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# AN EXAMINATION OF LEADERSHIP AND EMPLOYEE CREATIVITY: THE RELEVANCE OF TRAITS AND RELATIONSHIPS

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Creativity is becoming a topic of ever-increasing interest to organizational managers. Thus, there is a need for a greater understanding of the dynamics between the personal and contextual factors responsible for creative performance in work settings. In particular, there is a need to identify the role of leadership for creativity. Until now, creativity studies have examined leadership and employee characteristics from a single-domain perspective. Data from 191 R&D employees of a large chemical company were used to test a multidomain, interactionist creativity model of employee characteristics, leader characteristics, and Leader-Member Exchange (LMX). Results suggest that employee intrinsic motivation and cognitive style, LMX, the interactions between employee intrinsic motivation and leader intrinsic motivation, and between LMX and employee cognitive style relate to employee creative performance as measured by supervisor ratings, invention disclosure forms, or research reports. Implications for practicing managers and research on leadership and creativity are discussed.

"National prosperity is created, not inherited" (Porter, 1990, p. 73). These few, simple words aptly convey the necessity of innovation for corporate and national competitiveness. In this stage of our industrial history when innovation has become critical, an issue of increasing importance to is how to capitalize on the creative potential of the work force necessary for innovation. Individual creativity is the building block for organizational innovation (Amabile, 1988). Research on individual creative performance, however, is still at an early stage, and a selective review of the literature highlights several gaps that remain unaddressed.

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For example, it has been suggested that leaders are an important facet of the work context for creativity (e.g., Amabile & Gryskiewicz, 1987). Despite this, our knowledge of the role of leadership in the creative process remains limited. The few studies considering creativity leadership have restricted their investigation to a single leadership perspective (e.g., leader behavioral style; Oldham & Cummings, 1996; leader-member relations; Scott & Bruce, 1994). There has also been a strong sentiment among creativity researchers that creative performance emerges from key interactions between potential creators and their operating context (e.g., Amabile, 1983, 1988; Ford, 1996; Woodman, Sawyer, & Griffin, 1993). With few exceptions (e.g., Oldham & Cummings, 1996), studies testing possible interaction effects are rare. Given the dominant role of leadership in the workplace, research is needed to identify the myriad of interacting leader and employee factors that may shape employee creativity. In addition, although prominent creativity models suggest a set of personal qualities will initially determine creative work (e.g., Amabile, 1988), most creativity studies focus on a single aspect such as the creator's personality (e.g., Oldham & Cummings, 1996). Because creativity is likely to be influenced by a combination of personal characteristics (cf. Ford, 1996), research needs to consider additional personal attributes. Finally, creativity studies often rely on a single or subjective source of creativity indicators (e.g., Scott & Bruce, 1994). The few field studies that have included archival creativity measures (e.g., Oldham & Cummings, 1996) have used ordinary-least-squares (OLS) regression techniques that may fail to detect the true nature of the predictor-creativity relationship.

The overall purpose of our study was to address these specific issues. As a result, the study makes five unique contributions to the literature. First, we used a multiple-domain approach by considering leader relations, leader characteristics, and employee characteristics in a single model of employee creativity. Second, the study furthers our understanding of the multiplicative nature of creativity by examining the manner in which employee characteristics interact with leader characteristics and leader-member exchange (LMX) to influence creative performance. Third, we simultaneously examine two employee characteristics, innovative cognitive style and intrinsic motivation, representing both the skill and motivation components necessary for individual-level creativity (Amabile, 1983, 1988). Fourth, we use multiple criterion measures—patent/invention disclosure forms, research reports, and supervisory ratings—to assess employee creativity. We also apply an analytical technique, mixed Poisson regression, that has been used in other disciplines that routinely examine archival creativity indicators (cf. Hausman, Hall, & Grilleches, 1984).

## *Background and Hypotheses*

### *Creativity Defined*

There has been a growing consensus among creativity researchers regarding the appropriateness of defining creativity in terms of an outcome (Amabile, 1983) such as an idea or product (Amabile, 1988; Woodman, et al., 1993). In particular, Amabile's definition of creativity as the "production of novel and useful ideas" (1988, p. 126) has been cited in subsequent conceptual models (e.g., Ford, 1996; Woodman et al., 1993) as well as used in a number of recent creativity studies (e.g., Amabile, Conti, Coon, Lazenby, & Herron, 1996; Oldham & Cummings, 1996). Consistent with the operationalization used in these studies, we adopt Amabile's definition of creativity for this study as that which is practical, unique, and outcome oriented.

### *Employee Characteristics and Creativity*

The majority of creativity research conducted over the years has focused on various characteristics of individuals successful in creative endeavors (e.g., Barron & Harrington, 1981). A recent example of this research is a study (Oldham & Cummings, 1996) examining employee creative personality as it relates to workplace creativity. In addition to personality facets, cognitive style orientation and level of intrinsic motivation have also been recognized as core characteristics for employee creativity (Amabile, 1988; Woodman et al., 1993).

Kirton (1976) defines cognitive style as a natural orientation or preferred means of problem solving which can range from innovative to adaptive. Accordingly, an *innovator* (someone with an innovative cognitive style) will seek and integrate diverse information, redefine posed problems, and generate ideas likely to deviate from the norm. An *adaptor* (someone with an adaptive cognitive style) will tend to utilize data within a well-established domain, accept problems as defined, and generate ideas consistent with accepted convention. As noted by creativity researchers, a cognitive style oriented towards pursuing "new cognitive pathways" (Amabile, 1988, p. 131), or divergent thinking (Woodman et al., 1993), is necessary for creative production. Such an orientation is consistent with Kirton's definition of an innovative cognitive style and exemplifies what Amabile (1983, 1988) refers to as a creativity-relevant skill. Although conceptual work abounds proposing the innovative cognitive style–creativity link, the vast majority of empirical studies (e.g., Ettlie & O'Keefe, 1982) finding support for the premise have been conducted with students using self-report or pencil and paper tests of cre-

ativity (for exceptions, see Keller, e.g., 1984, 1986). Therefore, the following is proposed:

*Hypothesis 1a*: Employee innovative cognitive style will be positively related to employee creativity.

Csikszentmihalyi (1988, p. 337) states that "For no matter how original one might be, if one is bored by the domain, it will be difficult to become interested enough in it to make a creative contribution." Likewise, Amabile (1988) notes that a necessary component of intrinsic motivation is the individual's orientation or level of enthusiasm for the activity. Because it affects an employee's decision to initiate and sustain creative effort over time (Amabile, 1988), intrinsic motivation has been cited as one of the most prominent personal qualities for the enhancement of creativity (Amabile, 1983, 1988). Motivational orientation may be partially shaped by the environment (Amabile, 1983), but there is also evidence suggesting a stable, trait-like nature (e.g., Amabile, Hill, Hennessey, & Tighe, 1994). Similar to cognitive style, support for the intrinsic motivation–creativity link has been generated either in lab settings, among student samples, or using self-report creativity measures (e.g., Amabile, 1985; Amabile, et al., 1994). Although a recent field study (Oldham & Cummings, 1996) emphasized the role of intrinsic motivation as a mechanism by which their proposed contextual factors would operate on creativity, the actual intrinsic motivation level of employees was not included as a study variable. Because intrinsic motivation has been positioned as playing a crucial role in employee creativity, but has not been tested in a field setting, it was considered as one of the key employee characteristics in the current study.

*Hypothesis 1b*: Employee intrinsic motivation for creativity tasks will be positively related to employee creativity.

*LMX and Employee Creativity*

With its strong focus on supervisor-employee dyadic interactions, the LMX model positions leadership as a relational phenomenon serving as a conduit for a number of relevant organizational criteria (Graen & Uhl-Bien, 1995). As defined by Graen and colleagues (e.g., Graen & Cashman, 1975; Graen & Scandura, 1987), the nature of LMX appears compatible with employee creative action, considered to be an integral part of the coupling process between leader and employee (Graen & Scandura, 1987).

The quality of the LMX relationship should set the stage for employee creative performance in a number of ways. For example, high

LMX employees report engaging in more challenging and relevant tasks than their low LMX peers (Liden & Graen, 1980), two conditions that have been linked to creative performance in the workplace (Amabile & Gryskiewicz, 1987). High LMX employees are also more likely to engage in job-related risk taking (Graen & Cashman, 1975), and receive more task-related resources (Graen & Scandura, 1987) and recognition (Graen & Cashman, 1975). The combination of these factors suggests a receptiveness and support for creative work (Amabile, 1988; Ford, 1996). Indeed, previous research (Dunegan, Tierney, & Duchon, 1992; Scott & Bruce, 1994) indicates that high LMX employees believe they operate in a context that is supportive of innovative work. Finally, high LMX employees experience a strong sense of advocacy and liking from their supervisors (Duchon, Green, & Taber, 1986) conducive to a level of comfort and trust necessary for creativity (Mumford & Gustafson, 1988). A recent field study (Oldham & Cummings, 1996) supports this notion, finding that employees' perceptions of leader interpersonal support were linked to their creative output.

Preliminary support for the LMX–creativity link has been provided (Scott & Bruce, 1994). However, this particular study focused only on a leader-report measure of what was termed "innovative behavior" which included general activities that could apply to a number of the innovation process stages (e.g., idea generation, implementation), or reflect other employee performance behaviors. Therefore, the following hypothesis will be tested.

*Hypothesis 2*: LMX will be positively related to employee creativity.

*Employee-Leader Interaction Effects*

Oldham and Cummings (1996) report that leader style interacts with employee personality to predict creativity. A similar argument for considering interactions between leaders and employees is that even though they may differ in terms of what they bring to the situation, high performance will be contingent on the combined contribution of both parties (LePine, Hollenbeck, Ilgen, & Hedlund, 1997). Our literature review suggests that employees with an innovative cognitive orientation work best under conditions that permit risk taking, operational autonomy, and the freedom to deviate from the status quo (Kirton, 1989b). High LMX leaders encourage risk taking, provide greater job latitude, and expect nonroutine behavior from their dyad members (Graen & Cashman, 1975). Employees with a high intrinsic motivation need task challenge, meaningful work, and freedom from external constraints in order to capitalize on their creative potential (Amabile, 1988). High LMX leaders

strive to eliminate constraints to employee performance, and provide opportunities for engaging in challenging and relevant tasks (Graen & Scandura, 1987). Thus, when employees with an innovative cognitive style or intrinsic motivation for creativity operate within a high LMX context, creativity should be enhanced.

*Hypothesis 3a*: Employee creativity will be an interactive function of LMX and employee cognitive style, such that creativity will be highest when an employee with an innovative cognitive style experiences a high LMX relationship.

*Hypothesis 3b*: Employee creativity will be an interactive function of LMX and employee intrinsic motivation, such that creativity will be highest when an employee with a strong intrinsic motivation for creativity tasks experiences a high LMX relationship.

With few exceptions (e.g., Gibson, Fiedler, & Barrett, 1993), the notion that leader traits may affect employee creativity has rarely been broached. A small stream of research (Fiedler & Garcia, 1987; LePine, et al., 1997) considers cognitive capability or intelligence to be a cognitive resource of leaders that may interact with that of employees to influence performance. A leader's innovative cognitive style is another type of cognitive resource that may augment employee creativity. Because cognitive style is associated with a distinct pattern of behaviors, preferences, and values (Kirton, 1989a), creative synergies should occur when both leader and employee have innovative styles. For example, we would expect leaders with an innovative style to communicate a strong value for nonconformity and redefine problems with a move toward "doing things differently." A recent study (Redmond, Mumford, & Teach, 1993) reports that employee creativity is enhanced when leaders accept and exhibit an appreciation for cognitive diversity and nonconformity. We would, therefore, expect that the creativity benefits of having an innovative cognitive style leader would be maximized when an employee with the same orientation was given the opportunity to work with such a leader.

Likewise, if leaders possess a strong sense of intrinsic motivation for creative tasks, we would expect them to demonstrate acceptance for the creativity attempts of their employees. Leader expression of enthusiasm or acceptance for innovation is one of the noted factors necessary for employee's motivation to be creative (Amabile, 1988; Amabile et al., 1996). In addition, intrinsically motivated leaders are more likely to personally engage in creative work. The more the leader demonstrates such behavior, the more it will affirm for employees that creativity is expected—a factor associated with employee innovation-related performance (Scott

& Bruce, 1994; Tierney, 1998). The creativity of employees with a natural enjoyment for creative work is likely to be maximized in this situation. Thus, the following hypotheses are offered:

*Hypothesis 3c*: Employee creativity will be an interactive function of supervisor and employee cognitive style, such that creative performance will be highest when both employee and supervisor have an innovative cognitive style.

*Hypothesis 3d*: Employee creativity will be an interactive function of supervisor and employee intrinsic motivation, such that creative performance will be highest when both employee and supervisor have a strong intrinsic motivation for creativity tasks.

## *Methods*

### *Sample and Setting*

The current study was conducted in an R&D sector of a large chemical corporation. All eligible 191 nonclerical, full-time employees completed surveys. Sixteen employees involved in an earlier interview pilot study were not eligible to participate in the study. The sample included research managers, research scientists, section leaders, project leaders, work group professionals, and work group technicians. The sample was hierarchically structured with eight levels and included 40 supervisors. Formal work groups ranged in size from 1 (a supervisor-employee dyad) to 12, with an average group size of 4.6. Average corporate tenure of the final sample was 11.57 years ($SD$ = 9.46) and employees had been working within their job classification an average of 6.29 years ($SD$ = 6.1). Fourteen percent of the respondents had completed their high school degree, 14% their associates, 30% their bachelors, 15% their masters, and 27% their doctorate. Participants were employees of either the Basic (59%) or Applied (41%) corporate divisions.

### *Procedure*

An interview-based pilot study was conducted 3 months before the survey collection to develop a working understanding of the organization. Semistructured interviews consisted of 30–60 minute sessions with the Vice President of R&D, Directors of both the Basic and Applied divisions, the Patent Department Manager, three research managers, four section leaders, two senior research scientists, and three work group professionals. Interview results were also used to (a) validate our operational definition of creativity; (b) generate additional creativity rating

and intrinsic motivation items; and (c) identify archival sources of employee creativity assessment.

Data for the independent variables were collected from all employees by surveys distributed and completed on site during normal working hours with the first author present to answer questions and collect completed surveys. Supervisors were included in this data collection providing data for the independent variables of leader innovative cognitive style and intrinsic motivation. One week after the initial data collection, supervisors were provided with creativity rating forms to complete for each of their direct reports. The completed rating forms were mailed to the first author between 1 and 10 weeks afterwards. Data for the two archival measures, invention disclosure forms (IDFs) and research reports were provided by the corporate Patent Office and the Library and Records department following the survey collection.

Six supervisors did not provide complete information for either the leader cognitive style, leader intrinsic motivation, and/or employee creativity ratings. Four of these supervisors were ineligible to complete a characteristics survey because they had participated in the prestudy interviews. Because the missing supervisor data was to be assigned to their employees, 32 individuals were dropped from analysis for the supervisor creativity ratings ($n$ = 159), and 27 were dropped for research report and IDF ($n$ = 164) analyses. Demographic information was not available for one individual, but otherwise there were no missing data for the employee self-report variables (employee characteristics and LMX). Given the favorable response rates (above 80%), nonresponse bias was not a major concern. Although $t$-tests indicated that incomplete respondents were better educated, had longer tenure, and higher hierarchical status, there were no significant differences for any of the independent or dependent variables.

*Measures*

Employee intrinsic motivation (Cronbach alpha .74) was tapped using a 5-item, 6-point scale instrument developed for use in this study based on the work of Amabile (e.g, 1985) and the pilot study. Items targeted enjoyment for activities related to generating new ideas. All items (included in the Appendix) were reverse-coded and then averaged. Employee cognitive style was measured with the Kirton Adaption-Innovation survey (KAI; Kirton, 1976; Cronbach alpha .86), a 32-item, 6-point scale instrument designed to identify preference for problem-solving and decision-making style. A higher score represents a more innovative cognitive style. The quality of the supervisor-employee relationship was assessed by the 7-item version of the LMX instrument

(Graen, Novak, & Sommerkamp, 1982; Cronbach alpha .91) using a 5-point scale. To assess leader characteristics, supervisors completed the same intrinsic motivation and KAI instruments that were administered to employees (Cronbach alphas .72 and .87, respectively).

Previous research has been criticized (e.g., West & Farr, 1990) for failing to operationally delineate between innovation and creativity. Therefore, our focus was on criterion indicators directly related to creative idea generation. Based on this definition and our corporate interviews, creativity was assessed by three indicators: supervisor ratings, IDFs, and research reports. Supervisor ratings of employee creativity consisted of nine items (included in the Appendix) using a 6-point scale (Cronbach alpha .95). Four items were adapted from an existing self-report instrument (Ettlie & O'Keefe, 1982) and the remaining items were based on literature review and results of the pilot study. Supervisors were instructed to report how often each of their employees could be described according to the items. Higher scores indicated higher levels of creativity. Information on IDFs, forms employees complete describing an idea they have regarding a new product or process, was obtained from archival records. Employees at all levels were eligible to submit IDFs. Prior to submission, IDFs are reviewed by the work group supervisor. An independent panel of judges then rates them in terms of their degree of "uniqueness and usefulness" to the organization. Those IDFs deemed the most creative are maintained by the Patent Department. Number of IDFs by each employee for the time period corresponding to, and following 6 months subsequent to, the survey time frame were provided. The second archival creativity indicator was the number of research reports published by each employee describing research discoveries or ideas for new or improved products or processes. Only research reports written subsequent to the survey collection time frame were included in the study. In total, there were 147 IDFs, 97 research reports, and 31% percent of the sample had one or more IDFs, research reports, or both.

*Control Variables*

Educational level reflects task domain expertise or knowledge which could potentially shape creative performance (Amabile, 1988) and was measured on an 11-point scale (0 = *no college degree*; 1–10 = *number of college years completed*). Organizational tenure measured in years was also included. Hierarchical level has been related to greater involvement in innovation activities (e.g., Ibarra, 1993) and was measured on a 1 = *lowest level* to 8 = *highest level*. Finally, because creativity has traditionally been associated more with basic research, we controlled for

divisional affiliation (dummy coded 0 = *basic* and 1 = *applied*). Job type may (cf. Scott & Bruce, 1994), or may not (cf. Oldham & Cummings, 1996), influence creative performance. However, because the correlation between job type and hierarchical level in our study was .94, we felt that level served as an adequate proxy.

*Data Analysis Issues*

All hypotheses were tested by hierarchical regression analysis. For the study's IDF and research report dependent variables, use of OLS regression is problematic. Although previous research (e.g., Keller, 1986; Oldham and Cummings, 1996) has relied on OLS regression to assess relationships with such variables, this technique is inappropriate for several reasons. First, these variables are event counts representing the number of times some event has occurred during a given time period. Restriction of range associated with event counts results in a high degree of nonnormality. Transformations may reduce but cannot completely eliminate nonnormality since the variables tend to be Poisson-distributed. OLS regression assumes linear relationships. This functional form is implausible for event counts, and often results in predicted values that are less than zero. A more appropriate form is nonlinear and asymptotic (King, 1988). Other problems include the potential for OLS regression coefficients to be biased (King, 1988; Long, 1997), the possibility that statistical power is diluted due to the assumption of the wrong functional form (Gardner, Mulvey, & Shaw, 1995; King, 1988), the inherent heteroscedacity present in event count relations (Gardner et al., 1995; Greene, 1997; Long, 1997), and the tendency for the error terms to be nonnormally distributed (Greene, 1997; Long, 1997).

As an alternative to OLS regression, we utilized regression analysis within the generalized linear model (GLM: McCullagh & Nelder, 1989), which allows unbiased maximum likelihood estimation of regression models with response variables from any member of an exponential family of distributions. The PROC GENMOD procedure in SAS was used to estimate GLM regression models for IDFs and research reports relying on the basic Poisson model. This procedure has been used in economic research examining event count variables such as patents (Hausman et al., 1984; Wang, Cockburn, & Puterman, 1998), as well as in other disciplines such as political science, health care, and sociology (e.g., King, 1988; Land, McCall, & Nagin, 1996; Lidz, Mulvey, & Gardner, 1993). The Poisson model uses a 1-parameter model to describe the distribution of the dependent variable in which the variance is a function of, and is equal to, the mean. The model also assumes that events occur independently over time. Because it is unrealistic to assume that

creative achievements such as IDFs or research reports do not increase the rate of such achievements in the future, we included an additional parameter to model the effects of the overdispersion that would result (Greene, 1997; Long, 1997). The resulting model is called a compound or mixed Poisson regression model (Land et al., 1996; Wang et al., 1998). IDF and research report analyses were conducted using such a model, with the recommended dispersion parameter estimated (Gardner et al., 1995) by setting it to equal the square root of the deviance divided by the degrees of freedom.

The mixed Poisson procedure produces regression parameter estimates that can be interpreted in ways familiar to users of log likelihood and related models (e.g., an increase of .2 in LMX increases the expected number of IDFs by 20%, or by .14 IDFs). The Poisson model is nonlinear, so there is no sum of squares upon which to base an estimate of $R$ squared. However, we used two other estimates of model fit that are available. The first is the likelihood ratio statistic (Long, 1997), which compares a given model to a constrained model such as a null model, in which all slope coefficients are equal to 0. The difference between the two models is distributed as chi-square. This technique can be used to estimate the significance of adding additional parameters to the model analogous to the significance of incremental $R$ squared in hierarchical regression. We also utilized an estimate of model fit known as a "pseudo $R$ squared" statistic (Long, 1997; Greene, 1997), based on the percentage of explained "variation." The pseudo $R$ squared statistic measures the improvement of the given model over one with only a constant term.

Finally, because there were only 34 independent observations for supervisors, the values of leader variables (e.g., leader cognitive style and intrinsic motivation) assigned to the respective employees were not independent of one another, violating several OLS regression assumptions. First, a portion of random error will be constant within groups and may be autocorrelated. Empirical assessment of this possibility by the Durbin-Watson test for our data was inconclusive, indicating that significant autocorrelation may or may not exist. However, E-test results using WABA (Dansereau, Alutto, & Yammarino, 1984) suggest that the possible lack of independence is not a practical problem. Group-level random error may also vary across units, violating the OLS constant variance assumption. Inspection of partial scatter plots of residuals for supervisor creativity ratings suggests that this assumption is (in practical terms) not violated for leader cognitive style, and that the violation for leader intrinsic motivation is very minor. Finally, although parameter estimates are not affected by the problems noted above, standard errors estimated using an inappropriately large $n$ will be deflated. Thus, correlation significance levels for all leader characteristic variables (Table 1)

TABLE 1

*Means, Standard Deviations, and Intercorrelations of Variables*

| Variable | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Creativity ratings | 3.30 | 1.10 | .95 | | | | | | | | | | |
| 2. Invention disclosure forms | 0.65 | 2.14 | .29** | | | | | | | | | | |
| 3. Research reports | 0.50 | 1.27 | .28** | .11 | | | | | | | | | |
| 4. Employee cognitive style | 3.48 | 0.38 | .35** | .01 | .17* | .86 | | | | | | | |
| 5. Employee intrinsic motivation | 5.10 | 0.54 | .28** | .13 | .10 | .20* | .74 | | | | | | |
| 6. LMX | 3.33 | 0.59 | .30** | .17* | .06 | .10 | .26** | .91 | | | | | |
| 7. Leader cognitive style | 3.60 | 0.53 | .23 | .16 | .20 | .09 | .10 | .04 | .87 | | | | |
| 8. Leader intrinsic motivation | 5.06 | 0.67 | .21 | .08 | .09 | .05 | .04 | .05 | .26 | .72 | | | |
| 9. Educational level | 4.60 | 2.66 | .40** | .17* | .39* | .34** | .06 | .02 | .28 | .23 | | | |
| 10. Organizational tenure | 11.58 | 9.46 | −.17* | .03 | −.16* | −.19* | −.09 | −.04 | −.13 | −.11 | −.31** | | |
| 11. Division | 0.59 | 0.49 | .11 | −.04 | −.23** | .02 | .03 | .12 | −.09 | .09 | −.16 | −.17* | |
| 12. Hierarchical level | 5.23 | 2.18 | .38** | .24* | .22** | .23** | .00 | .12 | .28 | .23 | .72** | .06 | .03 |

*Note:* Statistics reported are based on listwise $n$ of 159 except for correlation with leader cognitive style and leader intrinsic motivation, which are based on supervisor $n$ of 34. Division is coded 0 = *basic*, 1 = *applied*. Hierarchical level is coded 1 = *lowest*, 8 = *highest*. Numbers on the diagonals are the alphas.

* $p < .05$ ** $p < .01$

have been calculated based on $n = 34$. Standard errors reported for the two leader characteristics in the regression analyses were similarly adjusted.

## *Results*

### *Discriminant Validity of Self-Report Scales*

Before hypotheses testing, the discriminant validity of the study's four self-report scales (LMX, cognitive style, intrinsic motivation, and supervisor creativity ratings) was assessed using EQS (Bentler, 1995) to compare several nested models representing plausible alternative factor scale structures. These included (a) the hypothesized 4-factor model; (b) a 3-factor model with KAI and intrinsic motivation combined; (c) a 3-factor model with supervisor creativity ratings and intrinsic motivation combined, (d) a 2-factor model combining KAI, intrinsic motivation, and supervisor creativity ratings; and (e) a single factor model. We created three manifest indicators for each latent factor by randomly assigning items to "testlets" to reduce the number of parameters assessed, thus improving the sample-size to estimator ratio (Anderson & Gerbing, 1988). The 4-factor model showed good fit in absolute terms (chi-square = 81.01 on 50*df*, $p < .001$), and had a CFI of .97 and an RMSEA of .07. Values of CFI > .90 and RMSEA < .08 are considered to indicate "good fit." Comparisons of the 4-factor model with the other models were favorable. The 4-factor model exhibited better fit as assessed by chi-square difference tests, and higher CFI and RMSEA indices. These results indicate that the self-report scales used did possess adequate discriminant validity.

### *Correlational Analysis Results*

Descriptives and zero-order correlations are presented in Table 1. As shown, there were positive relationships between cognitive style and both hierarchical level and education level, and a negative relationship for cognitive style with tenure. All but three of the relationships between the controls and the dependent variables were significant, and all these were in the expected direction. Among the main independent variables, employee intrinsic motivation was correlated positively and significantly with employee cognitive style and LMX. Supervisor ratings of employee creativity correlated positively and significantly with the two archival measures of creativity.

The first three hypotheses predicted positive relationships between employee creativity and employee cognitive style (Hypothesis 1a), em-

ployee intrinsic motivation (Hypothesis 1b), and LMX (Hypothesis 2). All three expectations are supported at the correlational level for supervisor creativity ratings. However, only LMX is significantly related to IDFs, and only cognitive style is significantly related to research reports. Lack of stronger support for the hypotheses when the IDF and research report variables are examined is likely a function of the nonnormality of the variables resulting in violation of correlational assumptions. Leader cognitive style and intrinsic motivation were not related to any other study variable.

*Hierarchical Regression Analyses Results*

To better assess the hypothesized effects, hierarchical regression analyses were conducted. Control variables were entered first. Because employee characteristics are considered relatively stable characteristics (Amabile, 1988), they were entered into the equation next. Given its reciprocal nature, the development of dyadic relationships is only partially controlled by the leader. Thus, LMX was entered third. Because it was necessary to partial out the main effects of leader traits from the interaction terms of which they were components, leader cognitive style and intrinsic motivation were entered in the next block. For the creativity ratings analysis, a squared term for cognitive style was entered subsequent to entry of the leader characteristic block. Product terms were entered last, as a set. Following Aiken & West (1991), any variable used as a component of an interaction term was centered before entering it into the analysis.

Use of the squared cognitive style term was predicated on initial examination of regression diagnostics of the residuals suggesting nonlinearity in the relationship between the supervisor creativity ratings and employee cognitive style. Testing of a regression estimating the effect of the squared cognitive style term beyond that of the linear cognitive style term revealed that the squared term was significant. In line with suggestions by Aiken & West (1991), terms including the squared cognitive style component were entered in this regression equation first. Because they allow for nonlinear functional forms, squared terms were unnecessary for the Poisson regressions.

As discussed previously, the regression for creativity ratings was based on OLS analysis, and the regressions for IDFs and research reports were based on a mixed Poisson model. Although the coefficients and fit indices are not directly comparable between the two types of regression models, there are sufficient similarities in the conceptual bases of these analyses to allow some comparisons involving sign of relationship, significance levels of coefficients, incremental contribution of blocks entered

hierarchically, and to a lesser extent, $R$-squared and pseudo $R$-squared. The references below to incremental variance and significant variance explained refer to all three regression analyses. Hierarchical regression analyses for the three creativity measures are reported in Table 2. Educational level was significantly and positively related to research reports, with a 21% increase in research reports for each additional year of education. Respondents in the Basic division produced significantly more research reports than did those in the Applied division. Membership in the Applied division decreased the expected number of research reports by 65%. Hierarchical level was significant and positively related to IDFs (there is a 38% increase in IDFs for each level up in the hierarchy). In total, the control variables explained 21% of the variance in rated creativity, 22% of the variance in IDFs, and 30% of the variance in research reports.

After entry of the control variables, the employee characteristic block added significant incremental variance for rated creativity (9%) with both cognitive style and intrinsic motivation significantly and positively relating. Looking at both the pseudo $R$-squared and the change in likelihood ratio for IDFs in this block, a significant 8% of the variance was explained by the set of employee characteristics. Only intrinsic motivation was significantly related with a standard deviation increase in intrinsic motivation associated with a 62% increase in IDFs. Neither employee characteristic variable was significantly related to research reports, nor did the block contribute significantly to incremental variance explained. Therefore, Hypotheses 1a and 1b are partially supported.

LMX was positively associated with rated creativity, explaining an additional 3% of its variance beyond employee characteristics and the control set. LMX also explained an additional 7% of variance for IDFs (a standard deviation increase in LMX was associated with a 57% increase in IDFs). Although not contributing a significant increment in research reports, LMX was significant in the final equation. Therefore, partial support was found for Hypothesis 2.

The square term for employee cognitive style was entered next in the rated creativity regression. This term was marginally significant ($p = .06$) and explained a 2% increment in variance. Because the coefficients of both cognitive style and its square were positive, the shape of the creativity ratings-cognitive style relation is a concave upward curve (Aiken & West, 1991) indicating sharply increasing creativity as cognitive style becomes more innovative.

The interaction terms entered in the final block explained significant additional variance in all three regression models (for rated creativity, 6%; for IDFs, 7%; for research reports, 6%). Although the linear component of this interaction was not significant, the interaction of

TABLE 2

*Results of Hierarchical Regression Analyses for Creativity Ratings, IDFs, and Research Reports*

| IV Block | Creativity ratings ($n$ = 159) $R^2$ | $\Delta R^2$ | $\beta$ | Invention disclosure forms ($n$ = 166) Pseudo $R^2$ | $\Delta LR$ | Parameter estimate | Research reports ($n$ = 166) Pseudo $R^2$ | $\Delta LR$ | Parameter estimate |
|---|---|---|---|---|---|---|---|---|---|
| Step 1: Control variables | .21** | .21** | | .22 | 41.55** | | .30 | 41.39** | |
| Educational level | | | .22 | | | .06 | | | .21** |
| Organizational tenure | | | .03 | | | −.02 | | | −.02 |
| Division | | | .13 | | | .09 | | | −1.05** |
| Hierarchical level | | | .11 | | | .38** | | | .13 |
| Step 2: Employee characteristics | .30** | .09** | | .30 | 15.58** | | .31 | 2.69 | |
| Cognitive style | | | .23** | | | −.14 | | | .52 |
| Intrinsic motivation | | | .20** | | | .89** | | | .33 |
| Step 3: LMX | .33** | .03** | .32** | .37 | 12.11** | .77** | .32 | 1.74 | .79** |
| Step 4: Leader characteristics | .34** | .01 | | .47 | 18.53** | | .37 | 1.74 | .79** |
| Leader cognitive style | | | .06 | | | 1.27 | | | .96 |
| Leader intrinsic motivation | | | .10 | | | −.54 | | | .08 |
| Step 5: Cognitive style$^2$ | .36** | .02 | .12+ | | | | | | |
| Step 6: Interactions | .42** | .06* | | .54 | 13.09* | | .43 | 15.72** | |
| Cognitive style × LMX | | | −.08 | | | −1.52** | | | −1.28** |
| Cognitive style$^2$ × LMX | | | −.22* | | | | | | |
| Cognitive style × Leader cognitive style | | | .07 | | | −.88 | | | −.82 |
| Cognitive style$^2$ × Leader cognitive style | | | .08 | | | | | | |
| Intrinsic motivation × LMX | | | .09 | | | .08 | | | −.19 |
| Intrinsic motivation × Leader intrinsic motivation | | | .14* | | | −.47 | | | .70* |

*Note:* Beta weights for the OLS regression are reported for the final step. Significance of beta weights for the leader cognitive style and leader intrinsic motivation variables based on $n$ = 34. Parameter estimates for the mixed Poisson regressions are reported for the final step. Pseudo $R^2$ assesses incremental fit versus the null of the model specified at each step in the analysis. Change in likelihood ratio assesses the significance of adding additional parameters to the model and is roughly analogous to $\Delta R^2$.

$^+p < .10$ $^*p < .05$ $^{**}p < .01$

the squared employee cognitive style term and LMX was significant for rated creativity. The cognitive style-LMX interaction was also significant for both IDFs and research reports. In all three instances, the relationship was negative, running counter to predictions for Hypothesis 3a. A standard deviation increase in the product term was associated with a 59% decrease in IDFs and a 53% decrease in research reports. The interaction of employee and supervisor intrinsic motivation was positive and significant for rated creativity and research reports, but not for IDFs, suggesting partial support for Hypothesis 3d. A standard deviation increase in this product term was associated with a 32% increase in research reports. Support for the remaining two interaction terms (LMX $\times$ leader cognitive style, and leader cognitive style $\times$ employee cognitive style) was not found.

To interpret the conditional effects, we used procedures suggested by Aiken and West (1991) for plotting significant interactions. Figure 1 shows that the relationship between employee cognitive style and rated creativity varies as a function of LMX. Contrary to our prediction that creativity would be highest for the combination of employee innovative cognitive style and high LMX relations, the graph suggests that although employees with an innovative cognitive style are rated as highly creative, quality of the LMX relationship does not appear to influence their creative performance. High quality leader-member relations, however, appear critical to rated creativity for individuals who have a moderately innovative or adaptive cognitive style. Here, LMX seems to have more of an enabling effect for less innovative individuals. This interaction pattern is also evident in the relationships for IDFs (Figure 2) and research reports (not shown). For IDFs, the shape of the relations is generally similar, with two minor differences. First, the enabling effect of LMX increases dramatically as innovative cognitive style decreases, to the point where relatively adaptive individuals outperform those who are highly innovative. Second, whereas the slopes of the three regression lines for rated creativity were all positive, the slopes of the three regression lines in Figure 2 are much more dependent on LMX. Only when LMX was low did innovative cognitive style provide a positive benefit. When leader-member relations are poor, low-innovative (adaptive) individuals had fewer IDFs than any other subgroup, but innovative individuals had roughly as many IDFs as any other subgroup. Figure 3 shows the relationship between employee and leader intrinsic motivation for creativity ratings. The figure shows creativity highest when both employee and leader intrinsic motivation are highest. The same basic pattern is depicted in Figure 4 for research reports. There is a noticeable crossover

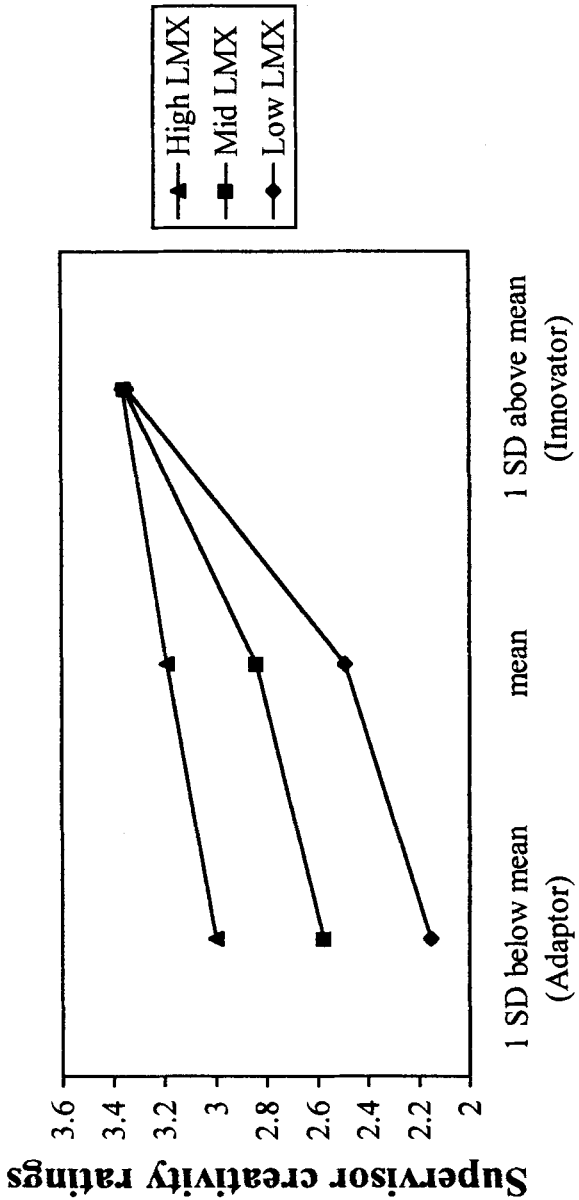


*Figure 1:* **Interaction of Employee Cognitive Style and LMX for Creativity Ratings.**

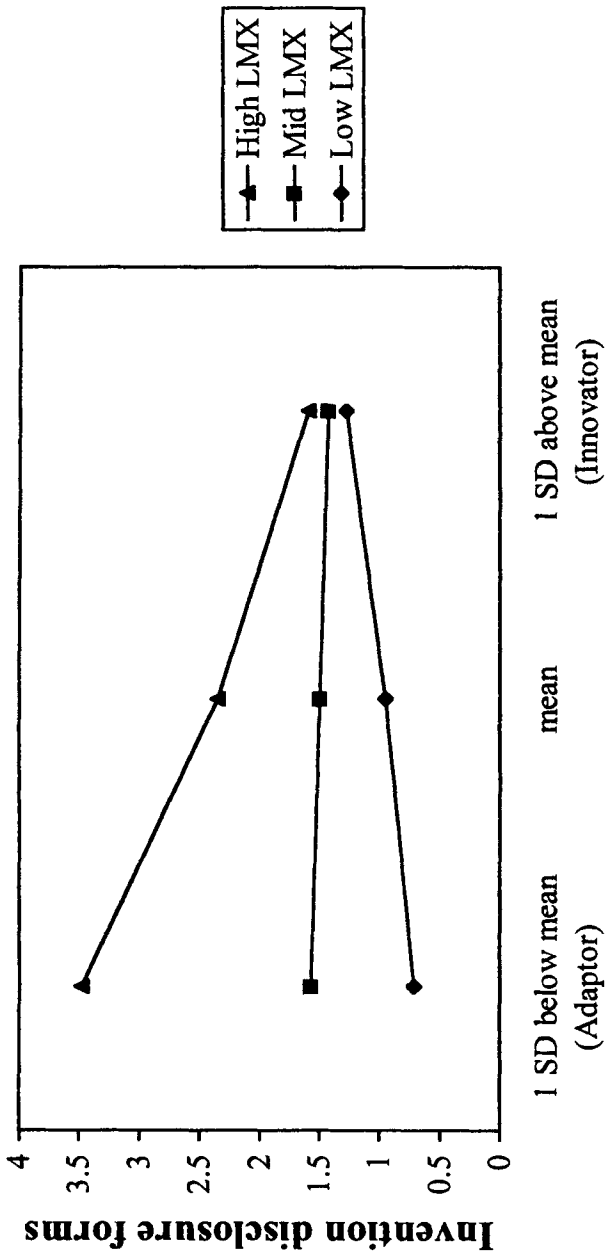


*Figure 2:* **Interaction of Employee Cognitive Style and LMX for IDFs.**

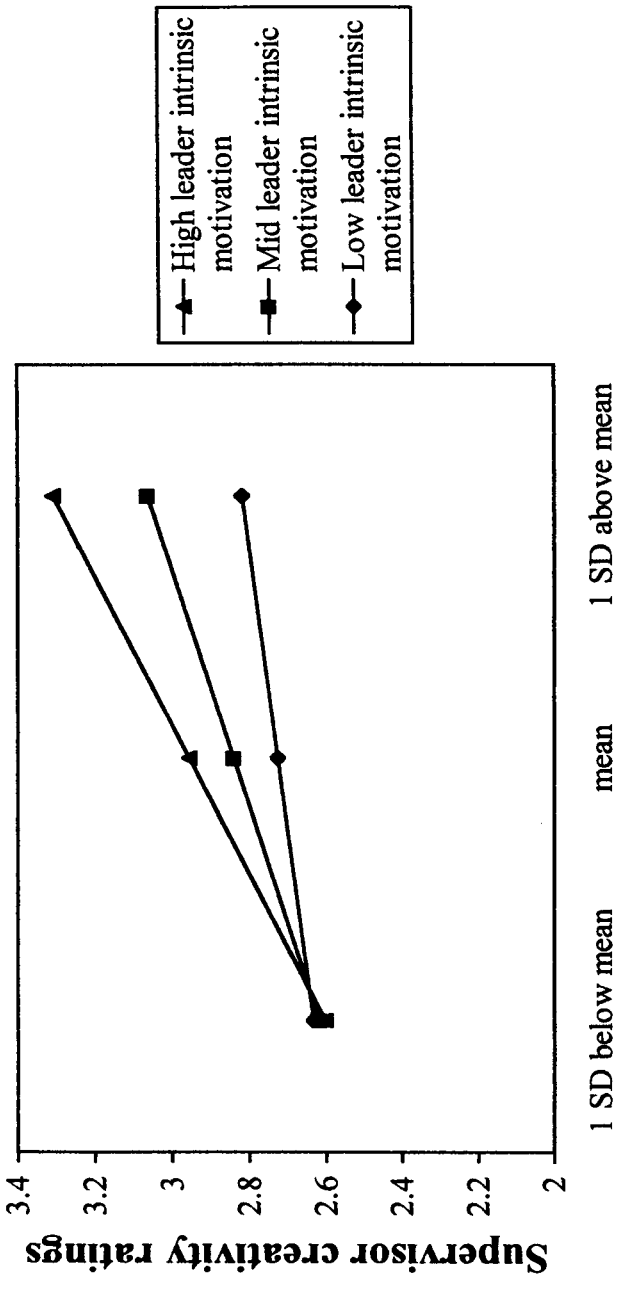


*Figure 3:* **Interaction of Employee and Leader Intrinsic Motivation for Creativity Ratings.**

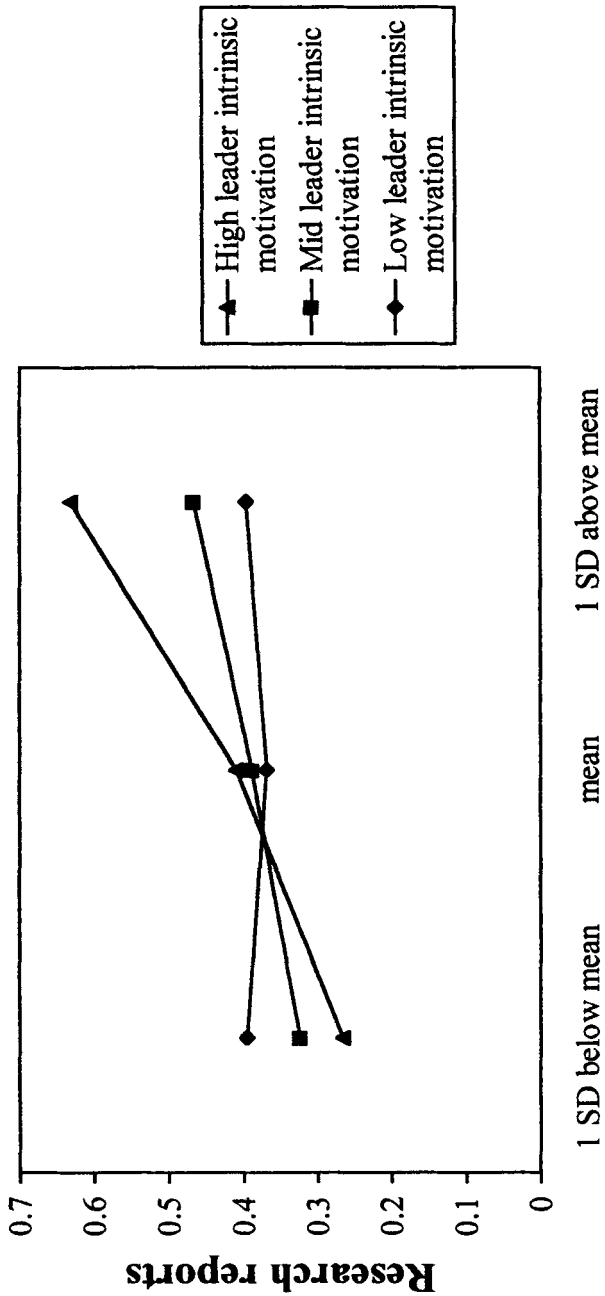


*Figure 4:* **Interaction of Employee and Leader Intrinsic Motivation for Research Reports.**

point in these relations for research reports when employee intrinsic motivation is just below its mean. At low levels of employee intrinsic motivation, the number of research reports produced is somewhat lower as levels of leader intrinsic motivation increase. This association quickly changes direction as level of employee intrinsic motivation increases. The slopes of the lines show that when leader intrinsic motivation is low, employee intrinsic motivation is irrelevant, but as leader intrinsic motivation increases, higher levels of employee intrinsic motivation associate with increasingly positive effects.

To summarize, although the form of the relationships was not always as predicted, with the exception of leader cognitive style, each independent variable was found to have either a significant main or conditional effect for each dependent variable. Overall, the entire variable set accounted for 42% of the variance in rated creativity, 54% of the variance in IDFs, and 43% of the variance in research reports. In terms of the proposed hypotheses, partial support was found for Hypothesis 1a (employee cognitive style), Hypothesis 1b (employee intrinsic motivation), Hypothesis 2 (LMX), and Hypothesis 3d (leader intrinsic motivation $\times$ employee intrinsic motivation). The interaction between LMX and employee cognitive style was significant, but in the opposite direction proposed in Hypothesis 3a.

## *Discussion*

It has been asserted that "leadership is employed to give people the opportunity and challenge of innovation and change..." (Uhl-Bien & Graen, 1992, p. 228). Research shows that leadership is an effective organizational tool for successfully obtaining relevant outcomes in other arenas (e.g., job satisfaction, routine productivity). It is natural to extend this application and ask how we lead people to innovate. The initial goal of the present study was to expand the study of leadership for employee creativity by investigating the association from a multiplicative perspective considering employee characteristics, leader relationship, and leader characteristics.

As a baseline, employee intrinsic motivation and innovative cognitive style were examined. Consistent with previous theory, our results indicate that when employees enjoy creativity-related tasks, their level of creative output is high. It also appears that when employees work with supervisors who possess a similar intrinsic motivational orientation, creative performance is enhanced. However, employees in the current study with a low intrinsic motivation for creativity assigned to high intrinsic motivation supervisors produced lower creative output in terms of research reports. One possible explanation is that such supervisors

may unintentionally intimidate or suppress the creative output of employees not naturally inclined toward creative activities. Results support that an innovative cognitive style is a creativity-relevant skill (Amabile, 1988) by showing associations with both creativity ratings and IDFs. We also found that the relationship between cognitive style and creativity ratings may depart from a simple linear association. As style becomes more innovative, the positive effects on creativity increase exponentially.

Because creativity may fall into the realm of the "necessary-but-not-required" aspects of many employee jobs, a means of influence extending beyond formal authority must be sought. The finding that LMX explains incremental variance in employee creativity underscores the necessity of considering the ongoing employee-supervisor interaction when trying to understand employees' propensity to create. It is important to note, however, that when considering LMX in an interactive sense with employee cognitive style, an interesting pattern emerges. Cognitive *innovators*, no matter what type of relationship they had with their supervisors, experienced high levels of creative output. However, cognitive *adaptors* in higher quality LMX dyads were consistently more creative than were adaptors in low quality dyads. Detection of the same pattern across all three creativity indicators refutes a simple high LMX supervisor rating bias and suggests that this interpersonal combination may truly be associated with creative performance. Extant literature suggests that adaptors tend to be more compliant, and easily influenced by external pressures (Kirton, 1976, 1989a). Thus, cognitive adaptors may readily respond to the LMX norm to go above and beyond routine performance and direct their efforts more toward creativity.

Although we hypothesized that innovative cognitive style employees working with a similar style supervisor would result in creative performance, our results did not bear this out. There are a few possible explanations for this finding. Kirton (1976; 1989b) portrays cognitive innovators as creative loners who are not particularly interested in relationship building. Given that these employees already possess the skills, confidence, and value orientation to be creative (Kirton, 1989a) they may not receive incremental benefit from interacting with a supervisor who also exhibits these tendencies.

Results also did not support our hypothesis that intrinsically motivated employees would be more creative working within a high LMX dyad. An initial prerequisite for creativity is that employees possess an intrinsic drive to be creative (Amabile, 1983). Once the intrinsic motivation baseline is there, LMX relations simply do not appear to augment creative performance. Nor did our findings suggest that employees would create when involved in a high LMX dyad despite their low intrinsic motivation for such activity. Consistent with the LMX concept,

as long as it falls within role expectations, high LMX leaders would tend to support the employees chosen area of performance as opposed to forcing performance in a particular realm (i.e., creativity) for which the employee has a basic dislike, and potentially dismantling the high LMX relationship.

*Theoretical Contributions and Implications*

The current study augments or supports recent models and empirical studies on organizational creativity in a number of ways. One of the most important contributions is our detection of interactive effects between leaders and employees. The study confirms the multiplicative nature of creativity suggested in models by Amabile (1988), Woodman et al. (1993), and Ford (1996). Although an interactive effect has been reported between leader behavior style and employee personality (Oldham & Cummings, 1996), our study permits insight into greater possible interaction effects involving two leadership and employee aspects. Second, as noted by Woodman et al. (1993), a shortcoming of creativity research is the tendency to "study creativity from a single perspective..." (p. 316). Because our study considers two leadership dimensions, relationships and characteristics, it provides a more encompassing perspective than studies considering only a single view on leadership.

Third, our findings support the notion that social work context influences creativity (Amabile, 1988; Woodman et al., 1993), and fulfills the need for insight as to how interpersonal relationships affect creativity (Van Gundy, 1987). Results also build support for the premise that high LMX dyads are characterized by elevated employee creativity (cf. Scott and Bruce, 1994). However, our study extends beyond previous findings. First, our inclusion of both leader traits and LMX permits us to evaluate the total and incremental effect the two leadership factors have on employee creativity. Second, our investigation of LMX took place in an interactive framework and represents one of the few studies taking into account possible moderators of the LMX-performance relationship. Our detection of a significant interaction effect for LMX is particularly relevant because it (a) indicates that there may be a specific combination of cognitive style orientation and leader relations most conducive for creativity, and (b) suggests a boundary condition for the potential impact of LMX on employee creativity. In addition, results of our examination of potential leader characteristics interactions provides further support that a situational leadership paradigm may apply to employee creativity.

Finally, recognizing the highly nonnormal nature of our archival variables, we looked to other disciplines that frequently use such criteria measures, and adopted an analytical technique appropriate to these vari-

ables. In addition, our study used multiple creativity indicators, leader ratings and two archival sources, compared to other studies that have relied on a single, subjective source (e.g., Scott & Bruce, 1994). Our use of multiple indicators provides a much-needed element of validity to creativity research. Although the similarity in our results pattern across the three creativity indicators is quite encouraging, and consistent with previous findings (e.g., Oldham & Cummings, 1996), intercorrelations among our dependent variables are relatively modest. Potential reasons may be both definitional and statistical in nature. First, although authors agree that creativity must reflect something novel and practical (e.g., Amabile, 1988), creativity exists in many different outcomes (Ford, 1996) such as physical products or unimplemented ideas. Our pre-study interviews identified our three dependent variables as valid indicators of work creativity, but also suggested that they were likely to tap creativity in different forms or stages of development. In addition, various creativity indicators may be subject to different influences during their development process. For instance, successful completion of a research report is contingent upon a level of writing skill that may not be required for our other dependent measures. Other issues may entail the level of time commitment, formality, and feedback associated with the creative criterion. Accordingly, a lack of strong overlap in their set of antecedents may result in lower convergence among outcome measures. In general, creativity has a rather broad construct space. Thus, different forms of creativity may not exhibit the strong level of association that would be expected among other performance criteria types.

In addition, the nonnormal, nonlinear nature of the archival creativity indicators may mask true relationships. Validity coefficients between supervisor creativity ratings and the archival measures in our study were reasonable (.29 for IDFs, .28 for research reports), but the coefficient between the two archival measures was low (.11). If we dichotomize the IDF and research report variables (0 = *none*, 1 = *having 1 or more*), the association between IDFs and research reports increases to a significant .31. Thus, correlation analysis may not provide an accurate assessment of concurrent validity for the types of archival variables often used in creativity research.

*Practical Contributions and Implications*

Identification of relevant factors permits organizations to reinforce those that enhance creativity and eliminate those that impede its emergence. Our findings regarding employee characteristics and their connection with creativity have implications for areas such as selection, assignment, and training. For example, given that cognitive style is a rela-

tively stable characteristic (Kirton, 1976), that can be determined by tests such as the KAI, it may serve as a useful selection tool (Keller, 1984) or in guiding task or work group assignment (Kirton, 1989b). Even if employees have the ability to be creative at work, they may not necessarily be inclined to do so. Thus, managers must also account for employees' motivation to be creative. Identification and assignment of employees with the appropriate motivational orientation for jobs involving creativity is likely to enhance the emergence of innovative ideas. Study results also suggest that placement of a supervisor with a true appreciation for creative work among employees with the motivation to create may be a promising scenario for the advent of innovation. Results of the current study also indicate that if organizations are interested in promoting creativity, the provision of leadership training in the area of relationship-building (cf. Graen, Novak, & Sommerkamp, 1982) may be worthwhile. The ability and willingness of supervisors to create positive experiences conducive to creativity may provide a powerful and effective means by which organizational creativity can be enhanced.

*Study Limitations*

A true test of causal associations requires a longitudinal study and to a large extent, our study was cross-sectional in nature. Temporal ordering of the collection for two of the creativity indicators (supervisor ratings and research reports) was subsequent to the timing of the independent variable survey. This somewhat precludes a reverse causality explanation for our results. Although IDFs corresponded to, and followed, the response time for the survey, it is difficult to pinpoint the length of time entailed in developing an IDF. However, to the extent that the other two creativity dependent variables relate to the IDF criterion, and all three show some similar patterns, the potential for reverse causality is lessened. From a theoretical perspective, there is also some degree of precedence for the causal nature of our findings. For example, given that cognitive style is considered a trait (Kirton, 1989a) exhibiting stability over time and situational interventions (e.g., Murdock, Isaksen, & Lauer, 1993), it is less amenable to reverse causality scenarios. In addition, because creativity ratings and leader characteristics data were both provided by the leader in our study, the possibility of common method variance between the two exists. However, separation by time and method for two of our data sources (Podsakoff & Organ, 1986), and the congruent results patterns suggest that common method variance is not immediately evident, and may have little practical impact on the results. Finally, although our dependent variables depicted convergence levels commensurate with similar creativity studies (Oldham & Cum-

mings, 1996; Scott & Bruce, 1994), as noted earlier, they were not as strong as expected.

*Directions for Future Research*

In terms of future research directions, a number of suggestions can be made. It would be beneficial to conduct a longitudinal study permitting both causality assessment and results generalizability to diverse industrial settings and functions. Future examinations of the broader social context beyond the immediate supervisor might also add to our knowledge of how to promote creative work. In particular, the work group appears to hold promise as a social influence on employee creativity (Woodman et al., 1993). Although some studies (e.g., Keller, 1986) have examined work group facets in relation to creative output, additional research is warranted. Additional inquiry into the intrinsic motivation-creativity dynamic in organizational settings would also be fruitful. Although the current study tested propositions derived from two organizational creativity models (Amabile, 1988; Woodman et al., 1993), a recent comprehensive model (Ford, 1996) proposes a number of key mechanisms inherent in individual creativity that need to be empirically tested. Given the complex, multiplicative nature of creativity, future studies should also focus on additional employee–context interactions to provide a better understanding of how creativity unfolds in work settings. Finally findings of the current study would also advocate the future use of a more inclusive perspective when investigating the impact of leadership on phenomena of interest. Expansion in terms of how we define and operationalize leadership may elicit a more accurate portrayal of leadership's role overlooked in previous research.

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## APPENDIX

*Intrinsic motivation items:*

"Please indicate the extent to which you agree or disagree that each statement currently describes your self-orientation."

1. I enjoy finding solutions to complex problems.
2. I enjoy coming up with new ideas for products.
3. I enjoy engaging in analytical thinking.
4. I enjoy creating new procedures for work tasks.
5. I enjoy improving existing processes or products.

*Employee creativity items:*

"Please indicate how often the following statements characterize this employee."

1. Demonstrated originality in his/her work.*
2. Took risks in terms of producing new ideas in doing job.
3. Found new uses for existing methods or equipments.*
4. Solved problems that had caused other difficulty.*
5. Tried out new ideas and approached to problems.*
6. Identified opportunities for new products/processes.
7. Generated novel, but operable work-related ideas.
8. Served as a good role model for creativity.
9. Generated ideas revolutionary to our field.

* adapted from Ettlie & O'Keefe (1982)