

Asian Academy of Management Journal, Vol. 18, No. 1, 55–74, 2013

CLIMATE IN SOFTWARE DEVELOPMENT TEAMS: ROLE OF TASK INTERDEPENDENCE AND PROCEDURAL JUSTICE

M. P. Ganesh

*Department of Management Studies
Indian Institute of Technology (IIT) Madras, Chennai-600036 India
E-mail: mpganesh@iitm.ac.in*

ABSTRACT

The objective of the study is to understand the role of task interdependence and procedural justice in influencing climate in software development teams. Data was collected from 192 software professionals from 33 software development teams. Team climate was measured using Team Climate Inventory by Anderson and West. Procedural justice was measured using a scale developed by Colquitt. Pearce and Gregersen's scale was used to measure task interdependence within the team. Teams were taken as the unit of analysis. Regression was used to study the moderating and main effects. Results showed a positive impact of task interdependence on all the sub dimensions of team climate. Procedural justice had a positive effect on two sub-dimensions of team climate (participatory safety and support for innovation). Perception of procedural justice also helped to improve the positive effect of task interdependence on the members' perception of support for innovation within their team.

Keywords: Software development teams, team climate, procedural justice, task interdependence

INTRODUCTION

Flexible team structures are considered an effective alternative to more rigid, centralised structures. Team-based organisational structures are highly recommended to better manage environmental components, particularly in the current turbulent business environment (Mohrman, Cohen, & Mohrman, 1995), as work teams provide flexibility and specificity in handling different stakeholders and can, accordingly, improve organisational effectiveness. However, it is unwise to treat team-based structures as the sole answer to all of an organisation's structural and strategic issues. The success of team-based structures as effective alternatives to other structures largely depends on the way the teams are designed and managed. Accordingly, understanding the role of various technological, procedural and interpersonal factors with respect to the efficiency of the team is the first step in the effective design and management of work teams. Identifying the factors and mechanisms that influence the efficiency

of the work team has been a focus of researchers and practitioners for many years.

A review of the academic literature shows that, in the recent past, work teams have been one of the most extensively studied areas in organisational behaviour literature (Bettenhausen, 1991). More specifically, empirical studies on work groups increased dramatically in the 1990s (Sundstrom, McIntyre, Halfhill, & Richards, 2000), and most of the recent research focuses on work group effectiveness and related factors. Effectiveness can be defined as the degree to which an organisation/entity realises its goals (Etzioni, 1964). In the context of work teams, the goals can go beyond measurable productivity and related standards and can include softer dimensions, such as cohesion, learning and integration (Hackman, 1987). These softer dimensions reflect the positive climate of a team. With respect to a project-based team, such as a software development team, climate can play a crucial role in improving team performance. Therefore, it is imperative to understand the factors that influence the climate within the team. Though few of the earlier studies have examined the climate of software development teams (e.g., Fagan, 2004), there exists no empirical literature on the effect of task- and process-related variables on the climate of software development teams. Therefore, the research problem in this study is to examine the impact of task- and process-related factors on the climate of software development teams.

RESEARCH OBJECTIVE

With this background, the primary objective of the study is to understand the role of task interdependence and procedural justice in influencing the climate of software development teams. The study also aims at understanding the moderation effect of the perception of procedural justice on the relationship between task interdependence and team climate.

LITERATURE REVIEW

The following section provides a description of the variables used in the study and discusses the important literature pertaining to those variables.

Team Climate

The concept of team climate has been an area of focus for applied psychologists and organisational sociologists for the past three decades (Anderson & West, 1998). The concept of team climate is approached both as the individuals' cognitive representations of their proximal environments (James & Sells, 1981) and as the shared perception of the team processes (Reichers & Schneider, 1990).

Team climate relates to the manner of working together that the team has developed, and accordingly, it can include several different aspects, such as communication patterns, participation, safety, norms, cohesiveness, task style, vision, and innovativeness (Anderson & West, 1994).

Anderson and West (1994, 1998) have worked extensively on climate within teams and have developed a scale to measure team climate. According to their studies, climate within the team can be measured using four dimensions, namely, vision, participatory safety, support for innovation, and task orientation.

Vision

This dimension denotes the collective perception of a "valued outcome which represents a higher order goal" (West, 1990, p. 310). The collective perception of a vision within the team may result in team cohesiveness, a factor that acts as a strong motivator for team members as they strive to achieve goals and cooperate with each other. The presence of a shared goal also provides a sense of direction to the team. According to Anderson and West (1994), team vision has four subdimensions: clarity, perceived value, attainability, and sharedness. Clarity refers to whether the goals are succinctly and directly stated. Perceived value is the extent to which members feel that the goals are worthwhile. Attainability is the extent to which the goals are realistic and achievable. Sharedness denotes the level of agreement among team members in terms of the team goals.

Participatory safety

This dimension denotes an "interpersonal, non-threatening environment" that is characterised by trust and support among members. Accordingly, such an environment can motivate members to be more engaged in the team decision-making processes (West, 1990). When team members perceive that other members are non-judgmental and open, they are more willing to share information and express their opinions, (Anderson & West, 1998). The Team Climate Inventory measures participatory safety using four sub-dimensions, namely, information sharing, safety, influence and interaction frequency. Information sharing denotes the extent to which team members feel comfortable sharing information within the team. Safety denotes the extent to which the team feels safe to take risks. Influence is the degree to which members positively influence team decision-making. Interaction frequency refers to the extent to which members interact with the other members of the team.

Support for innovation

This dimension denotes the expectation, approval and practical support available for team members to introduce new and improved ways of doing things within the team (West, 1990). Support for innovation within the team can be reflected in

two forms, namely, articulated support and enacted support. Support is articulated through personnel documents or policy statements, or it can be conveyed by word of mouth (Anderson & West, 1998). On the other hand, enacted support is the actual support offered to members by members through verbal encouragement, the availability of resources, the freedom to take risks, and so forth.

Task orientation

This dimension denotes the shared concern for excellence with respect to the quality of task performance in relation to shared visions or outcomes, and it is characterised by evaluations, modifications, control systems and critical appraisals (West, 1990). Task orientation is demanded through emphasis on individual and team accountability, the presence of control systems for monitoring performance, intra-team knowledge sharing, and so forth (Anderson & West, 1998). Task orientation is measured using three sub-dimensions, namely, excellence, appraisal and ideation. Excellence denotes the team members' commitment to excellence in task performance. Appraisal denotes the presence of control mechanisms to evaluate and modify performance. Ideation denotes the openness to explore opposing opinions and systems available to nurture constructive controversies (Anderson & West, 1998).

Researchers have extensively studied the role of team climate on individual team member performance and on overall team outcomes (e.g., Ashkanasy, Wilderom, & Peterson, 2000; Kozlowski & Klein, 2000). Most studies confirm that team climate is a crucial determinant of team performance (Agrell & Gustafson, 1994; Anderson & West, 1998) and an important predictor of work team innovation (Burningham & West, 1995).

Various factors, such as socialisation patterns within the team, common experiences among members, and effective communication of organisational vision statements, can help teams create a positive climate among their members (Anderson & West, 1998). Among these numerous factors, interaction between individuals, common goals, and task interdependence are some of the necessary conditions that create shared understandings and behavioural expectations among team members. Task interdependence between members is especially considered a crucial determinant of positive team climate (Loo & Loewen, 2002).

Task Interdependence

Interdependence among members is an inherent characteristic of work teams and can, accordingly, take many forms, including task, goal and resource interdependence. Task interdependence refers to "features of inputs into the work itself that require multiple individuals to complete the work" (Wageman, 2001, p.

198). In simple words, task interdependence is the extent to which a task requires coordination among different members for its accomplishment. Task interdependence also includes the team members' perceptions about the structural relationships among the members of the team (Van Der Vegt, Emans, & Van de Vliert, 1999). Thompson (1967) used two concepts, namely, task structure and task complexity, to explain task interdependence. He also suggested the following three types of task interdependence within work groups:

1. Sequential interdependence, which arises when the tasks are highly structured and performed in a specified serial order. This form of interdependence requires limited coordination.
2. Pooled interdependence, which arises when two or more entities work on sub-tasks that must be collated at the end. This form of interdependence requires coordination efforts from the individual who collates the different sub-tasks at the end.
3. Reciprocal interdependence, which arises when task outputs of the entities reciprocally influence each other. This form of interdependence requires a high level of coordination among members.

The role of task interdependence in team performance has been acknowledged in some older studies in the organisational behaviour and social psychology literature (e.g., Thompson, 1967; McGrath, 1964). However, recent studies have shown that task and goal interdependence can lead to increased interactions among members and thereby increase the need for cooperation among them (Saavedra, Earley, & Van Dyne, 1993; Bachrach, Powell, & Bendoly, 2004). Importantly, task interdependence influences both the task performance (Liden, Wayne, & Bradway, 1997) and the extra role performance (Ganesh & Gupta, 2010) of team members. At high levels of task interdependence, team members are more inclined to seek assistance from each other, which can increase and enhance individual performance among members of work groups (Anderson & Williams, 1996).

Studies have also shown that task interdependence can lead to high levels of motivation to perform the assigned task (Campion, Papper, & Medsker, 1996; Johnson & Johnson, 1989; Wageman, 1995). According to Bachrach, Powell, & Bendoly, 2004, as the need for interaction to complete a task increases, the situation lends itself to coordination and therefore becomes more susceptible and receptive to collective efforts and cooperation among team members. Thus, because an increase in receptiveness to collective efforts and cooperation can lead to a positive team climate, the following hypotheses are proposed:

- H1 : Task interdependence positively affects the overall team climate.
- H1(a) : Task interdependence positively affects participative safety within the team.

- H1(b) : Task interdependence positively affects support for innovation within the team.
- H1(c) : Task interdependence positively affects the team vision.
- H1(d) : Task interdependence positively affects task orientation within the team.

Procedural Justice

Among the various factors, perception of fairness among members has a significant impact on work team effectiveness (Colquitt, Noe, & Jackson, 2002). Organisational justice assumes various forms, such as distributive, procedural and interactional justice. Procedural justice has a strong correlation with various outcome variables such as job satisfaction, organisational commitment, citizenship behaviour, and job performance (Colquitt, Conlon, Wesson, Porter, & Ng, 2001). Procedural justice is the extent to which members feel that the organisation's decision-making procedures are fair. Procedural justice, as a construct, has its roots in equity theory (Adams, 1965), a theory about the fair distribution of rewards within organisations. Research shows that employees value the procedures used for arriving at decisions as being equally as important as the actual decisions with regard to resource allocation (Folger & Konovsky, 1989; McFarleen & Sweeney, 1992). This is especially true within the team context. For example, when the perception of procedural justice of the team members is high, the members feel psychologically safe within the team, a factor that improves team cohesiveness and loyalty among the members (Lind & Tyler, 1988).

Studies have shown procedural justice to be a crucial determinant of employee organisational citizenship behaviour (Tepper & Taylor, 2004; Ehrhart & Naumann, 2004). One way in which procedural justice positively affects team outcomes is through the opportunities afforded team members to voice their concerns during the decision-making process (Folger, 1977). When given a voice, members feel that they are respected and valued by other members of the group, which leads to a positive team climate. Accordingly, the following hypotheses are proposed:

- H2 : Procedural justice within the team positively influences the overall climate of the team.
- H2(a) : Procedural justice within the team positively influences participatory safety within the team.
- H2(b) : Procedural justice within the team positively influences support for innovation within the team.
- H2(c) : Procedural justice within the team positively influences the team vision.

- H2(d) : Procedural justice within the team positively influences task orientation within the team.

Apart from being an independent variable, the perception of procedural justice can also moderate the relationship between task interdependence and team climate. The basic assumption behind this hypothesis is that when task interdependence between members is high, it becomes difficult to distinguish the individual contributions of the team members from the overall performance of the team. Therefore, it is imperative to have clear and fair procedures in place to identify and acknowledge the contributions of individual team members to the larger team goals. High levels of task interdependence without fair procedures to identify individual contributions can, in fact, lead to dissatisfaction and conflict within the team, which can be detrimental to the overall team climate. On the other hand, at high levels of task interdependence, when members are assured of fair procedures to identify team members' contributions to the overall team goals, the team members tend to cooperate more, which can, in turn, nurture a positive team climate. Thus, the following hypotheses are proposed:

- H3 : Procedural justice perception positively moderates the relationship between task interdependence and team climate.
- H3(a) : Procedural justice perception positively moderates the relationship between task interdependence and participatory safety with respect to team climate.
- H3(b) : Procedural justice perception positively moderates the relationship between task interdependence and support for innovation with respect to team climate.
- H3(c) : Procedural justice perception positively moderates the relationship between task interdependence and vision with respect to team climate.
- H3(d) : Procedural justice perception positively moderates the relationship between task interdependence and task orientation with respect to team climate.

RESEARCH FRAMEWORK

According to the socio-technical systems approach, any organisation or work unit is a combination of social and technical parts and is, accordingly, open to its environment (Appelbaum, 1997). Therefore, while designing a work team, managers should ensure that both the social and the technical parts yield positive outcomes, a result known as joint optimisation. In the given research framework, task interdependence is considered the design of the task (the technical aspect), while the perception of fairness reflects the social dimension. Thus, both factors

interact with each other to influence the climate within the team, which, in the long term, may yield improved team performance.

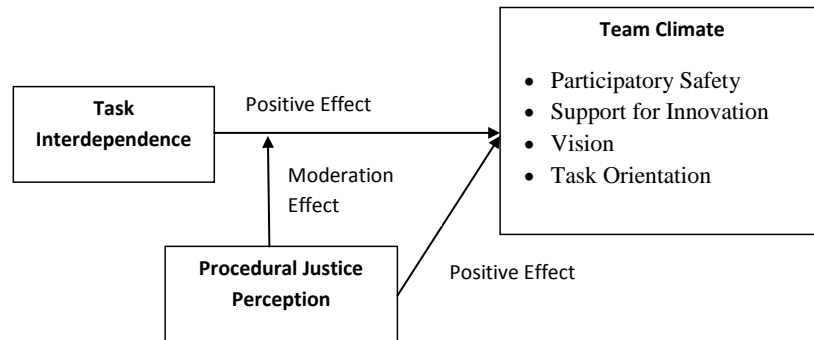


Figure 1. Hypothesised relationship between variables

Software Development Teams as the Research Context

The information technology (IT) consulting and development industry has become a major source of income and employment for developing countries such as India. It is posited that understanding the dynamics of work behaviour in software development teams facilitates the management of the teams, thus sustaining their competitive advantage. Research has further shown that team climate is a crucial determinant of team performance (Agrell & Gustafson, 1994; Anderson & West, 1998) and an important predictor of work team innovation (Burningham & West, 1995). Because innovativeness is a crucial component of software development tasks, the significance of team climate among software development teams is very high. Furthermore, software development is a task that is highly complex and that requires a high degree of interdependence among team members and the external environment (Faraj & Yan, 2009). In terms of procedural justice, earlier research has shown that perceptions of fairness are significantly lower among the IT occupational groups than among the operations and accounting/finance groups (Moore & Love, 2005). Accordingly, the study has incorporated crucial team context variables, such as task interdependence and procedural justice, to understand their impact on the climate of software development teams.

METHODOLOGY

Sample

Teams tasked with software development were the target population for this study, and data were collected from 192 software professionals from 33 software development teams. The total sample was taken from five organisations (large

Indian Information Technology companies). Purposive sampling was used to select the samples. The average age of the team members is 28 years, and the average tenure in the organisation is one year. The total sample constitutes 147 male respondents and 45 female respondents. Team size ranged from four to 11 members. Teams were matched in terms of work experience of the members (not less than 1 year of work experience) and the nature of the project (software development). The survey method was used for data collection, and in most cases, the questionnaires were administered to the participants in a face-to-face format.

Instruments

The following section lists the instruments that were used to measure the studied variables.

Team climate inventory

Team climate was measured using the Team Climate Inventory developed by Anderson and West (1994). This inventory has the following subscales:

1. Participatory safety (12 items)
2. Support for innovation (8 items)
3. Vision (11 items)
4. Task orientation (7 items)
5. Social desirability (6 items)

The social desirability dimension is used to identify likely inaccuracies in member responses that might portray the social and/or task climate too favourably. Accordingly, the social desirability score is used to exclude responses from the initial analysis.

The scale consists of 44 items and uses a five-point rating scale. The authors have established the validity of the tool, and the reliability of the scale ranges from 0.84 to 0.94.

Task interdependence

Task interdependence was measured using a modified version of the task interdependence scale developed by Pearce and Gregersen (1991). The modified version of the task interdependence scale used in the present study consists of 3 items, and a seven-point rating scale, where 1 denotes strongly disagree and 7 denotes strongly agree, is used. The reliability (Cronbach's alpha) of the scale is 0.74.

Procedural justice

Procedural justice was measured using a scale developed by Colquitt (2001). The scale consists of 7 items and uses a 5-point rating scale, where 1 denotes "to a small extent" and 5 denotes "to a large extent". The reliability of the tool is 0.93.

RESULTS

An analysis was conducted at the team level, and the Pearson correlation was used to analyse the relationships among variables. Hierarchical regression was used to identify the main and moderating effects of the independent variables on team climate. According to Baron and Kenny (1986), a basic moderator effect can be represented as an interaction between a focal independent variable and a factor that specifies the appropriate conditions for its operation. In this study, task interdependence is treated as the main independent variable, and procedural justice is treated as the moderator. According to Cohen and Cohen (1983) and Cleary and Kessler (1982), when the moderating effect is assumed to be linear, a hierarchical regression method can be used to capture the interaction effect. The following steps were used to run the hierarchical regression in SPSS:

1. Independent variables were centred to avoid multicollinearity among the variables. Variables were centred by subtracting mean scores from every data point.
2. The interaction term was calculated by multiplying centred independent variables.
3. Regression analysis was run by entering each of the independent variables in two separate blocks and the interaction terms in the third block.

To understand the interaction effects, a preset Excel program was used (source: <http://www.jeremydawson.co.uk/slopes.htm>) to create graphs based on the regression coefficients of the independent variable, moderating variable and interaction effect.

Relationships Among Variables

Table 1 shows that out of the four dimensions for team climate, participatory safety has the highest mean score, suggesting that members of most teams feel comfortable sharing information within the team and feel that they positively influence other members of the team. Though the mean score for task interdependence (measured on a seven-point rating) within the team is relatively low, the standard deviation is relatively high, suggesting that there is a general opinion among team members that task interdependence is low with respect to

the development of software, though this opinion is not shared among all members. This high variability could have been observed because the teams varied in other extraneous factors such as life-cycle stage of the project and the nature of the project.

Table 1
Descriptive statistics and relationships among variables

SI No.	Variables	Mean	S.D.	1	2	3	4	5	6	7
1	Task Interdependence	4.12	1.33	1	0.21	0.65**	0.68**	0.61**	0.50**	0.67**
2	Procedural Justice	3.5	0.58	0.21	1	0.37*	0.31	0.31	0.28	0.37*
3	Participatory Safety	4.06	0.41	0.65**	0.37*	1	0.91**	0.76**	0.76**	0.94**
4	Support for Innovation	3.9	0.44	0.68**	0.38*	0.91**	1	0.82**	0.75**	0.95**
5	Vision	4.04	0.39	0.61**	0.31	0.76**	0.82**	1	0.75**	0.91**
6	Task Orientation	3.9	0.36	0.50**	0.28	0.76**	0.75**	0.75**	1	0.87**
7	Overall Team Climate	4.02	0.67	0.67**	0.37*	0.94**	0.95**	0.91**	0.87**	1

* Significance at 0.05 level; ** Significance at 0.01 level

The results from the correlation analysis indicate that task interdependence has a significant positive relationship with overall team climate as well as with all dimensions of team climate. This trend reflects the positive influence of task interdependence on the climate of the teams. On the other hand, procedural justice has a significant positive relationship with the following team climate dimensions: overall team climate, participatory safety and support for innovation.

The sub-dimensions of team climate have strong positive correlations among themselves as well as with overall team climate.

Although few studies (e.g., Roberson, 2006) have considered interdependence as a critical factor in the emergence of team-level justice perceptions, current results do not show any significant relationship between task interdependence and procedural justice.

Main and Moderating Effects

Hierarchical regression was used to examine the main and moderating effects of the independent variables on the team climate dimensions.

Table 2
Main and moderating effects

Independent Variable	Participatory Safety			Support for Innovation			Vision			Task Orientation			Overall Team Climate		
	M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3
Task Interdependence (beta value)	0.60**	0.59**	0.65**	0.68**	0.63**	0.63**	0.6**	0.56**	0.56**	0.5**	0.46*	0.47**	0.67**	0.62	0.66**
Procedural Justice (beta value)		0.34*	0.32*		0.42*	0.40**		0.18	0.16		0.27	0.32		0.30	0.203
Task Interdependence x Procedural Justice (beta value)			0.17		0.32*			0.04			0.27				0.220
Adjusted R^2	0.399	0.43	0.42	0.44	0.47	0.52	0.34	0.35	0.316	0.21	0.21	0.24	0.429	0.45	0.457
F	16.94**	9.97**	6.92*	19.5**	11.5**	9.8**	13.4**	7.3**	4.7**	7.7**	4.3**	3.5*	19.0**	11.1**	7.7**
df (regression and residual)	2,30	3,29	4,28	2,30	3,29	4,28	2,30	3,29	4,28	2,30	3,29	4,28	2,30	3,29	4,28

* Significance at 0.05 level; ** Significance at 0.01 level

The results showed that task interdependence ($\beta = 0.67^{**}$) has a significant positive effect on overall team climate. Task interdependence also has a significant positive effect on all the dimensions of team climate. Thus, H1 and its sub-hypotheses are accepted.

Though procedural justice does not have any significant impact on overall team climate, it does have a significant positive impact on participatory safety ($\beta = 0.34^*$) and support for innovation ($\beta = 0.419^{**}$), both dimensions of team climate. Therefore, H2 is not accepted, while H2(a) and H2(b) are accepted.

Procedural justice also moderated the relationship between task interdependence and support for innovation, both dimensions of team climate. Therefore, H3(b) is accepted.

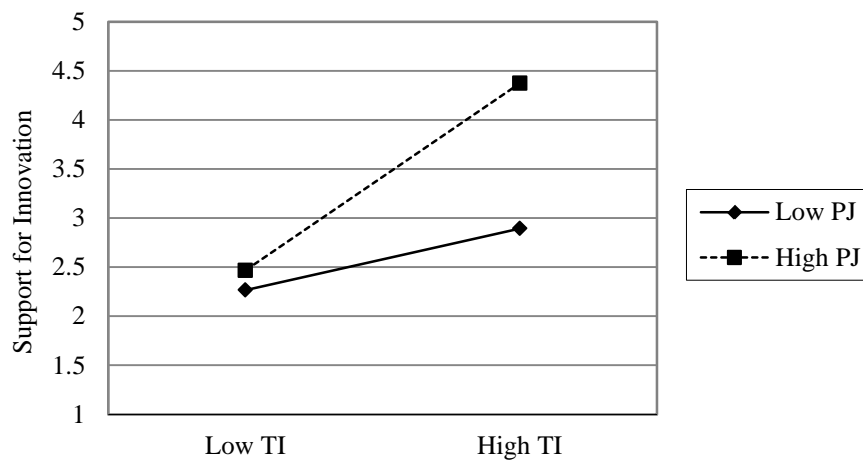


Figure 2. Interaction effect of task interdependence and procedural justice

Figure 2 shows the nature of the moderating effect of procedural justice in the relationship between task interdependence and support for innovation, two dimensions of team climate. The figure shows that high task interdependence always leads to higher levels of support for innovation within the team. Furthermore, the positive impact of high task interdependence on members' perceptions of support innovation increases when procedural justice is also high. That is, higher levels of perceived procedural justice increase the positive effect of task interdependence on the support for innovation within the team. Accordingly, the results indicate that H3(b) is accepted.

DISCUSSION

The results from both the correlation and regression analyses indicate that task interdependence is a crucial variable that influences team climate. The results of the regression analysis also supported the hypothesis that task interdependence has a significant positive effect on the climate of software development teams. This finding supports the premise that task interdependence is a necessary precondition for developing a positive team climate (Anderson & West, 1998). The current finding is supported by similar extant research, which shows that task interdependence has a positive impact on the sharing of information among team members (Crawford & Haaland, 1972), the willingness to assist other team members (Ganesh & Gupta, 2010) and the cooperation norms implemented within the teams (Shaw, 1981). The strong positive influence of task interdependence on team climate found in the current study can be explained by the fact that task interdependence increases the need for interaction among team members for the completion of team tasks. Accordingly, the need for interaction among team members leads to increased coordination and thus nurtures collective efforts and team coordination (Johnson & Johnson, 1989). Similar studies have also found that the perception of co-dependence and the collective responsibility towards the task enhances the level of cooperation among the members of the group (Thomas, 1957; Van Der Vegt & Janssen, 2003). Thus, the increase in the level of cooperation among team members may have strongly affected the team climate.

The results from the correlation analysis show a significant positive relationship among the following three dimensions of team climate: procedural justice, participatory safety and support for innovation. Procedural justice also has a significant positive relationship with overall team climate, and the results of the regression analysis show a significant positive impact of procedural justice on participatory safety and support of innovation. Similar studies have shown that procedural fair treatment affects not only task performance but also extra role performances (such as helping behaviour) within the team (e.g., Moorman, Neihoff, & Organ, 1993; Naumann & Bennett, 2000). Previous research also suggests that when procedural justice is high, team members are more willing to invest their resources in the team (Sapienza & Korsgaard, 1996). More specifically, with respect to innovation Moenaert, Caeldries, Lievens and Wauters (2000), found that procedural justice has a significant impact on the performance of international product innovation teams.

The respondents may have perceived the extent of risk they could afford to take within the team as a common element in both the participatory safety and support for innovation dimensions. That is, the perception of participatory safety could encourage team members to be open in communicating their ideas with the team,

which could otherwise be risky. Further, support for innovation denotes the extent to which members receive support to take risks associated with innovating new ideas. Thus, the results show that team members perceive that it is less risky to share their ideas and viewpoints when procedures associated with reward decisions are fair and just.

The presence of fair procedures may lead to trust among members, which, in turn, can encourage risk taking among members. Thus increased trust due to perception of fair procedures would have increased team members' perceptions of participatory safety and support for innovation. If we consider the relationship between the member and the team as a social exchange, fairness is the key criterion that decides the effectiveness of the relationship. Earlier literature suggests that in a social exchange, the perceived integrity of the person being trusted determines the level of trust placed by the other, while integrity is determined by the perception of fairness by the person who trusts (Mayer, Davis, & Schoorman, 1995). According to Dirks and Ferrin (2001), a higher level of trust by a work partner may encourage a team member to take a risk with that partner (e.g., cooperate, share information). Such actions can lead to positive outcomes (e.g., enhanced individual performance). When procedures with regard to identification of team member contributions to the overall team performance are fair, team members may feel that they will receive a fair share of rewards for their ideas and contributions, which will encourage them to be more open in team discussions and more likely to such ideas during idea-generating tasks.

The results also showed a significant moderating effect of procedural justice on the relationship between task interdependence and support for innovation. Procedural justice enhances the positive effect of task interdependence on team members' perceptions of support for innovation within the team. Accordingly, knowledge sharing was determined to be a crucial element in team innovation (Swan, Newell, Scarbrough, & Hislop, 1999). Though task interdependence may compel members to share their knowledge within the team, it may not be sufficient to motivate them to do so voluntarily. In this respect, trust may act as a facilitator in knowledge sharing within the team. Research has also shown that trust is a strong determinant in the extent of knowledge sharing within the team (Staples & Webster, 2008). Similarly, trust within teams is strongly associated with procedural justice within the team (Korsgaard, Schweige, & Sapienza, 1995). Procedural justice increases the positive effect of task interdependence on support for innovation within the team by enhancing trust within the team.

IMPLICATIONS AND CONCLUSIONS

Though the study has its limitations, such as a relatively small sample size and a lack of control over other extraneous variables, its findings have significant

managerial and theoretical implications. The results emphasise the significance of designing team tasks to ensure the optimal level of task interdependence, as task interdependence can facilitate team cohesion and nurture a positive team climate. According to Wageman (2001), among various other factors, team members' perceptions of task interdependence within the team are influenced by the way in which the team tasks are defined and the rules or instructions that are prescribed. Thus, the role of the leader is crucial in communicating the task definitions and the instructions during the initial stages of the team formation. Communication is also important for establishing the perception of fairness within the team, as the findings show that the role of procedural justice in nurturing team climate and improving the positive effect of task interdependence on team climate. The findings emphasise the need to build trust among team members through fair procedures that reward members for their contributions to the overall team performance.

The results also challenge managers to effectively balance rewards and equitably recognise team member contributions, thereby encouraging cooperation among team members. However, earlier research has shown that although equitable rewards may increase performance of individual team members, they also may promote competition among team members (Tyler, Rasinski, & Tjosvold, 1986). Accordingly, this paradox can be resolved by being transparent in the procedures used to determine team and individual rewards. Studies have shown that when employees are given opportunities to voice their concerns regarding the procedures related to reward allocation, they tend to view the procedures as fair (Kanfer, Sawyer, Earley, & Lind, 1987; Tyler, Rasinski, & McGraw, 1985). Both the HR department and the team leader play an important role in making team members feel safe in voicing their concerns at any stage of the decision-making process. Another important challenge for the team leader is to identify and reward extra role performances, as these performances act as social lubricants for the performance of the team. In so doing, however, managers should be cautious not to weaken the intrinsic motivation associated with these voluntary behaviours. Accordingly, non-monetary rewards, such as recognition and awards, can be used as an answer to this challenge.

With respect to research implications, the current study used process related variables such as procedural justice to understand the relationship between task interdependence and outcome variables. In the context of earlier research, which has shown that fairness perceptions are significantly lower in the IT occupational group than in other groups (Bhal & Gulati, 2007), the current findings stress the need to nurture procedural justice perceptions in software development teams. The current study also confirms the role of trust created by procedural justice with respect to the team members risk-taking behaviours in the form of support for innovation and participatory safety. Future research can examine the impact

of trust among team members on specific team outcomes, such as team learning, information sharing and innovativeness. Future research can also study how team climate, over a period of time, influences the perception of fairness within the team.

In conclusion, task interdependence creates the need among team members to interact, coordinate and share information, thereby demanding cooperation within the team. This cooperation, over a period of time, may create a positive team climate. At the same time, the implementation of fair procedures is essential for creating trust within the team, which then contributes to the team's ability to sustain higher levels of cooperation among members and maintain a positive team climate. Additionally, this study stresses the need to manage the paradox of maintaining robustness through fair procedures while maintaining flexibility within the team to facilitate cooperation.

REFERENCES

- Adams, J. S. (1965). Inequity in social exchange. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (pp. 267–299). New York: Academic Press.
- Agrell, A., & Gustafson, R. (1994). The team climate inventory and group innovation: A psychometric test on a Swedish sample of work groups. *Journal of Occupational and Organizational Psychology*, 67, 143–151.
- Appelbaum, S. H. (1997). Socio-technical systems theory: An intervention strategy for organizational development. *Management Decision*, 35(6), 452–463.
- Ashkanasy, N., Wilderom, C. P. M., & Peterson, M. F. (Eds.). (2000). *Handbook of organizational culture and climate*. Thousand Oaks, CA: SAGE Publications.
- Anderson, N. R., & West, M. A. (1994). *The team climate inventory manual and users guide*. Windsor, U.K.: Assessment Services for Employment, NFER-Nelson.
- Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: Development and validation of the team climate inventory. *Journal of Organizational Behavior*, 19, 235–258.
- Anderson, S. E., & Williams, L. J. (1996). Interpersonal, job and individual factors related to helping processes at work. *Journal of Applied Psychology*, 81, 282–296.
- Bachrach, D. G., Powell, B. C., & Bendoly, E. (2004). Organizational citizenship behavior and performance evaluations: The impact of task interdependence. *Academy of Management Proceedings*, 91(1), 193–201.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173–1182.
- Bettenhausen, K. L. (1991). Five years of group research: what we have learned and what needs to be addressed. *Journal of Management*, 17, 345–381.

- Bhal, T. K., & Gulati, N. (2007). Pay satisfaction of software professionals in India. *Vikalpa*, 32(3), 9–21.
- Burningham, C., & West, M. A. (1995). Individual climate and group interaction processes as predictors of work team innovation. *Small Group Research*, 26, 106–117.
- Campion, A. M., Papper, E. M., & Medsker, G. J. (1996). Relations between work team characteristics and effectiveness: A replication and extension. *Personnel Psychology*, 49(2), 429–452.
- Cleary, P. D., & Kessler, R. C. (1982). The estimation and interpretation of modified effects. *Journal of Health and Social Behavior*, 23, 159–169.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.
- Colquitt, J. A. (2001). On the dimensionality of organizational justice: A construct validation of a measure. *Journal of Applied Psychology*, 86(3), 386–400.
- Colquitt, J. A., Noe, R. A., & Jackson, C. L. (2002). Justice in teams: Antecedents and consequences of procedural justice climate. *Personnel Psychology*, 55, 83–109.
- Colquitt, J. A., Conlon, D. E., Wesson, M. J., Porter, C. O. L. H., & Ng, K. Y. (2001). Justice at the millennium: A meta-analytic review of 25 years of organizational justice research. *Journal of Applied Psychology*, 86, 425–445.
- Crawford, J. L., & Haaland, G. A. (1972). Pre-decisional information seeking and subsequent conformity in the social influence process. *Journal of Personality and Social Psychology*, 23, 112–119.
- Dirks, K. T., & Ferrin, D. L. (2001). The role of trust in organizational settings. *Organization Science*, 12(4), 450–467.
- Ehrhart, M. G., & Naumann, S. E. (2004). Organizational citizenship behavior in work groups: A group norms approach. *Journal of Applied Psychology*, 89(6), 960–974.
- Etzioni, A. (1964). *Modern organizations*. New Jersey: Prentice Hall.
- Fagan, M. H. (2004). The influence of creative style and climate on software development team creativity: An exploratory study. *Journal of Computer Information Systems*, Spring, 73–80.
- Faraj, S., & Yan, A. (2009). Boundary work in knowledge teams. *Journal of Applied Psychology*, 94(3), 604–617.
- Folger, R. (1977). Distributive and procedural justice: Combined impact of voice and improvement on experienced inequity. *Journal of Personality and Social Psychology*, 35, 108–119.
- Folger, R., & Konovsky, M. A. (1989). Effects of procedural and distributive justice on reactions to pay raise decisions. *Academy of Management Journal*, 32, 115–130.
- Ganesh, M. P., & Gupta, M. (2010). Impact of virtualness and task interdependence on extra-role performance in software development teams. *Team Performance Management*, 16(3/4), 169–186.
- Hackman, J. R. (1987). The design of work teams. In J. W. Lorsch (Ed.), *Handbook of organizational behaviour* (pp. 315–342). New Jersey: Prentice Hall.
- James, L. R. & Sells, S. B. (1981). Psychological climate: Theoretical perspectives and empirical research. In D. Magnusson (Ed.), *Toward a psychology of situations: An international perspective* (pp. 275–295). New Jersey: Erlbaum, Hillsdale.

- Johnson, D. W. & Johnson, R. T. (1989). *Cooperation and competition: Theory and research*. Edina, MN: Interaction Book Co.
- Kanfer, R., Sawyer, J., Earley, C., & Lind, A. (1987). Fairness and participation in evaluation procedures: Effects on task attitudes and performance. *Social Justice Research, 1*, 235–249.
- Korsgaard, A. M., Schweige, M. D., & Sapienza, J. H. (1995). Building commitment, attachment, and trust in strategic decision-making teams: The role of procedural justice. *Academy of Management Journal, 38*(1), 60–84.
- Kozlowski, S.W.J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein, & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 3–90). San Francisco: Jossey-Bass.
- Liden, R. C., Wayne, S. J., & Bradway, L. K. (1997). Task interdependence as a moderator of the relation between group control and performance. *Human Relations, 50*(2), 169–181.
- Lind, E. A., & Tyler, T. R. (1988). *The social psychology of procedural justice*. New York: Plenum Press.
- Loo, R., & Loewen, P. (2002). A confirmatory factor-analytic and psychometric examination of the team climate inventory: full and short versions. *Small Group Research, 33*(2), 254–265.
- Mayer, R. C., Davis J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of Management Review, 20*, 709–734.
- McFarleen, D. B., & Sweeney, P. D. (1992). Distributive and procedural justice as predictors of satisfaction with personal and organizational outcomes. *Academy of Management Journal, 35*, 626–637.
- McGrath, J. E. (1964). *Social psychology: A brief introduction*. New York: Holt, Rinehart & Winston.
- Moenaert, R. K., Caeldries, F., Lievens, A., & Wauters, E. (2000). Communication flows in international product innovation teams. *Journal of Product Innovation Management, 17*, 360–377.
- Mohrman, S., Cohen, S., & Mohrman, A. Jr. (1995). *Designing team-based organizations: New forms for knowledge work*. San Francisco: Jossey-Bass.
- Moore, J. E., & Love, M. S. (2005). IT professionals as organizational citizens. *Communications of the ACM, 48*, 88–93.
- Moorman, R. H., Neihoff, B. P., & Organ, D. W. (1993). Treating employees fairly and organizational citizenship behavior: Sorting the effects of job satisfaction, organizational commitment, and procedural justice. *Employee Responsibilities and Rights Journal, 6*, 209–225.
- Naumann, S. E., & Bennett, N. (2000). A case for procedural justice climate: Development and test of a multilevel model. *Academy of Management Journal, 43*(5), 881–889.
- Pearce, J. L., & Gregersen, H. B. (1991). Task interdependence and extra role behavior: A test of the mediating effects of felt responsibility. *Journal of Applied Psychology, 76*(6), 838–844.

- Reichers, A. E. & Schneider, B. (1990). Climate and culture: An evolution of constructs. In B. Schneider (Ed.), *Organizational climate and culture* (pp. 5–39). San Francisco: Jossey-Bass.
- Roberson, Q. M. (2006). Justice in teams: The effects of interdependence and identification on referent choice and justice climate strength. *Social Justice Research, 19*(3), 323–344.
- Saavedra, R., Earley, P. C., & Van Dyne, L. (1993). Complex interdependence in task performing groups. *Journal of Applied Psychology, 78*, 61–72.
- Sapienza, H. J., & Korsgaard, M. A. (1996). Procedural justice in entrepreneur-investor relations. *Journal of Management, 39*, 544–574.
- Shaw, M. E. (1981). *Group dynamics: The psychology of small group behavior*. New York: Harper.
- Staples, S., & Webster, J. (2008). Exploring the effects of trust, task interdependence and virtualness on knowledge sharing in teams. *Information Systems Journal, 18*(6), 617–632.
- Sundstrom, E., McIntyre, M., Halfhill, T., & Richards, H. (2000). Work groups: From the Hawthorne studies to work teams of the 1990s and beyond. *Group Dynamics: Theory, Research, and Practice, 4*(1), 44–67.
- Swan, J. A., Newell, S., Scarbrough, H., & Hislop, D. (1999). Knowledge management and innovation. *Journal of Knowledge Management, 3*, 262–275.
- Tepper, B. J., & Taylor, E. C. (2004). Relationships among supervisors' and subordinates' procedural justice perceptions and organizational citizenship behaviors. *Academy of Management Journal, 46*(1), 97–105.
- Thomas, E. J. (1957). Effects of facilitative role interdependence on group functioning. *Human Relations, 10*, 347–366.
- Thompson, J. D. (1967). *Organizations in action: Social science bases of administrative theory*. New York: McGraw-Hill.
- Tyler, T. R., Rasinski, K., & McGraw, K. (1985). The influence of perceived injustice on the endorsement of political leaders. *Journal of Applied Social Psychology, 15*, 700–725.
- Tyler, T. R., Rasinski, K., & Tjosvold, D. (1986). The dynamics of interdependence in organizations. *Human Relations, 39*, 517–540.
- Van Der Vegt, G. S., Emans, B., & Van de Vliert, E. (1999). Motivating effects of task and outcome interdependence in work teams. *Journal of Social Psychology, 139*(2), 202–215.
- Van Der Vegt, G. S., & Janssen, O. (2003). Joint impact of interdependence and group diversity on innovation. *Journal of Management, 29*, 729–751.
- Wageman, R. (1995). Interdependence and group effectiveness. *Administrative Science Quarterly, 40*, 145–180.
- Wageman, R. (2001). The meaning of interdependence. In M. Turner (Ed.), *Groups at work* (pp. 197–217). Mahwah, NJ: Lawrence Erlbaum Associates.
- West, M. A. (1990). The social psychology of innovation in groups. In M. A. West, & J. L. Farr (Eds.), *Innovation and creativity at work: Psychological and organizational strategies* (pp. 4–36). Chichester, West Sussex: Wiley.