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# Perceptions of an Innovative Climate: Examining the Role of Divisional Affiliation, Work Group Interaction, and Leader/Subordinate Exchange

Kenneth J. Dunegan, Pamela Tierney, and Dennis Duchon

**Abstract**—Results from a cross-sectional field study with 198 members of an international chemical company suggest that divisional affiliation, work group interactions (WGX), and the quality of exchange between leader and subordinate (LMX) significantly predict employee perceptions of climate factors believed to foster innovative activities. Tests also indicate that LMX remains a significant predictor of five of the six climate variables measured, even after controlling for divisional affiliation and the quality of work group exchanges (WGX). Further, analyses reveal that the interaction between WGX and LMX accounts for significant and unique variance on all six of the climate factors studied in this investigation. Results are discussed in terms of their implications for managerial practice and future research.

## I. INTRODUCTION

NAYAK and Ketteringham [27] argue that innovation usually occurs because *individuals* become intensely curious about something and are willing to pursue an idea despite opposition. This perspective clearly positions people as *the* crucial ingredient in a successful innovation endeavor. Yet many researchers are coming to the conclusion that having the right people is not always sufficient for achieving innovative solutions to organizational problems [2]. Instead, many believe that innovative thinking is something which must be actively cultivated by the organization [50], and that establishing a work climate compatible with innovation is as much a part of the equation as the people themselves (e.g., [1], [17], [24], [29]–[31]).

For example, in a study conducted by Abbey and Dickson [1] in the semiconductor industry, it was found that

the climate perceived by R & D workers significantly influenced all stages of the innovation process (e.g., idea generation, initiation, adoption, and implementation). Similar linkages between work climate and innovative behaviors are reported by Baker and Freeland [6], Sapolsky [35], Vegso [51], and others [49], [47]. Studies have even documented that creative thinking, an important component of the innovation process, is significantly enhanced by establishing a conducive work climate [4], [44]–[46]. Thus, not only is there an intuitive link between work climate and innovative activities, but findings such as those cited above are establishing a growing body of research which demonstrates an empirically supported linkage as well.

In fact, the importance of work climate in fostering innovativeness is becoming widely accepted. Amabile [2] suggests that "... at a gross level, personal factors such as general intelligence, experience in the field, and ability to think creatively are the major influences on output of creative ideas. But, assuming that hiring practices at major corporations select individuals who exhibit relatively high levels of these personal qualities, the variance above this baseline may well be accounted for primarily by factors in the work environment." (p. 128) Similarly, Paolillo and Brown [30] state that work climate is *at least* as important in the innovative process as characteristics of the people involved. Paolillo and Brown go on to say that managers should not assume they can simply hire good people and let the system run by itself. Rather, it is essential to create and sustain a work climate which is supportive of innovative behaviors.

Several theorists suggest that managers may play a key role in this endeavor. Kanter [21] and James and James [18], for example, maintain that managers are a primary source for the signals from which subordinates construct perceptions of their work group's climate. Since employee perceptions of climate conditions have been strongly linked with innovation initiation, adoption, and implementation [1], understanding how leader/subordinate relationships influence those perceptions is an important area

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of inquiry for innovation researchers.<sup>1</sup> A recent study by Kozlowski and Doherty [23] demonstrated that the quality of exchange between the leader and subordinate was significantly correlated with perceptions of a number of climate factors believed to foster innovative activities, but this line of inquiry is still in its nascent stages.

Clearly, however, managers are not the only source from which perceptions of the work climate can emerge. The nature of the tasks performed in various functional areas of an organization, and the underlying qualifications of employees needed to perform those tasks, may introduce preexisting structural conditions [30], which are more or less conducive to an innovative climate. In other words, we might expect inherent differences in the climates experienced by employees in manufacturing and R & D divisions, for example, simply because of the structural characteristics endemic to these functional areas [28]. This isn't to say that an innovative climate is more important in one division compared to another, but rather that baseline conditions which foster or constrain innovation may not be equivalent across functional areas. Thus, with naturally occurring differences in baseline conditions, we might also expect naturally occurring differences in employee perceptions.

A third source of employee perceptions of climate will come from exchanges among members of the work group itself [1], [18]. Since climate has a strong subjectively-based component [37], [38], much of what a subordinate comes to perceive will be the result of socially constructed interactions. That is, the attitudes and perceptions an employee develops can, in large part, be a function of the attitudes and perceptions of the group within which he/she works [34]. Therefore, regardless of whether or not a manager is attempting to foster an innovative climate, the norms [33] and cohesiveness [42] of work group members may either counteract or augment a manager's efforts [22]. Said differently, perceptions of how conducive

the climate is to innovative actions may be due to the quality of interaction an employee has with other work group members.

The purpose of this study is not so much to empirically validate whether or not the three factors of functional affiliation, work group interactions, and leader/subordinate exchange are related to employee perceptions. Indeed, previous studies offer evidence which already indicates these relationships exist. Rather, this investigation is intended to assess the manner in which these three sources *interact* to explain differences in the experienced work climate. But perhaps more importantly from a managerial perspective, the study also will examine the *incremental* contribution made by the leader/subordinate relationship, over and above any variance explained by the other two factors. The significance focusing on this particular variable lies in the relative control a manager has over the three factors.

Since the types of tasks performed in different divisions may require dissimilar skills, talents, and training, it is likely that differences will exist between the individuals who are hired to perform those tasks. While a manager may be empowered to make hiring, firing, and transferring decisions, once a person is in a certain division, the idiosyncratic characteristics of task and employee are a relatively stable "given." That is, short of redesigning tasks and the concomitant skills necessary for task performance, a manager is not likely to be able to do much to change the *inherent* climate variations which may exist across divisional boundaries.

Similarly, the dynamics which emerge among work group members and the degree to which members are able to develop positive interactions with each other will, in large part, be a function of individual personalities, needs, and motivations of the various members. While a manager is not powerless to affect work group dynamics, most of what he/she can do is limited to indirect strategies (i.e., redesigning tasks, changing group member membership through hiring, firing, transferring, etc.) Bottom line, a manager can only provide the *opportunity* for positive exchanges among work group members to develop. What emerges cannot be legislated by managerial decree.

On the other hand, of the three sources of climate perceptions discussed above, the quality of exchange which develops between a leader and subordinate will be the one most sensitive to managerial intercessions. In other words, a manager would be in a better position to affect *this* source of climate perception to a greater degree than either of the other two. Therefore, part of what will be examined in this study is the extent to which the quality of the dyadic exchange (the exchange between manager and subordinate) is able to predict *additional* variance in perceived climate conditions beyond that predicted by the factors farther removed from managerial control. Said differently, the study will explore whether the dyadic exchange makes a difference in subordinate perceptions, *given* functional affiliation and the quality of work group interactions.

<sup>1</sup> It is worth noting that there is some debate regarding the nature of climate as a research construct. The issue is whether climate exists as an organizational reality [10], or as a manifestation of an individual's subjective perceptions [37], [39]. In other words, the question revolves around whether climate is an objective or subjective property. The debate has been somewhat defused by suggestions that there are probably several types of climates within the realm of a single organization [40]. James and Jones [19], for example, suggest that individual level perceptions of climate factors tap into a "psychological climate," a climate which will be more subjective and idiosyncratic. This does not rule out the possibility, however, that there may be consensus of perceptions among organizational members, indicating the presence of a more objective "organizational climate" [19]. From a methodological point of view, the possibility of several climates existing within the same organization raises design problems. Specifically, which climate should be measured? Powell and Butterfield [32] and Schneider and Reichers [40] suggest that the climate measure chosen should be consistent with the intent of the research investigation. Since Nayak and Ketteringham [27] argue that the genesis of most innovations are *individuals* responding to their own curiosity, and since this is a study of climate factors germane to the innovative process, then it seemed fitting, at least for purposes of *this* investigation, that climate should be operationalized at the individual level. Thus, consistent with most innovation research cited in this paper, we chose to assess climate by measuring individual employee perceptions of a number of factors shown to be correlated with innovative behaviors.

## II. METHOD

### A. Sample and Procedure

This study was part of a research program sponsored by the Center for Innovation Management Studies. Data were collected from 198 employees from three divisions of a large, international chemical company. Participation in the study was completely voluntary and respondents were assured of the confidentiality of all answers. Of those subjects for whom demographic information was available, 169 were men with an average age of 42.5 years and 13 years with the company; 16 were women with an average age of 36.4 and 7.2 years with the company. The three divisions included in the sample were manufacturing ( $n = 49$ ), R & D ( $n = 45$ ), and corporate—representing the marketing, sales, and administrative arm of the organization ( $n = 104$ ).

Data were collected via questionnaires. Instructions to participants stated that "... this is not a test. There are no right or wrong answers. We simply want to know what your views are. ... Work quickly. Your initial impression is probably the right one." Participants were given a preaddressed, prepaid envelope in which to mail their completed questionnaires directly to the research team.

### B. Measures

All variables in the study, with the exception of divisional affiliation, were collected with items using a 5-point, Likert-type response scale.

*Climate*—As indicated earlier, previous studies have already identified a number of climate variables believed to either promote or inhibit innovative activities (cf. [1]–[3], [5], [7], [31], [43], [48]). For purposes of this investigation, six variables were used to evaluate subordinate perceptions of their work climate, the first five of which were adapted from an instrument developed by Welsh and Matthews [53]. Of the six variables, four have been found to be positively correlated with innovative activities (freedom, encouragement, recognition, and coordination); two have been shown to be negatively correlated (disinterest and constraints).

- *Freedom*: the degree to which subordinates perceived they had been given operational autonomy in performing their tasks. This variable combined responses from five items, scored so that the higher the score the more freedom a subordinate perceived. Internal reliability (Cronbach's alpha) for this variable was .89.
- *Disinterest*: the degree to which subordinates believed innovative and creative solutions were not *really* something the organization cared about. This climate measure was assessed with three items, scored so that the higher the score the greater the perceived level of disinterest. Internal reliability (Cronbach's alpha) for this variable was .81.
- *Recognition*: a four-item measure assessing the degree to which subordinates perceived they would be appropriately recognized and rewarded for innovative

behaviors. The higher the resulting score, the more respondents felt recognition would be given for innovative actions. Internal reliability (Cronbach's alpha) for this variable was .75.

- *Encouragement*: the degree to which subordinates felt encouraged to be innovative because of managerial enthusiasm and overall support for new and creative ideas. Again, scores from five items were combined to create this variable. The higher the score, the more encouraged subordinates felt about being innovative. Internal reliability (Cronbach's alpha) for this variable was .88.
- *Constraints*: the degree to which subordinates believed there wasn't sufficient time or resources to allow them to search for creative and innovative solutions. This was a six-item measure. The higher the score the more subordinates perceived constraints were present which inhibited innovative actions. Internal reliability (Cronbach's alpha) for this variable was .65.
- *Coordination*: this was a five-item variable adapted from Georgopolous and Mann [11], which assessed the degree to which subordinates believed positive and constructive interactions existed with other, relevant groups in different departments or work units of the organization. Higher scores represented a more positive perception of levels of coordination. Internal reliability (Cronbach's alpha) for this variable was .76.

*Work Group Exchange (WGX)*—Seven items from the questionnaire were combined to measure a subordinate's perception of the quality of exchange within his/her work group. Items evaluated such things as commitment, satisfaction, coordination, quality and quantity of tasks performed by members of the respondent's work group. Higher scores represented a more positive exchange between work group members. Internal reliability (Cronbach's alpha) for this variable was .89.

*Leader—Member Exchange (LMX)*—Six items from Graen's Leader—Member Exchange scale [8], [9], [13] provided information for evaluating the quality of dyadic interaction between managers and subordinates. This was the same instrument used in the study performed by Kozlowski and Doherty [23], cited earlier. Once again, scoring was done such that higher scores indicated a more positive perception of the dyadic exchange. Internal reliability (Cronbach's alpha) for this variable was .89.

*Divisional Affiliation*—Information on divisional affiliation was obtained from archival records provided by the sponsoring organization. For statistical purposes, dummy codes were used to identify whether a respondent was a member of the manufacturing, R & D, or corporate divisions.

## III. ANALYSES AND RESULTS

Descriptive statistics (means and standard deviations) and correlations among the climate and exchange vari-

TABLE I  
CORRELATIONS AND DESCRIPTIVE STATISTICS<sup>1</sup>

	Mean	Std.	Intercorrelations							
			1.	2.	3.	4.	5.	6.	7.	8.
1. Freedom	15.09	4.74	.89							
2. Disinterest	7.31	2.73	-.42***	.81						
3. Recognition	10.23	3.14	.41***	-.46***	.75					
4. Encouragement	17.57	4.42	.46***	-.36***	.47***	.88				
5. Constraints	17.20	3.80	-.39***	.44***	-.34***	.38***	.65			
6. Coordination	14.00	3.39	.13 <sup>#</sup>	-.31***	.18**	.07	-.27***	.76		
7. WGX	20.73	5.15	.24***	-.24***	.18**	.25***	-.23**	.27***	.89	
8. LMX	21.91	4.87	.34***	-.24***	.41***	.69***	-.21**	.07	.34***	.89

\*\*\* $p < .001$ ; \*\* $p < .01$ ; \* $p < .05$ ; <sup>#</sup> $p < .10$ ;  $n = 198$

<sup>1</sup>Internal consistency scores (Cronbach's alpha) are shown on the diagonal.

ables are presented in Table I. Several items are worth noting from this table. First, there were significant correlations between work group exchanges (WGX) and the six climate variables, all in the expected direction (i.e., positive correlations with perceptions of freedom, recognition, encouragement, and coordination; negative correlations with constraints and disinterest). Second, a similar pattern of relationships was found between LMX (the variable assessing the quality of exchange between manager and subordinate) and the climate variables, with the exception of coordination. LMX and coordination were not significantly correlated. Third, the positive and significant relationship between WGX and LMX indicated that subordinates who perceived favorable exchanges with their supervisor were also more likely to report favorable exchanges within the work group.

A final observation from data in Table I is that the climate variables were not independent. That is, strong intercorrelations were present among several of the different measures. Although these results are not surprising, given the measures were all tapping into perceptual issues using a common method (i.e., questionnaire) of collecting information [18], [23], they did suggest that a multivariate analysis precede the examination of how division affiliation, WGX and LMX might interact in predicting variance of individual climate variables. Therefore, the next step was to perform a multivariate analysis of variance (MANOVA), where all six climate factors were simultaneously entered as dependent variables, with division, WGX, LMX, and their interactions as the independent measures. Results from this analysis are shown in Table II.

Basically, findings from the MANOVA supported continuation of the analyses on a univariate level. Even though climate variables were found to be intercorrelated (see Table I), MANOVA results indicated significantly strong  $F$  values were present for each of the main effects (i.e., division, WGX, and LMX), as well as two of the interaction terms (i.e., division \* LMX, and WGX \* LMX). Therefore, to examine relationships on a univariate level, six separate regression models were tested, one for each of the climate variables.

However, as indicated earlier, since part of this investigation was to see whether the exchange between leader

TABLE II  
MULTIVARIATE ANALYSIS OF VARIANCE (MANOVA) RESULTS TESTING RELATIONSHIPS AMONG DIVISIONS, WORK GROUP EXCHANGES (WGX) AND LMX WITH ALL CLIMATE VARIABLES CONSIDERED SIMULTANEOUSLY

Independent Variable:	d.f.	Wilks' Lambda	$F$
Division (D)	12	0.896	1.62 <sup>#</sup>
WGX (W)	6	0.889	3.59**
LMX (L)	6	0.873	4.19***
D * W	12	0.904	1.50
D * L	12	0.896	1.63 <sup>#</sup>
W * L	6	0.842	5.42***
D * W * L	12	0.908	1.43

\*\*\* $p < .001$ ; \*\* $p < .01$ ; \* $p < .05$ ; <sup>#</sup> $p < .10$

and subordinate (LMX) could account for significant variance above and beyond divisional affiliation and WGX (the two variables over which a manager has less control), it was important to manipulate the order of entry of the predictor variables. This was accomplished by constructing hierarchical regression models so that LMX was the last predictor variable entered. More specifically, division was entered first, followed by WGX, followed by LMX, then the interaction terms. In this way, LMX would only be tested for significance on the variance remaining after division and WGX had already accounted for any common variance shared between these variables and LMX. Results from these tests are reported in Table III.

As data in Table III indicate, all six models were significant, with the full models accounting for between 14 and 53% of the variance in the climate factors. There were significant differences in freedom, disinterest, recognition, and encouragement associated with divisional affiliations. Only constraints and coordination were not found to differ between manufacturing, R & D, and corporate divisions. For informational purposes, mean scores for each climate variable were computed by division and reported in Table IV.

Results shown in Table III also indicate that perceptions of work group exchange (WGX) was a strong and consistent predictor of all six climate variables. That is, beyond any naturally occurring differences brought about by divisional affiliations, the quality of exchange among work group members accounted for significant and unique variance on all climate factors.

TABLE III  
REGRESSION ANALYSES TESTING THE RELATIONSHIPS AMONG DIVISIONS,  
WORK GROUP EXCHANGES (WGX) AND LMX ON CLIMATE VARIABLES

Climate Measure	d.f.	Freedom		Disinterest		Recognition	
		F	R <sup>2</sup>	F	R <sup>2</sup>	F	R <sup>2</sup>
Full Model	11	5.46***	.25	5.59***	.25	6.20***	.27
Division (D)	2	8.45***		4.40**		6.81***	
WGX (W)	1	11.44***		15.28***		7.85**	
LMX (L)	1	14.41***		8.44**		31.98***	
D*W	2	0.63		0.49		2.92#	
D*L	2	2.80#		2.71#		0.67	
W*L	1	6.65**		12.87***		7.17**	
D*W*L	2	1.79		4.87**		0.17	
Climate Measure	d.f.	Encouragement		Constraints		Coordination	
		F	R <sup>2</sup>	F	R <sup>2</sup>	F	R <sup>2</sup>
Full Model	11	19.01***	.53	2.70**	.14	3.70***	.19
Division (D)	2	4.92**		1.26		1.70	
WGX (W)	1	25.49***		12.43***		18.26***	
LMX (L)	1	162.79***		5.09*		0.01	
D*W	2	0.89		1.08		0.31	
D*L	2	1.26		0.40		0.46	
W*L	1	5.59*		6.70**		17.32***	
D*W*L	2	0.55		0.02		0.10	

\*\*\*p < .001; \*\*p < .01; \*p < .05; #p < .10; n = 198

TABLE IV  
MEAN CLIMATE SCORES BY DIVISION

Climate Variable	F	Division		
		Manufacturing n = 49	Corporate n = 104	R & D n = 45
Freedom	8.45***	12.88	15.89	15.39
Disinterest	4.40**	7.71	6.82	7.98
Recognition	6.81***	9.19	10.83	9.70
Encouragement	4.92**	16.67	18.20	16.98
Constraints	1.26	17.42	16.88	17.88
Coordination	1.70	14.55	14.02	13.33

\*\*\*p < .001; \*\*p < .01

Of greater interest to this study are two other results reported in Table III. For all but the coordination variable, the quality of exchange between leader and subordinate (LMX) continued to account for significant and unique variance, even *after* division *and* WGX preceded it in the models. Further, data in the table revealed that in all six tests the interaction term of WGX \* LMX was also significant. That is to say, even though it followed the three main effect terms *and* the other two first-level interaction terms (division \* WGX and division \* LMX), the interaction of work group exchange and leader/subordinate exchange continued to be an important factor and still accounted for significant variance on *each* climate factor.

To examine the nature of these interactions, scores for WGX and LMX were dichotomized into low vs. high levels of work group exchange, and out-group vs. in-group exchanges for leader/subordinate relationships. [Note that the terms out-group and in-group have been used by Graen and colleagues [8], [9], [13] to represent dyadic exchanges of low and high quality, respectively.] Mean values for the climate variables were then computed for each WGX \* LMX condition and used to plot Figs. 1-6.

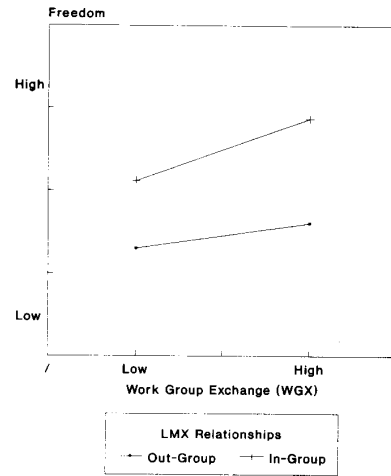


Fig. 1. WG X LMX interaction for climate variable: Freedom.

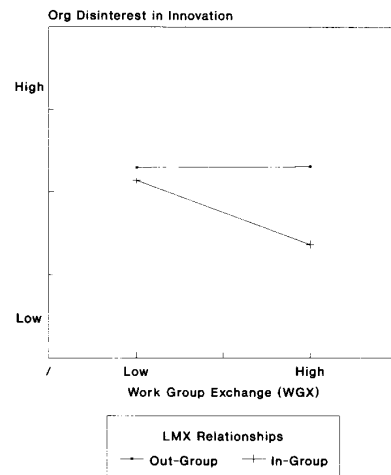


Fig. 2. WG X LMX interaction for climate variable: Disinterest.

As the figures reveal, in all six cases, the most desirable climate conditions (i.e., highest scores on freedom, recognition, encouragement, and coordination, and the lowest scores on disinterest and constraints) were reported by subordinates who experienced positive exchanges with *both* work group members *and* their manager. The least desirable scores on three of the climate factors (i.e., freedom, recognition, and constraints) were reported by subordinates experiencing negative exchanges with *both* work group members and their manager.

#### IV. DISCUSSION

Results from this study contribute to our understanding of work climate in two ways. First, data are reported which offer empirical corroboration for earlier studies. In this sense, the current investigation can be looked upon as validating previous research in that: (a) differences in several climate perceptions were found to exist among

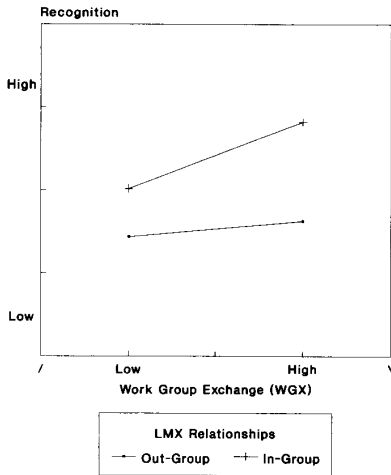


Fig. 3. WG X LMX interaction for climate variable: Recognition.

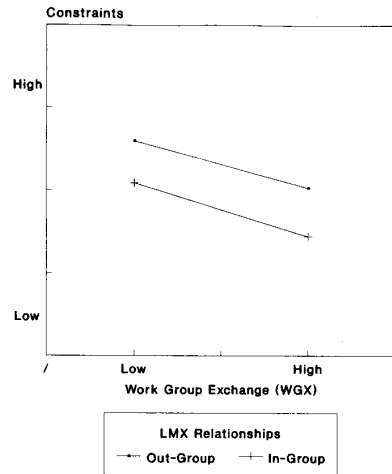


Fig. 5. WG X LMX interaction for climate variable: Constraints.

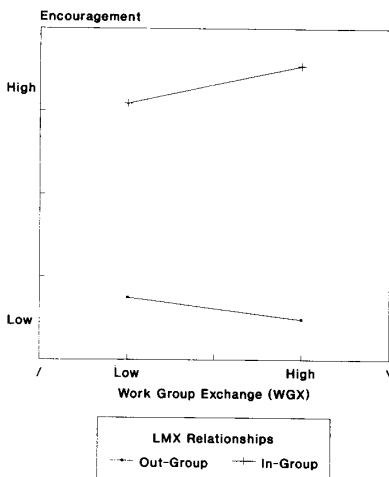


Fig. 4. WG X LMX interaction for climate variable: Encouragement.

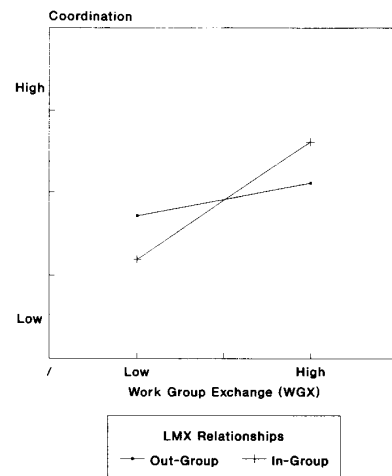


Fig. 6. WG X LMX interaction for climate variable: Coordination.

functional divisions; (b) positive correlations were found between higher quality work exchanges (WGX) and perceptions of freedom, recognition, encouragement, and coordination; (c) negative correlations existed between WGX and perceptions of disinterest and innovative constraints; (d) positive correlations were found for employees reporting higher quality exchanges (LMX) with their managers and perceptions of freedom, recognition, and encouragement; (e) negative correlations were reported for employees with higher LMX relationships and their perceptions of disinterest and constraints.

But the study makes a contribution beyond this validation component. It was structured so as to investigate how three sources of subordinate perceptions (i.e., divisional affiliation, WGX, and LMX) combined to explain variance in the climate experienced by employees. Fur-

ther, analyses were configured so as to evaluate the perceptual sources in descending order, according to the relative control a manager has in affecting them. Divisional affiliation, the factor with the least managerial control, was always given the first opportunity to account for variance in climate perceptions, followed by the next least controllable factor—interactions among members of the work group itself (WGX). The leader/subordinate relationship (LMX) was always the last predictor variable entered, and therefore, given the least chance for accounting for additional variance in climate perceptions. By testing for interactive relationships among the three sources of perceptions, and controlling order of entry to the statistical models, this study extends the research on innovative climate into new areas.

Before discussing implications of findings from this second area of contribution, a few comments are in order

regarding divisional affiliation and work group exchanges as main effects. As reported above, differences were found among the three divisions on measures of freedom, disinterest, recognition, and encouragement (see Tables III and IV). It is interesting to note, however, that employees from the manufacturing division were not always the ones who reported climate conditions least favorable to innovative actions, nor did R & D employees always report conditions most conducive to innovation. In fact, on all four climate factors where divisional affiliation had a significant main effect, it was the corporate division which consistently scored the most favorable marks (see Table IV). Thus, if there is truth to the commonly held maxim that the more conducive the climate the more innovative the employees, then, if taken *at face value*, these data suggest that this particular company should expect the most innovative behaviors from members of its corporate staff.

However, there is a shortcoming in this logic. First of all, scores for the climate variables used in this study were assessed using *perceptual* and, therefore, *relative* scales. Assume, for example, that innovative freedom could be measured with some *objective* instrument and that after applying this instrument we found two employees, one from manufacturing and one from R & D, had the same freedom score of 10 utils. Since the objective measure produced identical scores, might we also expect their perceptual assessment of this climate measure to be equal? Perhaps. But more likely perceptual responses would differ because employees in the two divisions probably have quite different expectations about the level of freedom they believe *should* exist, given the nature of their tasks, skills, and level of training. Thus, 10 utils of freedom for the manufacturing employee may be perceived as very high, whereas the R & D employee might perceive 10 utils of freedom to be very low.

This being the case, it may be inappropriate to make direct comparisons of the "absolute" perceptual scores on climate variables across divisions. A more fitting analysis would be to hold these differences constant while assessing the impact of other factors contributing to perceptual variations. In effect, this is exactly what was done by controlling the order in which factors were added to the regression analyses. Since division affiliation was always entered first, it was, in essence, held constant while testing relationships between the climate factors and the other predictor variables.

With regard to the relationship between WGX and the climate variables, a clear and consistent pattern emerged from these data. The quality of interaction a subordinate had with other members of his/her work group was definitely associated with perceptions subordinates developed about the work climate. If we adhere to the aforementioned maxim that a conducive climate will result in more innovative behaviors, then it is apparent that work group dynamics can act to either foster or inhibit an innovative environment.

From a managerial perspective, the consistent relation-

ship between WGX and desirable climate conditions is a double-edged sword. On the positive side, the presence of a strong and favorable work group interaction may be able to overcome, or at least minimize, other factors (i.e., resource scarcity, time pressures, etc.) which might normally denigrate an innovative climate. On the negative side, if the exchange between work group members is dysfunctional, vis-a-vis an innovative climate, WGX dynamics may neutralize environmental factors which would customarily foster a creative atmosphere.

Unfortunately, the quality of work group dynamics is not something which can be legislated by managerial decree. As stated earlier, however, while managers may have less control over WGX than other climate-related factors (e.g., LMX), there are any number of managerial strategies which can be used to influence the degree of work group interactions. For example, a manager might find that he/she can obtain more desirable WGX conditions by manipulating such things as task interdependencies, intragroup conflict and competition, creating or collapsing subgroups, or simply by redesigning spatial arrangements among work group members to influence communication patterns. [For a more detailed discussion, readers are encouraged to examine any number of very good books/articles on this topic [12], [16], [20], [25], [26], [41].] Suffice to say that although managers may not be able to *directly* control the quality of exchange among work group members, there are tactics which can be used to create conditions where a more desirable WGX can develop.

On the other hand, the quality of dyadic exchange between leader and subordinate (LMX) is something over which the manager can have a more direct effect [15], [36]. While important in and of itself, this capacity to orchestrate the relationship with subordinates takes on additional meaning within the context of this study. As shown in Table I, significant correlations were found between LMX and subordinate perceptions of five of the climate factors (coordination being the exception). These data indicate that as the dyadic exchange improves in quality (i.e., as LMX scores increase), subordinates are significantly more likely to perceive climate conditions which Amabile and others [2], [3], [5], [7], [31], believe fosters, stimulates, and encourages innovation and creative problem solving.

Further, the fact that LMX continued to account for significant variance in the same five climate factors *after* divisional affiliation and WGX preceded it in the regression analyses, indicates rather strongly that the dyadic interaction between leader and subordinate taps into a unique and potentially powerful segment of a subordinate's perceived work environment. In other words, even after removing the variance accounted for by divisional affiliation, and all the preexisting elements subsumed therein (e.g., training, skill levels, education, tradition & history, expectations, etc.), and even after removing the variance accounted for by group interactions and the powerful effects of socially constructed realities in-



cumbent in WGX, the quality of exchange which develops between a leader and subordinate *remains* an important and nonredundant source of climate related perceptions.

However, a note of psychometrically-induced "caution" must be introduced here. These data were collected using a cross-sectional design, and because of this cannot be used to argue for causality. They do not prove that higher LMX *causes* more favorable climate conditions (nor, for that matter, that divisional affiliation or WGX causes subordinate perceptions). Still, since studies have demonstrated that managers *can* do something to improve relationships with subordinates [15], [36], enhancing the LMX exchange is, if nothing else, at least a proactive step which *may* set the stage for greater innovative activities on the part of subordinates. [It should also be noted that in several longitudinal research endeavors, where causality *could* be demonstrated, the quality of exchange between leader and subordinate *has* been shown to have a causal impact on a number of organizationally relevant factors such as turnover [14], job satisfaction [9], [15], career progress [52], and managerial development [36].]

A final contribution this study makes toward understanding climate comes from testing the interactive effects of divisional affiliation, WGX, and LMX. For the most part, previous empirical studies in this area have primarily focused on main effect relationships and have not examined the possible interactive nature of perceptual sources. As reported in Tables II and III, a number of significant interaction terms were found in these data. Although divisional affiliation was found to interact with WGX and/or LMX in a number of tests (e.g., freedom, disinterest, and recognition), it did not seem to play a very consequential role beyond its influence as a main effect variable.

On the other hand, the interaction between WGX and LMX was consistently significant across all six regression analyses. What this suggests is that the relationship between WGX and LMX in explaining variance on these climate factors goes beyond simple additive effects. That is, a synergy appears to exist between WGX and LMX such that they work *interdependently* to account for climate perceptions. As explained earlier, an attempt to capture the nature of this interdependency was made by dichotomizing the two factors and plotting the six climate factors in Figs. 1-6. [It should be noted that by dichotomizing these factors we sacrifice some of their statistical power, so the resulting figures are somewhat "weakened" representations of the actual interactions.]

As illustrated in all six figures, climate perceptions most favorable to innovative activities were found when both WGX and LMX scores were the highest. In other words, when subordinates had a high quality exchange with both work group members *and* their manager, the perceived environment was most conducive to innovation. Further, half the figures illustrate that perceptions of climate factors *least* conducive to innovation were found when both WGX and LMX were low. In concert, these data suggest that in order to optimize conditions for innovative activity,

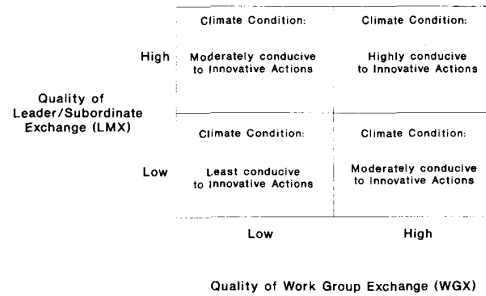


Fig. 7. Creating an innovative climate with WGX and LMX.

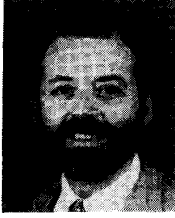
managerial actions should be taken to develop high quality relationships with each subordinate (LMX) *as well* as creating work groups characterized by positive member interactions (WGX).

These findings have been synthesized and are graphically illustrated in Fig. 7. Overall climate conditions *least* favorable to innovative activities would be experienced by subordinates who perceive low quality exchanges with their work group peers *and* their direct supervisor. A moderately favorable climate would be perceived by subordinates where either the work group or the leader/subordinate exchange is of high quality. However, the goal of any manager interested in fostering innovation would be to reach the high-LMX *and* high-WGX quadrant. Under these conditions, subordinates would experience a work climate which would be *most* conducive to innovation and creative problem solving. Further, the interactive effects of WGX and LMX appear relevant across divisional lines. That is, a manager in manufacturing would find the model depicted in Fig. 7 as appropriate as a manager in R & D or corporate (or, we surmise, in *any* functional breakdown).

To summarize, the literature on innovation indicates that the climate within which employees perform their tasks will have a significant impact on the opportunity and motivation to act in an innovative fashion [1]-[3], [29], [30]. What data from this study empirically documents is that divisional affiliation, work group interactions (WGX), and the quality of exchange between leaders and their subordinates (LMX) are significantly related to the perceptions a subordinate will develop regarding this climate. Further, it was demonstrated that the LMX factor, the factor argued to be most controllable by the manager, remains a strong predictor of innovative climate perceptions even after accounting for variance explained by the other two sources. Finally, data indicate that there is a significant interactive influence on climate associated with the *interdependency* of WGX and LMX, an association which goes beyond the influence of simple main effects. Future research should be undertaken to validate the present findings. Where the current study utilized a cross-sectional design, it would prove especially useful if future investigations could engage in longitudinal examinations in order to permit the testing of causal inferences.

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