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Human Resources Management and Knowledge Creation

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Recently, Peter Drucker stated that less than one fifth of the workforce nowadays are blue-collar workers doing manual work, while white-collar workers doing knowledge work make up two fifths of the workforce. Yet, when it comes to our understanding of a knowledge worker's productivity, we are "in the year 2000 roughly where we were in the year 1900 in terms of productivity of the manual worker" (Drucker 1999, p. 83). If companies could enhance productivity of knowledge workers in the 21st century as much as they did of manual workers in the 20th century, the payoffs would be astronomical.

This article will describe new ways of managing the human resources function in organizations of knowledge workers and how this can enable knowledge creation. To understand the task of introducing new human resource policies in knowledge worker organizations it is important to see how human resources management is still shaped to a large extent by ideas on how to manage *manual work*. In order to gain new insights on how to enhance the productivity of knowledge workers as dramatically as was the case with manual workers in the past, it is necessary to start by asking what are the main similarities and what are the main differences between traditional manual work and knowledge work in firms.

Similarities Between Manual and Knowledge Teamwork

Basically, all work inside firms – whether traditional work or knowledge work – is teamwork. The word "team" indicates that the employees are interdependent. Together, team members can produce a higher output than the sum of the separate outputs of each team member

working independently. This is just as true for manual workers jointly lifting cargo into a truck as it is for knowledge workers jointly designing a new software product. A team or a firm thus creates what is commonly known as synergy. The more effort exerted by one person, the more productive other members of the team become. Creating synergies is precisely what makes it advantageous to organize people in firms instead of depending wholly on market transactions (Simon 1991).

At the same time creating synergies constitute what is sometimes called a collective good. A collective good is a good that can be used by people who have not contributed their share to its production. This is the case in team production. When a product or service (a “good”) is produced by a team effort it is often impossible to know which of the members contributed to it and which did not. It is hard to determine what input each of the team members has contributed to the joint output. Some team members could freeride at the cost of others. The possibility of freeriders on a team can result in poor performance. While most team members would no doubt prefer to contribute their share to the team’s task, the suspicion that some may not can inhibit their contribution. Thus the purpose of the team – its potential to produce more than the members could individually – is not achieved. This problem is sometimes called a “social dilemma.” It characterizes situations in which the actions of rational and self-interested individuals lead to situations of collective irrationality in which everyone is worse off. A “tragedy of the commons” (Hardin 1968) may arise, which exemplifies the true meaning of a tragedy: Each team member is fully aware of the situation and realizes that their action leads to a negative outcome and “every team member would prefer a team in which no one, not even himself, shirked” (Alchian & Demsetz 1972, p. 790). Individuals would be happy to enjoy that good at the cost of their individual contribution, if there were a guarantee that everyone else would contribute their share. However, a rational selfish single person is unable to solve such dilemmas on his own. If all or most of the team members free ride, the collective good will not be achieved, or will at least be undersupplied. Synergies will not be created. This is the reason why solving social dilemmas is at the heart of human resources management in firms (Miller 1992).

The traditional solution in manual work to social dilemmas was to give supervisor the right to punish shirking. This is exactly what Frederick Taylor and Henry Ford preached. Owners or managers could oversee production workers and assess their individual productivity. A strictly horizontal and vertical division of labor – making it clear what each worker’s job was

– made supervision work. It enabled owners, managers or engineers to control the inputs and measure outputs of employees. Supervision includes all human resources tasks, in particular selection, instruction, observation of individual effort, sanctioning and rewarding, as well as adjusting the terms of measuring the productivity of individual workers. Does this traditional solution to solve social dilemmas work when manual work is replaced by knowledge work?

Differences Between Manual and Knowledge Teamwork

Most work is now no longer manual but knowledge teamwork. Teams are the fundamental learning units in modern organizations and there is increasing recognition that collective work in teams is the most efficient way of creating knowledge. Therefore it is vital to understand the differences in obstacles to overcoming social dilemmas in knowledge teams from those in manual teams. There are three main differences.

Firstly, in contrast to manual teamwork, pure knowledge work raises productivity of the team only if different knowledge is dispersed among different people (Hayek 1945). If all knowledge workers in teams have the same knowledge, one person could do the whole job almost entirely alone. This difference between knowledge teamwork and manual teamwork becomes quite clear if you compare a team of workers lifting cargo into a truck with a team of fashion designers. Fashion designers do creative work and need to integrate diverse knowledge about e.g. production processes, the garment, CAD software and marketing. If the team leader knows and learns what her subordinates know and learn, then she could create the design herself. If she does not know what their subordinates know, then she can neither monitor whether her subordinates have chosen the most productive activities nor whether they shirk. The only thing she can do is to evaluate whether certain professional standards are met. If the outputs are marketable products or modularized tasks, she could use and benchmark the team's output without understanding how the good was produced, just as you can use certain software without knowing how it works. But this does not help to prevent shirking by individual team members producing new software or new fashion designs. If the team's output is not measurable, the situation is even worse. An example is knowledge created within the fashion design team. To evaluate such knowledge, the supervisor must be an expert herself. But, if this is the case, teamwork will not produce much knowledge which exceeds

the supervisor's knowledge. As a result, knowledge workers in teams are in a good position to hide their expertise vis-à-vis their superiors (Davenport & Prusack 1998).

Secondly, the result of joint knowledge work is at least in part new explicit knowledge which can easily be disseminated and further developed by all members of the firm. This new knowledge is seen as the feedstock of competitive advantage. Nonaka and Takeuchi (1995), in their famous SECI-model, have clearly illustrated how organizational learning proceeds by integrating more and more tacit and explicit knowledge to become collective explicit knowledge. The access to this knowledge – for example knowledge that is collected in an electronic database – is unrestricted to members of the firm. It is a firm specific common good, while individual tacit knowledge is a private good which can be excluded from freeriders. If an employee makes his individual tacit knowledge explicit, he changes a private good into a common good. Why should he do that? By making his tacit knowledge explicit, he may gain some reputation, but at the same time lose his competitive edge. Sharing knowledge with colleagues may negatively affect an employee's ability to outperform them. In addition he enables his supervisor to monitor him more effectively. As a result, selfish knowledge workers in teams are not only in a better position, but they also have an incentive to hide their expertise vis-à-vis their superiors and colleagues.

Thirdly, knowledge workers have much more bargaining power vis-à-vis the owners or managers than manual workers. They cannot be easily replaced. Consider the example of the team of workers lifting cargo into a truck. These workers can be trained quickly and their skills can be easily transferred. They could be paid the going wage rates in a competitive labor market. In contrast, knowledge workers are a critical resource to the firm, because their abilities must be idiosyncratic to enhance the productivity of teams. This goes hand in hand with a changing balance of power between knowledge capital and financial capital (Rajan & Zingales 2004) Financial capital is crucial in traditional firms to exploit economies of scale of physical work. Today flourishing financial markets have made financial capital less critical as a source of power. Rather, knowledge capital has become the critical resource. The changes that have taken place are best summed up in the following statistic: In 1929, 70 percent of the top income earners came from holdings of capital. In 1998, only 20 percent come from capital and 80 percent from wages and entrepreneurial income (Fogel 2000, p. 219). In general, knowledge workers have gained considerable power compared to the owners of financial capital. Within firms, this power is dependent on the degree of knowledge specific to each

firm. It is true that this kind of knowledge makes the employee also more vulnerable to the employer. If the employer fires him, he not only loses his wage, but also a large amount of human capital he has built up. But if the employer threatens to do this, then the employee will “underinvest” in his firm specific knowledge without the employer being able to control this underinvestment efficiently. As a consequence, the competitive advantage of the firm will suffer.

To summarize, to the extent that teamwork contains knowledge work, traditional tools of human resources management built on supervision and control will fail. To raise productivity of knowledge teamwork, we have to look for new solutions to solve the inherent social dilemmas.

New Approaches for Human Resources Management of Knowledge Teamwork: Structural or Motivational?

Joint knowledge teamwork is crucial not only to enhance productivity by creating synergies, but also because it is the source of competitive advantages for the firm, which is hard to imitate. Today, there is a growing conviction among companies, researchers and consultants that joint knowledge work is the most important source of dynamic capabilities, which are unique and hard to imitate or substitute. What new solutions need to be found by human resources management in order for these goals to be fulfilled? How can social dilemmas be overcome and at the same time enhance the sources for sustainable competitive advantage?

The suggestions discussed for solving social dilemmas can be divided into structural and motivational solutions. Structural solutions change the rules of the game to make cooperation more attractive for selfish employees. These approaches are preferred by economists and human resources managers, who believe that compensation policy is the most important part of their job. Motivational solutions focus on the change of preferences of employees. They are preferred by social psychologists or human resources managers, who believe that preferences are not given but are plastic. They can be altered by the work content itself as well as by the work environment.

Structural solutions

Activating the "shadow of the future": The most influential proposal for solving social dilemmas is to extend the shadow of the future by long-term, reciprocal relationships (Axelrod 1984). A "win-win" situation may arise. However, it is often disregarded that this strategy only works on condition that individuals have information as to how the other persons behaved in the past. The more team knowledge is dispersed and tacit, the less this strategy is likely to be applicable.

Selective incentives: A selective incentive is a private good (e.g. a bonus) given to individuals as an inducement to contribute to a common good. All firm members may have access to the electronic database, but only contributors receive a reward. However, selective incentives raise two problems. Firstly they increase costs, and secondly you might subsidize hot air. Take the case of a reward for contributions made to an electronic database. As a result, you might get a high number of contributions with little value. If you count the downloads, the value of the contribution might work. However, it might also happen that the contributors induce their colleagues to download their contributions. You have become the victim of "the folly of rewarding A while hoping for B" (Kerr 1975) This is true in particular for knowledge work. Knowledge work contains some easy to measure components (e.g. pages of written text) and some hard to measure components (e.g. the importance of a text). Reward systems have to concentrate on few clear cut criteria. As a consequence, rational employees will focus on the easily measurable components and leave aside the components that are not so easy to measure.

Profit Centers: One frequently discussed structural solution to social dilemmas is to decentralize decision authority into profit centers or modules so that internal market forces can do their work via (transfer-)prices. The leader of the profit centers could then be remunerated according to measurable criteria. However, there are some problems with knowledge work organized as profit centers. Firstly, the leader of the profit centers has no incentive to share knowledge voluntarily with other profit centers, because then she would be giving away strategic opportunities for free. This is especially true for tacit knowledge. The transfer of tacit knowledge can be less well monitored compared to the transfer of explicit knowledge (Osterloh & Frey 2000). Secondly, the sources of hard to imitate competitive advantages will be undermined. In order to be able to bargain over (transfer-)prices and service level agreements across the boundaries of profit centers, some tacit knowledge must

be made explicit. As a consequence, the knowledge incorporated in the profit centers may become more tradeable and imitable (Chesbrough & Teece 1996).

To *summarize*, structural solutions might mitigate some problems of joint knowledge work. But the more the knowledge is complex and dispersed between employees the more structural solutions even worse the problem. In these cases structural solutions must be replaced by motivational solutions.

Motivational Solutions

As Simon (1991, p. 31-32) stated, “in most organizations, employees contribute much more to goal achievement than the minimum that could be extracted from them by supervisory enforcement...”. This makes clear that motivation is a main factor inside of firms. This is true for manual work as well as for knowledge work. A highly motivated workforce keeps costs of supervision and monetary incentives low. But as far as knowledge work is concerned, “management by motivation” (Frey & Osterloh 2002) might not only save costs, but become the most important factor in sustaining a competitive advantage. As tacit knowledge is the main source of inimitability, and its creation and transfer cannot be monitored and remunerated accordingly, motivation and, in particular, intrinsic motivation are the keys to dynamic capabilities as a foundation of long-term strategy.

Extrinsic and Intrinsic Motivation

Two kinds of motivation can be distinguished: Extrinsic and intrinsic motivation. In reality, pure extrinsic motivation and pure intrinsic motivation are extremes on a continuum.

Extrinsic motivation serves to satisfy indirect needs, for example money. As such, money is almost always the means to an end – for example, paying for a vacation or buying a car – and not an end in itself. In this instance, a job is simply a tool with which to satisfy one’s needs by means of the salary it pays. Structural solutions focus mainly on extrinsic motivation. As discussed, they can mitigate social dilemmas, but cannot solve it with knowledge work.

Intrinsic motivation works through immediate need satisfaction. An activity is valued for its own sake and is undertaken without any reward except the activity itself (Deci & Ryan 1985).

Intrinsic motivation is fostered by commitment to the work, according to the saying “If you want people motivated to do a good job, give them a good job to do”. If employees are motivated intrinsically, then shirking is not a preferable action, because the activity causes a benefit instead of a cost. The social dilemma disappears and a “win-win” situation arises. There are two kinds of intrinsic motivation: enjoyment based motivation and prosocial motivation.

Enjoyment-based intrinsic motivation refers to a satisfying flow of activity. Examples are skiing, playing a game, reading a good novel, climbing a mountain or solving an interesting puzzle. In each case, pleasure is derived from the activity itself and not by the compensation. During such activities, people often report a “flow experience”(Csikszentmihalyi 1975) that makes them lose track of time. The individual acts as a “homo ludens” (Huizinga 1986), the playful human being. Recently, in one of the most innovative industries – the software industry – this kind of motivation turned out to be crucial. One of the most successful kinds of software is open source software like Linux, which has become a serious competitor of Microsoft. It is produced voluntarily as a public good that everybody can download from the Internet. This is done to a large extent without monetary compensation and private intellectual property rights. Important contributors to open source software, like Linus Torvalds, report that they are doing the programming “just for fun” (Torvalds & Diamond 2001). A “flow experience” is often reported by all kinds of creative work.

Prosocial intrinsic motivation takes the wellbeing of others into account without expecting a reward. The welfare of the community enters into the preferences of the individuals. A wealth of empirical evidence demonstrates that many people are indeed prepared to contribute to the common good of their company and community (Frey 1997). Individuals feel better if they have observed group norms like ethical standards, professional codes of practice, or norms of fairness, reciprocity or team spirit. Empirical work shows that due to different group norms substantial differences exist in shirking between branches of a company, despite identical monetary incentives (Ichino & Maggi 2000). Two major instances in real life have been discussed, which both include sacrificing individual interests for the sake of the whole company.

- *Voluntary rule following.* People are prepared to follow rules and regulations that limit their self-interests without sanctions, as long as they accept their legitimacy (Tyler & Blader 2000).

- *Extra-role behavior.* Employees do not only observe rules voluntarily, but also exert “organizational citizenship behavior” (Organ & Ryan 1995). They provide voluntary inputs, going far beyond the duties stipulated in their employment contracts. “Extra-role behavior” is thought of as a “willingness to cooperate”. Of particular interest are helping behavior, organizational compliance and “whistle blowing” if rules of conduct are violated, e.g. in the recent corporate scandals. “Whistleblowers” disclosed malpractices to their bosses and risked the costs of being punished or even dismissed.

Laboratory experiments also reveal that a large number of people voluntarily contribute to common goods (see the survey by Rabin 1998). They show that a large number of people are willing to punish unfair behavior at a cost to themselves. It is important to note that these laboratory experiments have found, that there are considerable variations across different cultures (Henrich et al. 2001). This indicates that prosocial motivation is not “hardwired”. It can be changed by institutional measures. It is the most important task of human resources management to provide such measures.

How to Foster Intrinsic Motivation

It is more difficult to guide intrinsically motivated persons to work according to the particular goals of the firm than to guide persons who work mainly for monetary compensation. Firstly, intrinsic motivation cannot be enforced. It can only be enabled. Secondly, firms are not interested in enabling some kind of intrinsic motivation; say the pleasure of reading a novel during office hours. In contrast, extrinsic rewards can easily focus the motivation of employees on the firm’s goal. However, some measures, which strengthen extrinsic motivation to induce them to pursue the firm’s goals, weaken intrinsic motivation. The question arises how human resources management can induce the kind of intrinsic motivation that is required.

Self-determination theory offers an answer (Deci & Ryan 2000). According to this theory, the preconditions of being intrinsically motivated for a certain job are autonomy, feelings of competence and social relatedness. Interventions of human resource management have to question whether they crowd in (increase) or crowd out (decrease) intrinsic motivation by increasing or decreasing these three preconditions.

Autonomy

Autonomy is the most important precondition for creativity, complex problem solving and conceptual work (e.g. Amabile 1998). A well known example how to enhance productivity by enlarging autonomy is 3M (Gundling 2000). 3M is one of the most innovative companies: 30 percent of their sales come from products new to the market. It has introduced the famous 15 percent rule. 3M employees are allowed to spend 15 percent of their time on individual research or initiatives. At the beginning of each innovation process – in the so-called “doodling phase” - management tends to be absent. In addition, 3M has established a strong culture of camaraderie.

The perception of autonomy decrease if people perceive that their self-determination is reduced, when doing an intrinsically interesting activity. People feel that they are not the origins of their behavior. Their attention shifts from the activity itself to the reward or sanction. The content of the activity loses its importance. Note, that this is only the case if the individuals were intrinsically motivated in the first place. Only then this motivation can be undermined. In contrast, in situations where no intrinsic motivation exists in the first place, monetary rewards can increase performance, like simple manual work on an assembly line. Lazear (1999) provides an empirical example. He found that, in a large auto glass company, productivity increased from between 20 percent to 36 percent when the firm switched from paying hourly wages to piece rates. Knowledge teamwork is very different from that kind of jobs.

The crowding-out phenomenon has been firmly established by numerous laboratory and field experiments (for an overview, see Frey & Jegen 2001). An impressive field experiment shows that monetary rewards can undermine prosocial motivation. Gneezy & Rustichini (2000a) analyzed the behavior of school children collecting money voluntarily, i.e. without monetary compensation (e.g. for cancer research or disabled children). The children reduced their efforts by about 36 percent when they were promised a bonus of one percent of the money collected. Their effort to collect for a good cause could be raised when the bonus was increased from one to 10 percent of the money collected, but they did not reach the initial collection level again. This field experiment shows clearly that there are two countervailing forces affecting behavior: a crowding-out effect of rewards and an effect of motivating the children extrinsically after the intrinsic motivation has been decreased. It also shows that a

“hidden cost of rewards” exists. The money collected after having been given a bonus comes at a high price compared to strengthening intrinsic motivation.

Feelings of competence

Feelings of competence grow when individuals understand what they are doing and when they feel responsible for the outcome. Researchers have shown that when people are encouraged to feel that they are competent they make a greater contributions to the community (e.g. Kollock 1998). But there are two important preconditions:

Firstly, individuals must get positive feedback about the outcome of their contributions that does not eclipse their feelings of autonomy. Feedback on outcomes only strengthens intrinsic motivation if it is perceived as supporting rather than controlling. This condition makes feedback-processes one of the most important measures of human resources management, and at the same time makes it the most difficult measure to handle.

- On the one hand, feedback about outputs or processes can be supplied by supervisors, team-leaders, or peers only if there are measurable outputs, or if there is a sufficient overlap of knowledge between them. As we have argued, fulfilling these conditions with knowledge teamwork sometimes comes at a high price. If team leaders are only able to control some easy to measure task components, then the “the folly of rewarding A while hoping for B” will arise. Too much overlap of knowledge will decrease the productivity of creating new knowledge. In these cases, human resources management must rely on other tools, in particular giving the employees a feedback about having observed professional or social norms.
- On the other hand, if it is possible to get efficient feedback from the supervisor, they must be very careful not to act in a controlling way. This explains why the crowding-out effect is stronger with monetary rewards than with symbolic rewards, and why the effect is greater with expected rather than with unexpected rewards. Experiments show that if labor contracts are regarded primarily as a “gift exchange” (Akerlof 1982) rather than as a disciplining tool, then employees exert more effort. In a telling experiment, two different settings were compared. In the first setting, the “principals” offered a fixed amount of money and the “agents” chose an effort level. In the second setting, the principals had to make a choice between a fixed wage and a piece rate scheme and then the agents chose their effort level. In this setting efforts were higher

when fixed wages were offered compared to the case when piece rates were offered. Also, in the case of fixed pay agents mentioned the well being of the principal significantly more often than in the case of piece rates (Irlenbusch & Sliwka 2003). The social norm of reciprocity, which worked in the fixed pay setting, was crowded-out in the piece rate setting. This provides a strong argument for fixed wages whenever intrinsic motivation is crucial.

Secondly, individuals must believe that their participation is important for the provision of the common good. Then they ask, “What happens if I stop contributing?” When people believe that their actions will have a discernible effect on the value of the common good, they will be more likely to contribute to it. There are two ways which enhance responsibility for the outcome (Cabrera & Cabrera 2002). One way is to give *informational feedback* whenever other team members have received and used the posted contributions. It is important not to link such information to monetary rewards to avoid the “the folly of rewarding A while hoping for B” and the crowding-out effect. Rather, the rewards should be symbolic. An example would be to honor an employee with an award for helping behavior which is made visible widely. The second way to improve perceived impact on the value of the common good is by supplying *training* for the providers as well as the recipients of information. People might not get feedback on their contributions for two reasons. They might not know which information is most valuable for others and how they could present it effectively. Or the possible receivers might not be able to use efficient knowledge sharing systems or electronic databases. In both cases, training can increase responsibility for the collective outcome.

Social relatedness

Perceived social relatedness is of special importance for prosocial motivation. It raises group identity that has proven to have a strong impact on the amount of contributions to common goods (e.g. Kollock 1998). Human resources management has a variety of measures to enhance social relatedness and group identification.

Distributive fairness. The more people feel they are treated fairly, the more likely they are to identify with a group. Fairness can be divided into distributive fairness, procedural fairness, and fairness of contributions to a common good. Distributive fairness concerns whether people believe that outcomes or rewards are allocated to people in a justified manner. Empirical evidence shows that people are less concerned about what they earn in terms of absolute income, compared to what they earn relative to their close colleagues (Adams 1963).

Different fairness norms exist under different conditions. In settings when performance varies considerably between individuals and is easy to measure, *equity* according to individual outcomes is the prevailing criteria. As already mentioned, individual performance is hard to measure where knowledge work in teams is concerned. In such situations, *equality* is often considered to be fair. In close social settings, such as families or close-knit groups, the norm of *need* is often applied. Elements of need are also found in work settings, for example when supplements to wages are paid according to the number of children. In any case, what matters is not fairness in an objective sense, but rather what employees *perceive* to be a fair distribution. A lot depends on cultural, occupational and demographic factors and may vary across industries. Human resources management has to find out empirically which fairness norms prevail in which subsets. Whatever criteria is applied, one can suppose that the exorbitant salaries paid to top managers, as was recently revealed in the media, were perceived as extremely unfair. When superiors resort to feathering their own nests, it is no wonder that, under such conditions, employees are no longer prepared to contribute to the common good of the firm, e.g. by reporting colleagues whose behavior is not acceptable or by revealing knowledge voluntarily to the community and thereby giving up a competitive edge (Frey & Osterloh 2005).

Procedural fairness. While distributive fairness is related to outcomes, procedural fairness is related to the process leading to the outcome. Empirical evidence shows that procedural fairness impacts the willingness to contribute to common goods and to follow rules more than distributive fairness. This is true even in situations that are not favorable to one's own self-interest (Tyler & Blader 2000). The characteristics that lead to perceived procedural fairness can be summarized as participation, neutrality, and being treated with dignity and respect. *Participation* gives individuals a process control or the use of voice. It has been found that the use of voice is not just dependent on controlling outcomes; people value the opportunity of expressing their views. As a consequence, in cases of conflict, mediation has proven to be perceived as a fairer procedure than formal trials. Mediation typically provides greater opportunity for participation than formal procedures. A precondition of *neutrality* is the belief of employees that their superiors do not allow personal advantages to enter their decision-making. In laboratory experiments, it was shown that sanctions that served the punisher's self-interests crowded out cooperative behavior, whereas sanctions perceived as prosocially motivated enhanced self-interests (Fehr & Rockenbach 2003). It follows that supervisors and team leaders, who lay down the rules and regulations, should not be given an incentive to

manipulate the corresponding criteria in their own favor. In management, the exact opposite took place in recent times: the top executives were given the opportunity to manipulate the criteria by which they were evaluated and compensated (Osterloh & Frey 2004). Under these circumstances, it is difficult to maintain neutrality. Human resources management should not only be committed to rules of neutrality, but also make this commitment part of their written policy. *Being treated with dignity and respect* has proved to be of high importance for organizational citizenship behavior, including helping behavior, altruism and extra role behavior (Niehoff & Moormann 1993). Note that all three characteristics of procedural fairness (participation, neutrality and being treated with dignity and respect) are essentially unrelated to outcomes. Therefore, procedural fairness is crucial in situations which might lead to unfortunate results for the employees, e.g. in resolving conflicts or making decisions concerning promotions.

Conditional Cooperation. A third form of fairness is related to contributions to common goods. The more people expect others to contribute to common goods, the more likely they are to do so themselves. They are conditional cooperators. On the other hand, many people are conditional defectors. As a consequence, prosocial intrinsic motivation deteriorates if too many people freeride. No one likes being the only one who contributes to a good cause and being a “sucker”. This is shown by overwhelming empirical evidence (e.g. Fischbacher, Gächter & Fehr 2001). It follows that an employee’s inclination to cooperate is undermined if he feels that his colleagues don’t pull their weight, which is often not observable in knowledge teams. Therefore, Human resources management should be aware of the importance of protecting the company from malefactors in the workforce and should give prosocial preferences more weight in the selection process. This is important because a higher number of prosocially motivated employees increases conditional cooperation.

Personal contacts. Communication, or other conditions reducing social distance between persons, increases contribution in public good games (Ledyard 1995; Frey & Bohnet 1995). Communication has two important effects. Firstly, experiments show that most people, after some minutes of talking to each other, have higher expectations of others’ cooperative behavior. If they believe that others do not freeride, their willingness to contribute increases (conditional cooperation). This effect is much stronger when communicating face-to-face than when communicating via the computer. Secondly, communication provides an opportunity to invite other individuals to cooperate. It has been shown that being personally asked enhances contributions to collective goods greatly. These results might be summarized in such a way

that the less the situation approximates to a competitive market, the more pro-social behavior is likely to be observed. The growing role that “communities of practice” and “epistemic communities” play in knowledge-based industries underpins the significance of personal contacts and communication (Orr 1990; Lave and Wenger 1991). Many large companies, like Microsoft, Xerox, or Daimler Benz, have realized that the kind of communities that are based on communication and personal contacts foster not only creativity but also social relatedness and identification within the group.

Instructions. People seem to be inclined to do what they are asked to do, especially when the request comes from someone who is perceived as a legitimate authority. Instructions to cooperate in public good games raise the cooperation rate as much as 40 percent (Sally 1995). In real life settings, it is shown that people adhere to rules and accept the decisions of authorities they believe to be legitimate, even if it is not in their own self-interest to do so (Tyler 1990). This is contrary to what economists have taught us. They instruct people that it is clever to behave as a selfish homo oeconomicus, rather than risk appearing foolish or naïve. As a result, people behave in a selfish way: economics have to some extent become a self-fulfilling prophecy. Interestingly enough, most people overestimate the power of self-interest to affect the behavior of others, even when their own behavior was not primarily self-interested (Miller & Ratner 1998). Human resources management can stop this self-fulfilling prophecy by providing employees with information about existing social norms and social behavior in their company and in their community. In addition, there could be public recognition and (non monetary) awards for helpful and caring behavior, as is the case with the company 3M.

Framing of socially appropriate behavior. People are highly sensitive to signals about socially appropriate behavior. This became evident in an experiment. Players were divided into two groups. Each group played exactly the same game. The first group was told they were going to play “the Wall Street Game”. One third of the group cooperated. The second group was told that they were playing “the Community Game”. More than two thirds cooperated (Lieberman, Samuels & Ross 2003). A strong framing effect was also shown in a field study, with parents being fined for picking up their children late from a childcare center. The fine had an adverse effect: it led to a significantly lower level of punctuality. When the fine was discontinued, punctuality remained at the lower level (Gneezy and Rustichini 2000b). Fining switched the frame from a prosocial frame to a gain frame. The fine indicated that in the gain frame, it was socially acceptable that parents arrive too late. A similar affect

can be assumed with pay for performance. It signals that doing one's duty without extra pay is not socially appropriate. This signal could become a self-fulfilling prophecy. As a consequence for human resources management, variable pay with knowledge work might be dangerous. Fixed pay, based on fair overall procedural evaluations, avoid framing the teamwork into the "Wall Street Game".

Conclusions

Knowledge worker productivity is the biggest challenge of the 21st century, in particular for developed countries. Making knowledge workers more productive, and contributing to a sustainable competitive advantage, requires profound changes in the thinking of human resources management. What are the main differences between principles of human resources management for manual and knowledge work?

- ***Pay for performance has had its day!***

As soon as knowledge work is prevailing in teams, pay for performance loses the status of "management mantra" that it achieved during recent years. Variable performance pay

- crowds out intrinsic motivation, which is needed for efficient knowledge creation in teams when supervision and control fail;
- shifts attention from the activity to the reward;
- undermines pro-social behavior by providing a frame which tells employees that doing one's duty is not socially appropriate;
- hinders the flow of knowledge between individuals and teams because employees are provided with incentives not to give up their competitive edge;
- subsidizes hot air with complex tasks by the "folly of rewarding A while hoping for B";
- decreases competitive advantage of knowledge work.

- ***Strengthen autonomy, competence and social relatedness!***

As pay for performance is no longer a remedy to solve social dilemmas in knowledge teamwork, it is important to strengthen feelings of autonomy, competence and social relatedness. The following measures are of particular importance:

- a. fixed pay based on overall evaluations which, in the first place, have to be perceived as procedurally fair;
- b. selection of intrinsically and prosocially motivated employees to make sure that conditional cooperation works;
- c. supportive feedback that does not eclipse feelings of autonomy;
- d. training for the providers and the recipients of knowledge to strengthen perceived efficacy;
- e. providing opportunities for personal contacts and communication;
- f. giving instructions about appropriate social behavior and avoiding gain frames in favor of normative frames of behavior.

Some of these proposals clash with conventional wisdom but, based on existing research in economics and psychology, they promise to effectively raise the productivity of knowledge workers. At the same time they give knowledge work a hard to imitate competitive advantage.

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