exists in the sales departments all over the world, but nobody knows what kind of knowledge exists. Thus the employees very often had to do work twice before the database was introduced. Special offers, technical specifications or implementation strategies sometimes existed already, but they were developed a second or a third time, because the employees in charge did not know anything of the existing solutions. In order to avoid this "wasting" of resources, the corporation introduced a staff department which then initiated the development of the database with the help of project organisation. From the beginning those employees who later became ShareNet-managers were invited from all over the world to different workshops, because the later users should take part in the conceptualisation and implementation. Accordingly, planning and introduction were a participative process.<sup>12</sup>

In addition to a mere storage of documents which allows a free and voluntary input of documents following certain keywords, there existed 58 different discussion fora concerning specific organisational problems at the time of the survey. The database's function of "urgent request" is the function most frequently used. All the employees, especially sales managers when they have customers, are allowed to make urgent requests which are answered by their colleagues immediately. For example, a sales manager could ask whether it is possible at all to realize a technical specification which a customer wants or whether it has been developed already in another country.

The database has got three characteristic features regarding the issues discussed here:

1. A specific incentive system rewards the input of documents and questions.
2. In addition to computer-based communication the knowledge community's face-to-face communication is supported deliberately.
3. A controlling instrument supervises the database's efficiency.

(1) An incentive system has been developed in order to make sure that enough data, information, and requests are put in, that an adequate amount of requests is answered and that the data is used. This incentive system is not only to reward the use of the database, but it is also

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<sup>12</sup> For the importance of participation in knowledge management see Rascher/Wilkesmann 2003.

meant to enhance the evaluation of the quality of the stored documents and the answers to the urgent requests. A guideline regulates the assignment of credit points, "Shares". Generally speaking, everyone who answers an urgent request receives three Shares. The questioner can evaluate the quality of the answer by giving up to five additional Shares. At the time of the survey these were multiplied by two in order to emphasize the importance of the qualitative evaluation. Up to 20 Shares can be assigned for the documents in the database. If one object is evaluated with zero Shares twice, it will be moved from the database into an archive. There it is still available. The author of the object will be informed about this measure. At a certain point in time all the Shares collected by one employee are converted into prizes. According to the number of Shares the following prizes are awarded: technical or economic literature, different new mobile phones, additional training offers and visiting a colleague/subsidiary with whom/which a lot of data was exchanged. In addition to the incentive of a vacation, face-to-face communication is to be supported. The extrinsic incentives are meant to increase the amount of data in the database to a critical level and to establish a mutual quality controlling. After the period under investigation had ended the credit point system was abolished again. As a critical amount of data and users has been reached, the system is to be maintained by the intrinsic motivation of the users in the future.

(2) In order to support face-to-face communication a second instrument was introduced as well: those 10 to 15 employees who have used the discussion forum a lot will be invited to a three-day workshop. There they can continue to discuss the topics they are most interested in, but especially they are to meet in person in order to build up confidence and to strengthen their interaction relationships. Thus relevant discussions are supported and the knowledge communities are stabilized.

(3) A controlling instrument for the database does also exist. It shows the turnover of products and projects which are organized with the help of the database. Every year new goal-agreements determine the turnover aimed at by the ShareNet-initiative as a whole.

The analysis of the online-questionnaire could make use of 271 adjusted records, of which 13% were filled in by women and 87% by men. 34,6% of the sample are people between 21 and 30 years of age, 43,1% between 31 and 40, 15,6% between 41 and 50, and 6,7% between 51 and 60. The distribution of age and sex reflects the population. The sample is representative in this respect.

It has to be kept in mind that the participants of the survey are sales managers, who are socialised on extrinsic incentives by their professional situation to a very high degree. This is the reason why so many extrinsic incentives have been created for the system, at least until a

critical amount was reached. Although there are many extrinsic incentives and although it is possible to generate intrinsic motivation, 19,3% have admitted that they act as free-riders, i.e. they take more information from the database than they put in. And 48,9% of all employees consider knowledge to be a power resource.

The question concerning the primary incentive for sharing knowledge in ShareNet (only one answer was possible) was answered as follows: 11,1% said that their main incentive was receiving Shares, i.e. a mere extrinsic incentive; 31,4%, however, said that they wanted to help their colleagues, an intrinsic motive. 13,7% considered the reciprocity to be most important, i.e. that they are able receive useful information as well. The primary extrinsic incentive for 7,4% is to be promoted and for 4,8% the social status. 29,9% answered that the company needed the effort of all employees in order to remain competitive; this is a mediated extrinsic incentive which refers to job security. (cf. table 1).

	I receive Shares	Our company needs our efforts to remain competitive	I can find useful knowledge as well	It's helpful for my career	It's helpful for my social status	I like to help my colleagues
%	11,1	29,9	13,7	7,4	4,8	31,4

N = 266

table 1: "What do you consider the primary incentive for sharing knowledge in ShareNet?"

The next step is to analyse the first hypothesis. Therefore a factor analysis is carried out with all the answers of those items concerning the scope for working with the database and those concerning motivation (cf. Backhaus et al. 1996: 190ff). The factor analysis helps to define indices (Schnell et al. 1995: 164). The assumption that the five core dimensions developed on a theoretical basis can be displayed forms the starting point. But in many analyses, which made use of the original questionnaire developed by Hackman and Oldham, it was not possible to display exactly these five factors (cf. Schmidt/Kleinbeck 1999 referring to a meta analysis, Dick et al. 2001, Kil et al. 2000 for individual analyses).

Therefore the main component analysis is chosen. The number of main components is defined by a value greater than one according to the Kaiser-criterion. A rotation following the "Quartimax-method with Kaiser-normalisation" makes it easier to interpret the main components. With a KMO-value of 0,7 and a stated variety of 58,8% the following main components can be distinguished:

The first main component has got a high value with respect to the items of task identity and feedback. Max Alpha<sup>13</sup> (Armor 1973) for this main component is ,690. These four items are

<sup>13</sup> When k is the number of items,  $\alpha_{\max} = k/(k-1)[1-1/\lambda_{\max}]$  with  $\lambda_{\max}$  is the highest value of the correlation matrix; cf. Büchler (1983: 78).

combined in the dimension of "task identity and feedback" as an additive index (Cronbach's Alpha ,791). The second main component has got a high value with respect to the items of autonomy and the item "I feel responsible for my assignment". As this item refers to the responsibility of each employee, it is part of the item of autonomy. Max Alpha for this main component is ,569. These four items have been combined in the dimension "autonomy" (Cronbach's Alpha ,568). The third main component has got a high value with respect to the two items of the dimension task significance and the item of the dimension skill variety "I was well trained with ShareNet" (max Alpha ,384). But here only the prerequisite for the experience of skill variety, not the variety in itself is included. These three items are combined in the dimension "task significance and skill variety" (Cronbach's Alpha ,409). The two items "I need a variety of specific knowledge and skills for my activities" and "I feel paid off fairly for my contribution to ShareNet" are not taken into consideration any further, because they have a high value with respect to different main components and hence it is not possible to interpret their arrangement (cf. table 1, appendix). This compression reflects the five core dimensions with a slightly different delimitation.

The factor analysis of the items referring to motivation (main component analysis without rotation)<sup>14</sup> – with a KMO-value of 0,6 and a stated variety of 74,6% - produced three main components: the first main component has got a high value with respect to the items of extrinsic incentives (max Alpha ,619). As could be expected, this main component had a highly negative value with respect to the items of intrinsic motivation. These two items are combined in the dimension of "extrinsic motivation" (Cronbach's Alpha ,778). The second main component has got a very high value with respect to those items which ask for intrinsic motivation indirectly by means of the crowding-out effect (max Alpha ,326). Both items are combined in the dimension of "intrinsic motivation" (Cronbach's Alpha ,509). The third main component comprises those employees who are motivated intrinsically and extrinsically (max Alpha ,047). As the last main component has got a high value with respect to only one item, which can neither be added to the extrinsic nor to the intrinsic dimension, it is neglected in the further analysis (cf. table 2, appendix).

In the course of the further analysis the newly created dimensions are the basis for calculations. The correlation between the dimensions of scope and of motivation brings about the following results (table 2): the core dimension of task significance correlates very positively – as expected – with intrinsic motivation and there is no correlation with extrinsic motivation.

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<sup>14</sup> A rotation according to the Varimax- and the Quartimax-method produces the same main components as the factor analysis without rotation.

Similarly, the dimension of autonomy correlates negatively – as expected – with extrinsic motivation, but there is no connection with intrinsic motivation. The reason for this is that intrinsic motivation is operationalized by means of the crowding out effect. The work autonomy does not have any connection to the crowding out effect. The correlation of the dimension of task identity and feedback is contrary to the expectations expressed in the hypothesis. It is connected negatively with intrinsic and positively with extrinsic motivation. Especially, the participants perceive goal agreements and feedback as extrinsic motivation which correlates negatively with the crowding out effect.

	M	SD	N	Cronbach's $\alpha$	1	2	3	4	5	6	7	8
1 task identity and feedback	3,38	1,40	258	,79								
2 autonomy	5,56	,73	260	,56	,197**							
3 task significance and skill variety	4,40	1,13	261	,40	,052	,210**						
4 extrinsic motivation	3,82	1,71	263	,77	,309**	-,309**	-,011					
5 intrinsic motivation	4,93	1,33	265	,50	-,363**	-,061	,331**	-,041				
6 support	6,38	,95	270		,238**	,284**	,057	-,172**	-,185**			
7 cooperation	6,20	,83	267	,66	,069	,197**	,250**	,042	,168**	,102		
8 seniority	3,94	,90	269		,011	,026	-,146*	-,086	-,098	,108	-,047	

\*\* Significant on the level of 0,01.

\* Significant on the level of 0,05.

table 2: Correlation of all dimensions

A multiple regression analysis following the simultaneous method "Enter" extends the connection between intrinsic motivation and the core dimensions of scope by further variables (table 4; cf. Backhaus et al. 1996: 9ff). The created dimension of intrinsic motivation is a dependent variable. Further variables are sex, country, and (company) seniority. These three variables have been integrated into the estimation because of the assumption that women interact less strategically than men (Eckel/Grossman 1998) and that they might therefore have greater intrinsic motivation. Cultural differences with respect to intrinsic motivation might exist as well and the period of employment might influence intrinsic motivation. It was possible to operationalize the potential cultural differences through the data of the countries, where the participants live. With respect to the period of employment it is assumed that those employees who have not been working for Siemens for a long time consider the situation and hence external factors to be most important, while the employees with a medium-term seniority are more likely to be intrinsically motivated. For those employees, however, who have

been with the company for a very long time work has become a routine and therefore they do not have intrinsic motivation any more. In order to test whether the groups of employees with a period of employment from zero to one year, from one to ten years, and with more than ten years differ with respect to their intrinsic motivation, a variety analysis with Duncan test is carried out (table 3; cf. Backhaus et al. 1996: 56ff). The test reveals that the second group of employees (with a seniority of one to ten years) differs from the other groups with respect to intrinsic motivation. This group of employees has been chosen as reference variable for the regression analysis. The first two variables (sex and country) do not have a significant influence on the intrinsic motivation, but the period of employment (in this case one to ten years) does.

Seniority	N	Intrinsic motivation		sub-categories for Alpha = ,05	
		average	SD	1	2
> 10 years	68	4,279	1,185	4,279	
0-1 year	19	4,578	1,227	4,578	
1 – 10 year	176	5,221	1,312		5,221
F		14,175			
significance		,000		,288	1,000

Duncan-test: uses an harmonic average for the size of the sample = 41,0; the sizes of the groups are not identical. The harmonic average of the group size is used. Error level of type I are not guaranteed.  
table 3: Variety analysis with Duncan-test: seniority and intrinsic motivation

Dependent variable: Dimension of intrinsic motivation		
	Beta coefficient	standard error
constant	(4,779)**	,622
sex <sup>x</sup>	-,032	,214
country <sup>y</sup>	-,028	,168
period of employment <sup>z</sup>	,176**	,162
task identity and feedback	-,311**	,058
autonomy	-,087	,104
task significance and skill variety	,348**	,068
R <sup>2</sup>	,296	
corrected R <sup>2</sup>	,278	
F	16,588**	
N	244	

\*\* Significant on the level of 0,01.

\* Significant on the level of 0,05.

<sup>x</sup> female = 0; male = 1

<sup>y</sup> Germany is the Reference variable, interaction effects have been tested

<sup>z</sup> Reference variable is a seniority between 1 and 10 years

table 4: Multiple linear regression: intrinsic motivation

As the dimension of intrinsic motivation has been operationalized only indirectly, the assumed connection is to be analysed with the help of the question presented above concerning

the primary incentive for sharing information. Therefore the variable is dichotomised into intrinsic motivation ("I like to help my colleagues") versus all the other primary incentives. A variety analysis with the dimensions of scope proves the previous results (table 5). The average value of intrinsic motivation is higher with respect to the dimensions of autonomy and task significance than with respect to the other incentives. It is the other way round with respect to the dimension of task significance and feedback. This can be proved by the interpretation that the missing correlation between autonomy and intrinsic motivation is due to the operationalisation through the crowding out effect.

	task identity + feedback	autonomy	task significance + skill variety
all the other incentives	3,531 (1,401)	5,504 (,803)	4,314 (1,161)
intrinsic motivation	3,108 (1,389)	5,705 (,533)	4,627 (1,027)
F	5,084*	4,332*	4,419*

N = 258

average on a scale of seven (Seven-Likert-Scale)

standard varieties in brackets

\* Significant on the level of 0,05.

table 5: Variety analysis: dependence of the primary incentive intrinsic motivation on scope

Thus the first hypothesis can only partly be confirmed. There is no connection between the dimensions of autonomy and intrinsic motivation (with respect to an indirect operationalisation through the crowding out effect). In addition, the relationship to the dimension of task identity and feedback is negative. But the dimension of task significance corresponds to the expectation expressed in the hypothesis.

For the second hypothesis the connection between the core dimensions of scope and of cooperative actions has been analysed. Cooperation has been operationalized as unconditional support ("I never hesitate helping colleagues with my experiences"), as the two general considerations of communication between co-workers and of sharing knowledge ("I consider communication among the co-workers just as crucial for me"; "Knowledge management tools improve the distribution of knowledge") and as strategic calculation ("Knowledge management tools will reduce the time which I spend finding important information"). A factor analysis following the main component analysis produced two main components with Quartimax-rotation (KMO-value ,62, stated variety 71,6%), with the first item producing the second main component ("support") (main component load ,948) and the other three items producing the first main component (main component load ,840; ,830 und ,631; max Alpha ,590; table 3, appendix). These three items are combined in the dimension "cooperation" (Cronbach's Alpha ,66). The results are presented in table 2. The core dimensions of task identity and feedback have a positive correlation with the support of colleagues, as does the dimension

of autonomy. The dimension of cooperation is correlated positively with the dimensions of scope, autonomy, and task significance.

Thus the second hypothesis can be confirmed for all dimensions of scope.

In this case study it is not possible to confirm the third hypothesis, because only thirteen participants said that the social status was a selective incentive for them. The perception of usefulness does not correlate with intrinsically motivated cooperative actions. The perceived usefulness, however, is slightly negatively correlated with the controlling aspect of external interventions ( $p = -,225$ ; significance ,000). Hence the third hypothesis has to be rejected for this case study.

### **3.3 Summary of the empiric results**

The first hypothesis has been confirmed with slight reservations. There is a connection between the dimension of task significance and the emergence of intrinsic motivation during the work with the database. The second hypothesis has been confirmed for all the dimensions of scope. A large scope of action supports acting cooperatively in passing on data and, consequently, in sharing knowledge. These results are also interesting because the participants in this case study are people who have been socialised in a culture based on extrinsic incentives. Nevertheless, only a small number of interviewees said that they were motivated by extrinsic incentives alone.

## **4. Negotiation processes to create structures that support self-governance**

The room for action and decisions described by the core dimensions does not come into existence by itself. It has to be created deliberately and thus it is a result of negotiation processes. In Germany, an important actor, who is part of these negotiation processes of work organisation by law, is the works council. Material results of these negotiation processes are company agreements. They regulate structures and procedures of certain problem areas. Knowledge management, however, was not a major part of the works councils' occupation. Many works councils still consider the problems of the shop-floor workers as their priority. Nevertheless, there have been considerable changes in recent times.

In autumn 2002 we made a survey among German works councils in large enterprises in order to prove this theory by empiric results. 397 of 1465 works councils answered and 320 of the questionnaires could be used, which is an amount of 24,84 %. The focus lay on two problem areas:

1. Which company agreements have been made with respect to knowledge management so far?
2. How does the works council evaluate knowledge management?

It is striking that the smallest number of company agreements has been made with respect to the highly critical area of the processing of skill profiles (table 6). It is very likely that the interests are most different in this area.

Kind of company agreement	yes	no	don't know
General regulations concerning data processing	81,9%	16,3%	1,9%
Processing of skill profiles	13,0%	78,7%	8,3%
Regulations concerning information and communication systems	70,4%	28,6%	0,9%
Competence databases / networks	28,1%	63,6%	8,3%
Development databases	19,7%	66,1%	14,1%
Regulations concerning training databases	29,6%	64,2%	6,3%

table 6: Company agreements concerning different areas of knowledge management

In order to measure the works councils' attitude concerning knowledge management two scales have been created: those items in favour of knowledge management ("The works council helped to introduce knowledge management measures on its own account. The works council was allowed to participate in knowledge management measures implemented by the employer. The subject knowledge management should be supported actively by the works council.") were combined in the dimension "in favour of knowledge management" (Cronbach's  $\alpha$  , 639). The two items asking for an opinion against knowledge management ("The participation of the works council in knowledge management project is futile. Knowledge management should not be treated by the works council."), have been combined in the dimension "against knowledge management" (Cronbach's  $\alpha$  , 587). The analysis reveals that the attitude is dependent on the perceived implementation of measures (table 7). This is not surprising, but it underlines the necessity to carry out change management measures in a sensible way.

	Evaluation of intra-company communication with marks (from 1 = excellent to 5 = unsatisfactory)	Evaluation of implementation of knowledge management measures carried out so far with marks (from 1 = excellent to 5 = unsatisfactory)
in favour of knowledge management	,181**	,380**
against knowledge management	-,068	-,029

table 7: Correlation between the dimension "attitude towards knowledge management" and the evaluation of intra-company communication and the implementation of knowledge management measures; (N = 264 – 278)

## Summary

It is not possible to organize knowledge management externally by simple instructions. Structures are necessary which lead to cooperative actions in the sense of passing on data and generating new knowledge together. This kind of self-governance can be supported by small groups without any power differences which make it easier to implement social norms or by those core dimensions which define a large scope according to Hackman and Oldham. Both structures are relevant for generating new knowledge. In small groups without any power differences it is possible to introduce a social norm which guarantees cooperative actions. Intrinsic motivation can also guarantee acting cooperatively. A large scope (described by Hackman and Oldham's core dimensions) supports the attribution of intrinsic motivation. Small groups are irrelevant for the area of storing and using data, because especially large groups are to be reached. Nevertheless, room for manoeuvre is important for supporting intrinsic motivation. The two hypotheses which postulate a connection between the amount of scope on the one hand and the attribution of intrinsic motivation or acting cooperatively on the other hand have been confirmed with slight reservations. Thus it can be proved that self-governance, which is defined by the structures called core dimensions in this case, makes autonomous actions possible and that it is a method to organize knowledge management in a reasonable way.

An important dimension of autonomy is temporal sovereignty, which has been defined as slowness here. A very tight schedule, which is predetermined externally, makes the generation of intrinsic motivation impossible and might even destroy existing intrinsic motivation, because it is perceived as external control.

Self-governance does not come into existence by itself, it is the result of an intra-company negotiation process. In Germany an important actor in this negotiation process is the works council. Its attitude towards knowledge management and, as a consequence, towards these negotiation processes which lead to company agreements depends on its experiences with the implementation of knowledge management measures. This fact underlines the importance of a participation oriented change management process.

Nevertheless, knowledge management will only succeed, if self-governance develops and the respective conditions for negotiation processes exist in the companies. Otherwise "graveyards" for knowledge and data will develop.

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**Appendix**

Variables	"communities" (final values)	main component 1: task identity and feedback	main component 2: autonomy	main component 3: task significance and skill variety	main component 4:
I need a variety of specific knowledge and skills for my activities	,575	6,049E-03	,298	8,215E-02	-,692
I was well trained with ShareNet	,686	,452	,167	,580	-,341
I feel sufficiently involved in the development of ShareNet	,703	,829	,109	-5,201E-02	3,005E-02
I feel responsible for my assignment	,678	,160	,776	-7,508E-02	-,212
I am involved in the efforts to improve ShareNet which effect my working place	,723	,845	-8,909E-02	-4,197E-02	-1,176E-02
My position at ShareNet is important for the company	,667	-7,391E-02	,208	,778	,113
My superiors or colleagues rarely give me feedback concerning the quality of my work	,515	-,269	-,274	,604	5,008E-02
I feel paid off fairly for my contribution to ShareNet	,545	,252	,353	,169	,573
I can decide to manage my tasks in a certain order	,619	,123	,764	-,138	2,797E-02
I have a clearly defined job description	,376	-1,541E-02	,520	,324	-6,279E-03
I'm able to manage all activities, which belong to my assignment to ShareNet	,489	3,979E-02	,495	,267	,413
I am included in specifying goal-agreements	,428	,641	,103	-5,433E-02	-6,288E-02
Working with ShareNet shows me how well I did – independently of my co-workers' and superiors' feedback	,652	,747	,131	-2,162E-03	,276
individual values and max Alpha		2,759 ,690	2,109 ,569	1,551 ,384	1,236 ,206

Extraction method: main component analysis

Rotation following Quartimax-Method with Kaiser-normalisation

Number of factors chosen according to Kaiser-criterion

KMO-value ,70

N = 247

table 1: Factor analysis of the items referring to scope

Variables	"communalities" (final values)	main component 1: ex- trinsic motiva- tion	main component 2: intrinsic motivation	main component 3
For stronger motivation the Shares should be increased regularly	,747	,781	,260	,263
Additional Shares encourage me to set higher goals	,781	,823	,259	,192
I believe that Shares motivate my colleagues to be more concerned about their own benefit	,740	-,404	,718	-,246
Instead of giving Shares my superiors should let me know how satisfied they are with my performance	,585	-,712	,157	,231
I am happy with receiving Shares as an additional reward, but however do not find it necessary to motivate me	,887	-,306	-,269	,849
If Shares are assigned the superiors have better control over my performance	,740	-,122	,790	,317
individual values and max. Alpha		2,066 ,619	1,373 ,326	1,041 ,047

Extraction method: main component analysis without rotation

Number of factors chosen according to Kaiser-criterion

KMO-value,60

N = 258

Rotations following Quartimax- and Varimax-method result in coordinated main components

table 2: Factor analysis of the items referring to motivation

Variables	"communalities" (final values)	main component 1: cooperation	main component 2: support
I never hesitate helping colleagues with my experiences	,899	3,445E-02	,948
Knowledge management tools improve the distribution of knowledge	,708	,840	-4,720E-02
Knowledge management tools will reduce the time which I spend finding important information	,695	,830	-8,203E-02
I consider communication among the co-workers just as crucial for me	,563	,631	,407
individual values and max. Alpha		1,794 ,590	1,072 ,089

Extraction method: main component analysis

Rotation following Quartimax-methode with Kaiser-normalisation

Number of factors chosen according to Kaiser-criterion

KMO-value ,62

N = 267

table 3: Factor analysis of the items referring to cooperation