WORK TEAMS FOR KNOWLEDGE MANAGEMENT: THE IMPORTANCE OF A SUITABLE CLIMATE

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Abstract

This study defines the construct of team atmosphere and provides a framework within which causes and consequences of team atmosphere in knowledge transfer and creation can be empirically investigated. Data were collected using a survey of 363 individuals of 12 companies who worked in self-managed teams. As predicted, results indicated that a 'high care' atmosphere among team members favours both the transfer and the creation of knowledge. Findings also showed that certain management initiatives foster this type of atmosphere. The study concludes with some recommendations for future research in this area.

Descriptors: knowledge management, self-managed teams, climate, team atmosphere.

Introduction

Knowledge has become the most important asset in economic life. Unlike physical assets, which have been traditionally considered the basis of competitive advantage, knowledge assets are the source of today's organisations to outdo their competitors (Miller and Shamsie 1996). On the basis of these facts, many organisations aiming to strengthen those management practices which allow them to generate and protect their knowledge, have abandoned their traditional operative structures. In this context, the 1990s saw a noticeable increase in one of those practices; namely, the establishment of self-managed teams (Cohen and Ledford 1994; Goodman et al. 1988; Kirkman and Rosen 1999; Kirkman and Shapiro 1997, 2001; Kirkman et al. 2001; Nicholls et al. 1999; Trist et al. 1977; Wall et al. 1996; Wellins et al. 1990). These are non-hierarchical work groups responsible and accountable for outcomes in the organization (Moravec et al. 1998). According to Lawler et al. (1995), 68

percent of the *Fortune* 1000 have made use of this type of teams, which is nowadays a widespread practice.

In their review of the literature on self-managed teams, Kirkman and Rosen (1999) mention various advantages associated with the use of these teams, including higher performance outcomes (productivity, pro-activity, and customer service), and higher attitudinal outcomes (job satisfaction, organizational commitment, and team commitment). Although these types of advantages may explain the increasing use of self-managed teams, this rise can also be justified from the perspective of knowledge management. In fact, organising work in this way can lead to one of the traditional benefits of teamwork: knowledge transfer among team members, an advantage that is most beneficial when individuals posses some idiosyncratic information relevant to the other members of the firm (Lazear 1998).

All these virtues and advantages of teamwork seem to provide a compelling reason to group individuals together in self-managed teams. However, criticism and negative aspects associated with these teams are beginning to appear (Gibson and Tesone 2001). Along these lines, it has been said that they do not always achieve the desired improvement in performance (Chaston 1998). Furthermore, team members may display some reluctance to share knowledge (Moravec et al. 1997). Both problems are connected. If the different members of the team do not share their knowledge, the overall team performance will deteriorate.

These problems indicate that self-managed teams, although widely used, do not always produce positive results. Only under certain conditions will the desired knowledge transfer take place. Literature has mentioned several of these conditions. Pfeffer (1999) states that

team members need to participate in the selection of new members, enjoy job security, and be rewarded by means of group incentives (for example, profit-sharing, gain-sharing). Baron and Kreps (2000) and Cabrera and Cabrera (2002) argue that, in order to overcome the individual's reluctance to share knowledge, appraisal and professional development policies must be modified in such a way that rewards are not only awarded to those who produce, but also to those who exchange ideas and share their knowledge.

These initiatives, among others, are considered to generate a favourable atmosphere within the group, one in which individuals are encouraged to share and create knowledge. This climate has been defined in various ways: Lawler (1992) called it 'high involvement'; Von Krogh (1998) speaks of 'high care'. In any case, such a climate is frequently thought of as a 'black box'. We know it is important, but we do not know which specific dimensions it may have. Therefore, one of the major empirical challenges facing researchers lies in explaining and assessing the contents of the 'black box' to study the relationship between initiatives and knowledge outcomes. Although some studies have tried to analyse this, they were mostly carried out in the context of non-profit making organisations (e.g. Sarason 1985; Foner 1995; Noddings 1984). The fact is that there is no empirical evidence analysing it within the context of profit making organisations.

In this work, we aim to unlock the black box and fill this empirical gap. Drawing on the knowledge management literature, we begin by offering an integrated model which identifies both a collaborative climate, essential to encourage knowledge transfer and creation, and the organisational initiatives aimed at promoting it. Next, we will test this model on a large sample of self-managed teams in various multinational companies. To be more specific, our

aim is to provide an empirical model which can help companies identify the key factors ifluencing effectiveness of knowledge transfer and creation in self-managed teams.

Team atmosphere for knowledge sharing and creation

As we know from Adam Smith, companies exist because, to a large extent, working together is more productive than working as individuals. The philosophy of self-managed teams consists in acknowledging and implementing this fundamental premise of economic science. These teams are non-hierarchical groups of individuals with different and complementary skills and perspectives (Lazear 1998), responsible and accountable for the organization outcomes (Wageman 1997). Collective knowledge requires the transfer and integration of the individuals' knowledge (Hedlund 1994; Nonaka and Takeuchi 1995; Grant 1996a, 1996b, 1997, 2001) and although it ultimately resides in the individuals, it amounts to something more than the sum of its members' individual skills and abilities (Becker and Murphy 1992). No single individual can be actively involved in all the activities designed to improve and innovate the collective work process. Only through co-operation can this process be developed and improvements and innovations made (Grant 1996b; Swan et al. 1999).

Collective knowledge is not only more appropriate in many cases, but also more strategically interesting than the merely individual type of knowledge (Barney and Wright 1998). In the case of a company depending on the work or innovations of individuals occupying highly visible positions, there would be a loss of competitive advantage should they decide to switch companies and work for the competitors. If the company wishes to retain them, it will have to do so by increasing their salary to match the value of the rents they generate, which means losing these rents (Wright et al. 1994). On the other hand, when work and innovations are the result of teamwork, the competitive advantage is better protected. Moreover, given that the

team's output is greater than the sum of its members' individual outputs, it is difficult, if not impossible, for competitors to identify the specific source of the team's success (there is causal ambiguity). Furthermore, success might result from trust and good relationship among members, which is a complex social asset that takes time to build and is not transferable to other organisations. In such circumstances, competitors may choose to contract the entire team. However, team effectiveness could also be ascribed precisely to its unique background or its special relationships with other teams. These are specific assets that cannot be acquired in the market. In other words, causal ambiguity, social complexity, and the specificity associated with collective knowledge of self-managed teams represent an advantage which is more difficult to imitate than mere individual work or innovations.

Although working and innovating in a group seems to be more appropriate than doing so on an individual basis, it involves a higher degree of complexity, for it has the potential to create a situation where knowledge sharing is hampered. Along these lines, it has been suggested that the problems facing teams in which knowledge has to be exchanged and shared can be conceptualised as social dilemmas (Cabrera and Cabrera 2002). In these situations, the interests of individual members of a group are at odds with the collective interest of that group (Van Lange et al. 1992), forcing individuals to choose between either self-interest or collective interest. The problem of public goods is a particular social dilemma reflecting the situation of knowledge sharing in teams. A public good is a shared resource, made up of the voluntary contributions of some of the members of a collective, and from which all its members benefit, whether they have contributed to it or not (Connolly and Thorn 1990). These assets can also work as incentive for some members to take advantage of the collective. In fact, if everybody contributes and shares their knowledge except for one, then this member will benefit from collectively generated knowledge. On the other hand, if there is only one

person who contributes and shares, the situation could well result in a series of costs (loss of power, position of privilege, job, etc.) with no benefits in return. In that case, non-contribution becomes the dominant strategy, where no type of collective knowledge is generated (Cabrera and Cabrera 2002). From a sociological point of view, this might explain the problems associated with the reluctance of some members of self-managed teams to share their knowledge, already mentioned in the introduction.

This problem could also be explained from an economic perspective. Consistent with the typical public goods framework, this perspective is based on hidden information or voluntary provision (Ray and Vohra 2001). Economic research on teamwork has typically focused on the 'free-rider effect' as one of the potential teamwork problems: members who reap direct benefits from the group effort with no contribution of their own (Lazear 1998). If no mechanism are implemented to avoid this effect, the other team members will probably reach a stage when they might consider it more profitable to act accordingly and, consequently, it will have an adverse effect on the group's overall performance (Kandel and Lazear 1992).

A co-operative solution of social dilemmas and the non-appearance of free-riders require a certain team atmosphere. For example, it is alleged that Japanese firms have been successful because of their prevailing team atmosphere (Freeman and Weitzan 1987). If this atmosphere does not exist, then interpersonal co-operation, essential for the generation of true group knowledge, will not take place. What are the characteristics of this type of collaborative atmosphere or relationship?

The literature on knowledge management has described this atmosphere as one of true internal collaboration among group members (Miles et al. 1998) that goes beyond mere

communication and information exchange among them (El Sawy et al. 1997). It has been labelled in various ways. Lawler (1992) defines it as 'high involvement', while Von Krogh (1998) calls it 'high care'. It amounts to the 'mental' element of what Nonaka and Konno (1998) call a *shared organisational context* for knowledge transfer and integration, including both physical components (e.g. offices) and virtual components (e.g. e-mail).

In the artistic arena, we can also find examples that offer some clues about the type of relationship between collaborators. Jorge Luis Borges, one of the few writers who has worked in collaboration, says in his autobiography:

> 'I have often asked myself how one manages to write in collaboration. I think that it requires both parties to forget about ego, vanity, and perhaps even courtesy. Collaborators must forget about themselves and think only in terms of work. In fact when someone asks whether this joke or that epithet came from me or from Bioy, I honestly don't know. I've tried to collaborate with other friends, some of them very close, but, on the one hand, the inability to be frank, and on the other, the self-defensive front we tend to put up made those projects impossible' (Borges 1999: 121).

Borges' text highlights the different dimensions of the climate created in collaboration: to think in terms of work, to avoid defensive shields, to forget courtesy, to maintain a certain emotional relationship with the collaborator (in his case, friendship), etc.

Switching from the artistic arena of Borges' text to that of business literature, we will also find a series of dimensions which, although more systematic and detailed, are quite similar to those of the Argentine writer. Von Krogh (1998), based on Mayeroff (1971), declares that high care will be present in the team as long as the following premises exist:

- Mutual trust. The belief that the other members of the team have the abilities of absorption (Cohen and Levinthal 1990) and retention (Zaltman et al. 1973). These abilities are both necessary to assimilate and apply the new knowledge being transferred to them (Szulanski 1996). This belief must coincide with the recipient's certainty of the transmitter's good intentions and abilities.
- Active empathy. Putting oneself in the other's place, understanding 'emotionally' his/her particular situation, interests, and level of skills, background of success and failure and future opportunities and problems. As Nonaka and Konno (1998) state, empathy will make people feel free when sharing their feelings, experiences, and mental model.
- Lenience in judgement. Judgements and opinions about the other members' actions or ideas should be offered tactfully. This means taking into consideration the context in which any particular action was performed, or an opinion given, as well as the member's background and psychological state etc. In other words, offering constructive feedback.
- Courage. Team members must be able to express their opinions fearlessly. In that way, individual mental models will continuously be shared and opinion givers will, in turn, make an effort to analyse and reflect on them (Nonaka and Konno 1998).
- Access to help. Team members must be willing to share their knowledge. As Von Krogh (1998) states, the lack of this willingness is one of the fundamental problems facing organisations as regards knowledge sharing. This can usually be explained by a fear of losing the position of power or privilege associated with the exclusive possession of certain knowledge.

In the light of these considerations, we can establish our first hypothesis as follows:

H1. A certain atmosphere in the work team favouring mutual trust, active empathy, lenience in judgement, courage, and access to help (*i.e.* high care) facilitates knowledge transfer and creation in the team.

Initiatives for building a high care atmosphere

As Nonaka and Konno (1998) have pointed out, when academics and business people refer to knowledge management they often mean information technology. Research evidence confirms this statement. According to a survey by KPMG in 2000 (Cabrera and Cabrera 2002), 62 percent of the main companies in Europe and the USA are taking initiatives to facilitate knowledge transfer and creation in and between work teams. However, most of these initiatives are focused on the virtual component, with little regard for the atmosphere, or mental component, in which the teams work. The virtual component includes, for example, the different technology-based information systems (e.g. Intranets, data warehousing, DSS, Lotus Notes, etc.) provided by the company to enable the exchange of explicit knowledge. These findings are consistent with those of Ernst and Young in 1997 (Ruggles 1998). This company carried out a study of 432 European and US organizations in order to find out what measures were being implemented to manage knowledge. The study showed that most of these companies started by introducing technological capacity. Only after they had done so did they consider the human factor to be essential.

This dominance of technological initiatives comes as no surprise if we bear in mind that, according to the survey by KPMG, most knowledge management systems are run by the information processing department rather than the human resources department. This reflects the assumption that the problem of knowledge exchange is of an essentially technical nature.

Nevertheless, information technology alone, sophisticated as it may be, cannot make the members of a self-managed team embark on collaboration and the exchange of knowledge and experiences. Considering the social dilemmas and the free-rider effect associated with work teams, information systems, unless accompanied by other initiatives, create an incentive for non-co-operation and for some individuals to take advantage of the situation. Let us imagine a self-managed work team whose members have to issue reports, available to all employees (a public good), and one of the members is not willing to collaborate. Applying the logic explained above, non-contribution would be the dominant strategy leading to the under-utilisation of the information system, and consequently, knowledge transfer would be hampered. In other words, initiatives based on information systems and technology may be a necessary condition, but they are certainly not enough to share and create knowledge. We must consider the psychosocial context which makes knowledge transfer an easy, or else a difficult, task: this is the context we try to capture in the climate variable.

Supposing that a high care atmosphere were the variable essential to knowledge transfer and creation in work teams, it would be interesting to know what specific initiatives the company could undertake to achieve that climate. In this respect, the literature on knowledge management mentions many practices and initiatives favouring knowledge transfer and creation in work teams (Pfeffer 1999; Baron and Kreps 2000; Cabrera and Cabrera 2002). Although such initiatives are designed to create a collaborative climate, the 'black box' seems to remain unexplored thus far. For example, a system of appraisal and promotion rewarding individuals who share and disseminate their knowledge is said to foster an encouraging climate. However, we do not know which specific dimensions are affected (is it access to help, courage, or which other?) This means that, based on the literature, we can establish a series of empirically supported hypotheses about the specific dimensions of high care affected

by these initiatives. It is not our intention, nevertheless, to analyse the importance of each one of these, instead, we wish to lay emphasis on those usually highlighted in the literature, which are the following:

a) *Team Leader.* The figure of the team leader seems to be an extremely powerful mechanism whose influence on knowledge transfer has been widely analysed. The main task of the leader is to co-ordinate and focalize the different viewpoints found within the work team (Leonard and Strauss 1997; Leonard and Sensipier 1998). In addition, and following Eppler and Sukuowski (2000), team leaders must provide real and virtual spaces for communication, as well as guidelines for the team. Their function is to serve as a model to the collaborators, and so, they should be prepared to share information openly, put themselves in the others' shoes, provide constructive feedback and show all those attitudes and behaviours associated with a climate of 'high care'. We can now establish the second hypothesis:

H2. The presence of a leader actively involved in the team favours a high care atmosphere.

b) *Reward systems linked to knowledge sharing.* Reward systems indicate the organisation's values and so they shape the individuals' behaviour (Cabrera and Bonache 1999). Traditional systems seem to reward those who produce rather than those who share. Therefore, if an individual is rewarded (through promotion, for example) for what he knows in relation to his colleagues, he is being assessed for competence against the rest and, consequently, sharing and disseminating could have a high cost to the individual.

Hence, our aim is to lower the cost of sharing, or similarly, to increase the benefits associated with this type of behaviour. Along these lines (e.g. Baron and Kreps 2000; Hilb 2001), we can state that group incentives, promotion systems encouraging individuals to be more

collaborative, and 360º appraisal systems are some of the practices that help create a suitable climate for knowledge transfer and creation. Therefore, our third hypothesis is the following:

H3. Reward systems linked to knowledge sharing favour a high care atmosphere in the work team.

c) *Teamwork Training.* Reward systems will have little effect on the members of a team if they lack the capacity to co-operate with one another. Appropriate training is essential to develop the capacity to co-operate and show the behaviours typical of a collaborative atmosphere. Offering constructive feedback, presenting ideas openly, understanding the viewpoints of the other members, etc. are some of the skills to be acquired and developed through a suitable training programme. Enhanced capability is not the only benefit obtained through training (Lazear 1998). The organisation, in turn, would realise the importance of sending signals indicating the need to share and create knowledge. A corporate culture focused on this objective would thus be strengthened, as well as the employees' commitment to achieve this goal. In the light of these benefits, we can establish the following hypothesis:

H4. Teamwork training favours a high care atmosphere in the work team.

d) *Social events.* Informal communication networks favour both explicit and implicit knowledge sharing (Hedlund 1994). The outstanding example of the importance of this aspect is that of the American semiconductor industry (Sanexian 1991; Braun and McDonald 1982; Almeida 1996). The culture of intraregional communication and mobility among the companies in that industry led to sharing knowledge locally, which in turn made all the companies involved undergo a process of continuous innovation (Almeida 1996). Switching these experiences to the context of a company organised into work teams, we can identify social events, both informal (e.g. having coffee together during breaks or a drink after work)

and formal (e.g. parties and dinners organised by the company) as an effective initiative to create a high care atmosphere. On these grounds, we can establish the following hypothesis:

H5. Social events in the company favour a high care atmosphere in work teams.

Figure 1 summarises the hypotheses we wish to support in this research.

[Figure 1 about here]

Methodology

The method chosen to support our hypotheses was a survey carried out by means of self-reported questionnaires. A questionnaire was sent by post or e-mail to each of the participants. We guaranteed the confidentiality of individual survey responses, emphasizing that study participation was voluntary. A pre-test was run on one of the teams in the sample. This initiative allowed us to improve some of the questions and arrive at the final version of the questionnaire. Questionnaire statements are included in the appendix.

Universe and sample size

The universe under study comprised individuals belonging to medium and large companies located in Spain who worked in self-managed teams. Team members were chosen as respondents since they are best prepared to report accurately on the actual climate existing in their work team and the extent to which knowledge is shared and created. This is consistent with the call of Wright et al. (2001) about attending to the information processsing requirements of survey completion to aim the measures at a level that will permit respondents to feasibly provide reliable and valid information. Hence, our aim was to measure individual perceptions concerning the focal constructs.

After contacting various firms which organise the work, either partly or totally, in teams, we received the response of twelve companies which agreed to collaborate. These were mostly multinational companies operating in Spain. These companies are: Alcatel España, S.A., Alstom España IB, S.A., C.A.S.A., Canarias Telecom, ENBS-Empresa Nacional Santa Bárbara, Ericsson España, S.A., Fasa Renault, Gas Natural de Álava (GASNALSA), Iberdrola, Red Eléctrica de España, S.A., Renfe, and Seat, S.A. All of them offered the participation of part of their workforces. After a six-month fieldwork (from November 2000 to April 2001,) the participation of 363 individuals was obtained, giving a sample error of 5.2 percent.

Employees were asked to provide demographic information as part of the self-report questionnaire. Information regarding age, length of teamwork experience, and education level was required. Most of the respondents (73 percent) had at least three years of teamwork experience. The largest age group was between 35 and 50 years old (48 percent), the remaining 52 percent being almost equally divided between those under 35 and those over 50. 45.3 percent of the respondents had completed high school, and 27 percent had graduate degrees. The remainder was almost equally split between primary education and college degrees.

Measurements

Transfer and creation of knowledge

Five items were used to measure knowledge transfer and creation in the work team. Respondents answered on a seven-point Likert scale (1=strongly disagree, 7=strongly agree). Other studies (e.g. Kirkman and Rosen 1999; Stewart and Barrick 2000) use similar techniques to measure team results. A sample item is: ‘In my work team, I have learnt new

things from my colleagues that only they knew'. This scale showed acceptable reliability (*alpha* = 0.74).

Team atmosphere

Drawing on Von Krogh's model, we developed 10 items to measure the degree of high care in the work team. Using a seven-point Likert scale, the respondents indicated the extent to which they agreed or disagreed with 10 statements regarding active empathy, lenience of judgement, members' courage, mutual trust, and access to help in the work team. A sample item is 'In my work team, I try to understand the problems and difficulties facing my colleagues while they are doing their work'. Although this measure of high care has not been used in past studies and neither its reliability nor its validity have therefore been assessed before, it seems to have good face validity with respect to the construct under consideration. The reliability of the scale proved acceptable (*alpha* = 0.85).

Initiatives designed to build a high care atmosphere

Drawing on a review of previous research on the main initiatives designed to build a suitable atmosphere for knowledge transfer and creation (Pfeffer 1999; Baron and Kreps 2000; Cabrera and Cabrera 2002) together with some examples of items used to measure some of these initiatives (Gerhart et al. 2000; Delery and Doty 1996), we developed a total of 12 items to measure the four initiatives under study.Using a seven-point Likert scale, respondents were asked to indicate the extent to which there was a team leader or coordinator actively involved in their work team (4 items), a reward system linked to knowledge sharing (4 items), whether the company offered any teamwork training (2 items); and whether there were any social events in the company (2 items). A sample item for the first initiative is: 'The leader or co-ordinator of my work team encourages a climate of trust and co-operation among its

members'. Scales showed factor validity and acceptable reliability (*alphas* were all between 0.5 and 0.8; see Table 1).

Analytical procedures

The data were analysed in three phases. In phase 1, we conducted two exploratory factor analysis, one for the items of team atmosphere, and one for the items of knowledge outcomes, to assess the underlying structure of these constructs. In phase 2, we conducted correlation and multiple regression analyses to test hypotheses regarding direct relationships. In phase 3, we conducted a hierarchical regression analysis to assess the relative importance of each management initiative designed to build a high care atmosphere.

Exploratory factor analyses

An exploratory factor analysis (under 'varimax' rotation) was carried out to know the underlying structure of the high care construct. Contrary to our expectations, the 10-item measure of team atmosphere did not resolve into five factors. They resolved into three separate factors with eigenvalues greater than 1.0 and explaining a total of 70 percent of the variance. The first factor, comprising 3 items with high loadings, included items from the first two dimensions (active empathy and lenience in judgement). The second factor, comprising 4 items with high loadings, corresponded to the courage dimension. The third factor, comprising 3 items with high loadings, included items from the two remaining dimensions (mutual trust and access to help).

Also contrary to our expectations, and after carrying out another exploratory factor analysis (under 'varimax' rotation), the 5-item measure of knowledge outcomes resolved into two separate factors with eigenvalues greater than 1.0 which accounted for a total of 60 percent of

the variance. The first factor, comprising 3 items with high loadings, consisted of team behaviours reflecting a high degree of knowledge sharing within the team. The second factor, comprising 2 items with high loadings, reflected more creative forms of team behaviour. We labelled the first factor 'knowledge transfer' and the second, 'knowledge creation'.

Table 1 shows the correlations and reliabilities for the study´s variables.

[Table 1 about here]

High care and knowledge transfer and creation

To test the impact of the overall team atmosphere on knowledge outcomes, we created a high care atmosphere index. This index was calculated from the weighted average of the three extracted factors. To test for relationships between team atmosphere and knowledge outcomes, we examined correlations since relationships consisted of only two variables each. Team atmosphere was significantly related to both knowledge transfer ($r = 0.327$, $p < 0.001$), and knowledge creation ($r = 0.366$, $p < 0.001$). Thus, Hypothesis 1 was supported.

However, to examine the relationship between high care dimensions and knowledge transfer and creation, we conducted two multiple regression analyses, one for knowledge transfer and one for knowledge creation, as dependent variables. In both of them, we entered all three dimensions simultaneously into a regression equation as predictors. Table 2 shows the results obtained. These results indicated that both knowledge transfer and knowledge creation were significantly related to the three dimensions of team atmosphere.

[Table 2 about here]

Management Initiatives and High Care

To test the relationship between management initiatives and team atmosphere, we decided to examine correlations since relationships had only two variables each. Team atmosphere was significantly related to team leader (r = 0.335, p < 0.001), reward systems (r = 0.278, p < 0.001), teamwork training (r = 0.246, p < 0.001), and social events (r = 0.415, p < 0.001). Moreover, with the exception of teamwork training, all management initiatives were significantly related to every team atmosphere dimension (see table 3). Thus, Hipotheses 2, 3, and 5 were fully supported. Hipothesis 4, however, received only mixed support.

[Table 3 about here]

We have also conducted a hierarchical regression analysis to assess the relative importance of each management initiative designed to build a high care atmosphere. To check for multicollinearity, we included measures of tolerance, which indicated the absence of multicollinearity. The overall team atmosphere index was the dependent variable. Table 4 presents the regression results, including *beta* weights, adjusted R^2, changes in R^2 between steps of the regression, and significance levels. In the regression, both social events (Step 1) and team leader (Step 2) resulted in significant changes in R^2 at p < 0.001. However, the insertion of the reward variable (Step 3), and the training variable (Step 4) resulted in statistically insignificant changes in R^2. Thus, the social events and team leader variables as predictors of team atmosphere are more powerful than reward systems and teamwork training. It is also worth noting that the low proportion of explained variance of high care can be accounted for by the non-inclusion of other type of initiatives in our model.

[Table 4 about here]

Conclusions

Contrary to the assumption that knowledge management is a technical problem which can be easily solved by introducing an efficient information system, this study, taking self-managed teams as a reference point, highlights the importance of the psychosocial variables to understand the dynamics of knowledge exchange and creation. As predicted, a 'high care' atmosphere among team members favours both the transfer and the creation of knowledge. From that perspective, our findings provide empirical backing for a fact that has been widely highlighted in the recent literature on knowledge management (*e.g.* Nonaka and Konno 1998; Moravec et al. 1997; Von Krogh 1998).

Besides corroborating prior theoretical work, we have also revealed the contents of team atmosphere, a variable that literature has considered a kind of 'black box', difficult to discover and analyse (Von Krogh 1998). Nonaka and Teece (2001) state that '[...] because of the poor state of knowledge about knowledge management, it is important at this stage to generate new ideas and frameworks rather than focus on the rigorous testing of hypotheses'. However, without minimising the importance of delving into the theory of knowledge management, our study highlights the need for empirical studies to refine the purely theoretical discussions. More specifically, we show how team atmosphere can break down into three independent dimensions: (a) active empathy and lenience in judgement; (b) courage; (c) mutual trust and access to help. To express it in knowledge management jargon, we have adopted an empirical approach which allows us to make explicit what has been tacitly assumed in previous models, and to avoid analysing something as a whole when it is in fact made up of different components, which can be analysed separately.

Also as predicted, the four traditional initiatives for knowledge transfer and creation (i.e. leader or coordinator actively involved in the work team, reward systems linked to knowledge sharing, teamwork training and social events in the company) favour a suitable team atmosphere. They all have a significant effect on high care. However, our results suggest that these initiatives may be differentially important for the different high care dimensions, and on recognizing these differences, some practical implications emerge. For example, teamwork training influences mainly individuals´courage as well as active empathy and lenience in judgement in the work team, but it does not affect mutual trust nor access to help. Similarily, social events in the company especially favour active empathy and lenience in judgement among the work team members. Such evidence has significant practical implications, since it shows that not all initiatives are equally adequate to foster a certain dimension of team atmosphere. Organizations seeking to address particular aspects such as individuals´courage or problems associated with low access to help within the team should first identify what initiatives should be taken. In any case, additional research must be undertaken to detect other possible initiatives which could affect these three dimensions of climate. As discussed earlier, our goal was not to provide a complete list of such initiatives, but rather to include them within our model.

Results from our hierarchical regression analysis suggest that the figure of a leader actively involved in the team and the organization of social events in the company are the most relevant factors to enhance a collaborative team atmosphere. Respondents perceived a high care atmosphere determined by these soft mechanisms rather than by training and rewards. This is an interesting result for us, considering the strong emphasis placed on extrinsic rewards as a basis for team atmosphere found in the literature. Freeman and Weitzman (1987) argue that the prevailing team atmosphere in Japanese firms is determined by their

compensation system. Although additional research is required, these findings suggest the need to avoid the temptation to try to build a team atmosphere by merely focusing on explicit initiatives such as rewards and training. Practitioners should pay equal, if not more, attention to the other two initiatives, namely the figure of a team leader and social events organised by the company.

Several limitations of this study should be noted. A significant one is its unit of analysis. We recognize that the group rather than the individual would have been a more adequate unit of analysis. This is the approach followed, for example, by Kirkman and Rosen (1999) in their study on the antecedents and consequences of team empowerment. However, this approach could not be adopted in our study since we only had data from 21 complete teams. This is the reason why we have used individual level measures. In this sense, it should be noted that these findings are to be interpreted as individual perceptions of the proper team atmosphere for knowledge sharing and creation. In future, researchers should employ group measures to determine more conclusively the extent to which the team atmosphere affects the transfer and creation of knowledge in self-managed teams.

A second limitation is the general issue of measuring the team atmosphere. Our scales represent a new measure. New measures must be interpreted cautiously until a sufficient psychometric method can be established. Moreover, in such complex and fuzzy issues as team atmosphere and its connection with knowledge outcomes, the combined use of qualitative and quantitative measurements might prove to be productive. An empirical work combining both types of approaches represents an interesting challenge for further research in the area.

A third limitation refers to the set of initiatives considered. The low proportion of explained variance of high care suggests that perhaps other initiatives are also likely to affect team atmosphere and therefore have an impact on knowledge transfer and creation. The implication for future research is the potential need to provide a more complete inventory of management initiatives. Finally, as research has shown (Hofstede 1980), team work spirit is highly affected by national culture. The fact that our sample is limited to Spanish teams clearly constrains our ability to draw conclusions about the impact of team atmosphere on knowledge management in the rest of the world. From this point of view, replicating this research in other countries or in cross-cultural teams could be a very enlightening undertaking.

To sum up, this study makes an empirical contribution to the eminently theoretical literature on knowledge management in work teams. This is only an initial step in this direction, but it is nevertheless a crucial one, for it defines the construct of team atmosphere and presents a framework within which causes and consequences of team atmosphere in organizational settings can be weighed up. It is our hope that the above shortcomings will spur others to initiate more empirically oriented research on knowledge management in self-managed teams.

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Appendix

CONSTRUCT	ITEMS (Statements on the questionnaire)	VARIABLES
Transfer and creation of knowledge	• In my work team, I have learnt new things from my colleagues that only they knew. • In my work team, I have shared knowledge and experiences from my past (in this company or in others) that only I knew. • In my work team, it is normal that, as a result of ideas contributed by a member, we have related ideas that we had never considered before, and which we go on to develop.	*Knowledge transfer*
	• My work team has come up with idea/s for improvement that the company has subsequently put into operation. • In my work team, we have generated many improvements on the traditional way of doing things	*Knowledge creation*
Team atmosphere	• In my work team I try to respect and understand what the other members need. • In my work team, I try to understand the problems and difficulties facing my colleagues while they are doing their work. • In my work team I m sincere in expressing my opinions about the work of my colleagues	*Active empathy and lenience in judgement*
	• In my daily work, I try new ways of performing my task, even if they are wrong at times. • In my daily work, I make suggestions to my colleagues about how to improve their work. • In my work team, I have no difficulty expressing my opinions. • In my work team, I have the freedom to experiment with new ways of performing the tasks.	*Courage*
	• My colleagues in the work team are valuable people with good intentions. • In my work team, when I offer help to others, I trust that they will be able to understand and use my ideas in the best possible way. • In my work team, my colleagues are not reluctant to share their knowledge and experience.	*Mutual trust and access to help*
Team leader	• The leader or co-ordinator of my work team stands out for his/her knowledge of the task we are carrying out. • The leader or co-ordinator of my work team is involved in the task we are carrying out as a member of the team. • I can obtain from the leader or co-ordinator of my team all the information I need to carry out my day-to-day work. • The leader or co-ordinator of my work team encourages a climate of trust and co-operation among its members.	*Team leader*
Reward systems linked to knowledge sharing	• A variable part of my salary is based on my colleagues' assessment of the extent to which I co-operate with them. • The salary of the team leader partly depends on the results that the team achieves. • A significant part of my salary is due to the overall results of my team. • My company reward and compensates those team members who help their colleagues to improve and develop.	*Reward systems linked to knowledge sharing*
Teamwork training	• I have received training about developing, presenting and defending new ideas in my team, how to help the others and about other aspects of working in a team. • My company attaches much importance to training to work well in a team.	*Teamwork training*
Social events	• I normally have informal meetings with my team mates and/or other work teams both in working hours and outside the workplace. • My company usually organises social events where we can have a drink after work, even parties and dinners that most employees attend.	*Social events*

Figures y tables

Figure 1. Establishment of hypotheses

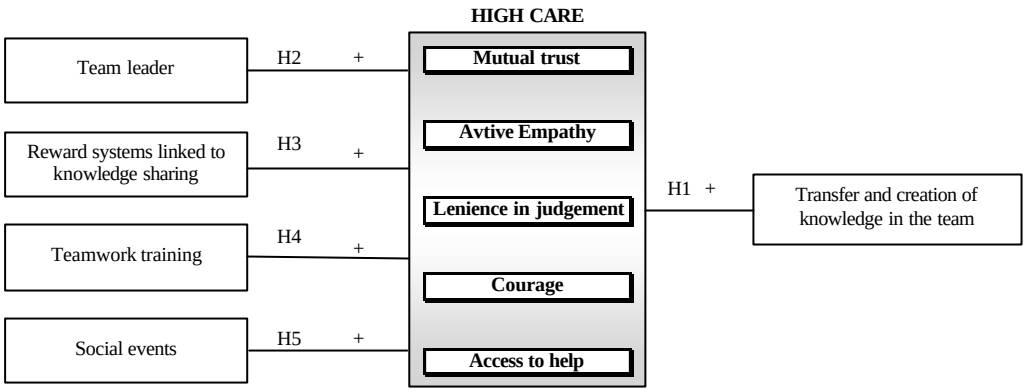

Tabla 1. Cronbach's Alphas and Correlations[a]

	Variables	**Alpha**	1	2	3	4	5	6	7	8
1.	Team leader	0.81								
2.	Reward systems linked to knowledge sharing	0.68	0.242***							
3.	Teamwork training	0.55	0.181**	0.312***						
4.	Social events	0.51	0.284***	0.526***	0.403***					
5.	Active empathy and lenience in judgment	0.84	0.219***	0.223***	0.190**	0.352***				
6.	Courage	0.75	0.122*	0.147*	0.214***	0.177**	-0.001			
7.	Mutual trust and access to help	0.75	0.415***	0.129*	0.068	0.141*	0.003	-0.035		
8.	Knowledge transfer	0.73	0.370***	0.259***	0.233***	0.367***	0.160**	0.298***	0.358***	
9.	Knowledge creation	0.61	0.239***	0.234***	0.101	0.242***	0.302***	0.173**	0.122*	-0.010

[a] N = 363 ; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Table 2. Relationship between high care dimensions and knowledge transfer and creation

	Dependent variable			
	Knowledge transfer		Knowledge creation	
Independent variables	*$*	*t*	*$*	*t*
Active empathy and lenience in judgment	0.159	3.196**	0.301	5.640***
Courage	0.311	6.246***	0.178	3.324**
Mutual trust and access to help	0.368	7.387***	0.128	2.387*
Adjusted R^2	0.243***		0.129***	

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Table 3. Relationships between management initiatives and high care[a]

Variables	1	2	3	4	5	6	7
1. High care							
2. Active empathy and lenience in judgement	0.918***						
3. Courage	0.338***	-0.001					
4. Mutual trust and access to help	0.196***	0.003	-0.035				
5. Team leader	0.335***	0.219***	0.122*	0.451***			
6. Reward systems linked with knowledge sharing	0.278***	0.223***	0.147*	0.129*	0.242***		
7. Teamwork training	0.264***	0.190**	0.214***	0.068	0.181**	0.312***	
8. Social events	0.415***	0.352***	0.177**	0.141*	0.284***	0.526***	0.403***

[a] N = 363 ; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Table 4. Relative importance of each management initiative designed to build high care atmosphere

	Dependent variable	
	High Care	
Independent variables	*$*	*t*
Step 1		
Social events	0.415	7.718***
)R^2	0.172***	
Step 2		
Social events	0.348	6.393***
Team leader	0.236	4.347***
)R^2	0.051***	
Step 3		
Social events	0.321	5.142***
Team leader	0.231	4.218***
Reward systems linked with knowledge sharing	0.053	0.864
)R^2	0.002	
Step 4		
Social events	0.291	4.493***
Team leader	0.225	4.122***
Reward systems linked with knowledge sharing	0.041	0.665
Teamwork training	0.093	1.616
)R^2	0.007	
Adjusted R^2	0.221	

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$