Towards Understanding the Direct and Indirect Effects of Transformational Leadership on Firm Innovation

DONGIL DON JUNG
San Diego State University
San Diego, CA 92182-0763
Donjung@mail.sdsu.edu

CHEE W. CHOW
San Diego State University
San Diego , CA 92182-0763
Chee.Chow@sdsu.edu

ANNE WU
National Chengchi University (Taipei)
Wenshan, Taipei 11623
Taiwan
anwu@nccu.edu.tw

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ABSTRACT

This study seeks to advance understanding of how transformational leadership by top executives can affect their companies' innovativeness. A holistic model is proposed that includes both direct effects from transformational leadership, and indirect effects mediated by characteristics of the organizational culture/climate, organizational structure, and the external environment. A multi-source, multi-dimensional approach is used to collect data and to operationalize the variables. Data from 53 Taiwanese electronics and telecommunications companies generally supported the expectation that transformational leadership increases organizational innovation. The findings also revealed indirect effects mediated by empowerment, climate of support for innovation, centralization, formalization, competition, and environmental uncertainty. While most of the mediating effects were in the expected direction, some (e.g., empowerment) had unexpected signs. The implications of these findings for practice and research are delineated.

In today's global economy, firms are under constant pressure to innovate their products and services (Cummings & Oldham, 1997; Tierney, Farmer, & Graen, 1999; Andriopoulos & Lowe 2000). For example, Leifer, O'Connor, and Rice (2001: 102) have observed that "the contemporary competitive landscape has been and continues to be driven by technological revolution, globalization, hyper-competition, and extreme emphasis on price, quality, and customer satisfaction, requiring an increased recognition and focus on innovation as a strategic competence." Likewise, Chartier (1998) has argued that a sustained stream of innovation is vital to long-term performance in today's high tech-oriented business environment.

Concomitant with this development, numerous studies have sought to identify factors that can stimulate organizational innovation, which has been broadly defined by Amabile and Conti (1999: 630) as "the implementation or adoption of new, useful ideas by people in organizations." Examples of factors found to have an effect include leadership (Amabile, 1998; Mumford & Gustafson, 1998), intra-organizational networks and learning capability (Tsai, 2001), CEO pay (Balkin et al., 2000), a creativity-conducive work environment (Amabile, 1998), job complexity and type of supervision (Oldham & Cummings, 1996), and organizational culture and climate (Mumford & Gustafson, 1988). Among these myriad factors, managers' leadership behavior has been identified by many researchers as being one of the most, if not the most, important (Amabile, 1998; Jung, 2001; Mumford & Gustafson, 1998; Mumford et al., 2002). In particular, a set of "transformational" behaviors has been held to be more effective than other leadership styles in enhancing organizational innovation (Lowe, Kroeck, & Sivasubramaniam, 1996; Gardner & Avolio, 1998; Howell & Avolio, 1993; Yammarino, Spangler, & Bass, 1993). The objective of our study is to advance understanding of the paths whereby transformational leadership may affect organizational innovation. We do this in two major ways. First, we adopt the perspective that

leadership behavior does not occur in a vacuum. Rather, it takes place in the context of an organization and its environment and accordingly, its effects also are mediated by characteristics of this organizational context. Thus, we develop and test a model that allows for both direct and indirect effects. Potential mediators of leadership's effects on organizational innovation are drawn from variables related to the organization (e.g., culture and structure) and environment (e.g., uncertainty and competition).

Second, we employ a multi-dimensional measure of organizational innovation. Having an accurate and adequate measure of organizational innovation is important because if organizations are misclassified on this attribute, inferences about different factors' effects also will be mistaken. As will be discussed in the Method section, we follow prior research in measuring each company's R & D expenditure and the number of patents received. But we also obtain assessments from external parties with an active interest in each company. Specifically, we use each company's public financial reports and stock prices to calculate a financial measure—Tobin's Q—which is well-accepted as a proxy for investors' assessment of companies' future growth potential. We also obtain ratings of each company's innovativeness from financial analysts who actively follow both the company and its industry.

The remainder of this article is structured as follows. In the next section, we summarize our theoretical framework, research model, and hypotheses. Subsequent sections will describe our method, present the findings, and provide a summary and discussion.

THEORETICAL BACKGROUND AND HYPOTHESES

Figure 1 presents our model of how transformational leadership affects organizational innovation. In addition to a direct effect, we also posit indirect effects mediated by attributes of the

organization and its external environment. The theoretical basis for our model and expectations is explicated in the following subsections.

Insert Figure 1 about here

TRANSFORMATIONAL LEADERSHIP AND ORGANIZATIONAL INNOVATION

Over the past two decades, many management scholars and practitioners have called for more adaptive leadership by top business executives in responding to the rapid changes confronting today's organizations (Bass, Avolio, Jung, & Berson, 2003), and corporate chieftains like Jack Welch of General Electric and Lou Gerstner of IBM have been held up as examples of how adaptive leaders can successfully restructure and transform their organizations. The label "transformational" has been applied to this set of adaptive leadership behaviors, which Bass and Avolio (1994) have characterized as encompassing four unique but interrelated behavioral components: *inspirational motivation* (articulating an appealing and/or evocative vision), *intellectual stimulation* (promoting creativity and innovation), *idealized influence* (charismatic role modeling), and *individualized consideration* (coaching and mentoring).

Advocates of transformational leadership maintain that it creates personal and professional commitment from subordinates by raising their self-awareness toward higher-level needs like self-esteem and self-actualization (Bass, 1985). This in turn leads to developing a group of intrinsically motivated subordinates. Indeed, Amabile (1998) has argued that intrinsic motivation is an important precondition toward employee creativity and firm innovation. In addition, a transformational leader's intellectual stimulation can facilitate unconventional and innovative thinking and working

processes that can lead to new knowledge and technology, which is fundamental to firm innovation (Dougherty & Hardy, 1996).

In support of transformational leadership's beneficial effects, a number of studies have found that leaders who display transformational behaviors are able to realign their followers' values and norms, promote both personal and organizational changes, and help followers to exceed their initial performance expectations (e.g., House & Shamir, 1993; Jung & Avolio, 2000). Chartier (1998) has reported a significant and positive relationship between top managers' openness to change and organizational innovation. Sosik, Avolio, and Kahai (1997) also found that transformational leaders encouraged their followers to think "out of the box" and to adopt generative and exploratory thinking processes that yielded more creative ideas and solutions than people working under managers with a transactional leadership style. Keller (1992) discovered that transformational leadership displayed by team leaders in charge of research and development project teams in a large R & D organization improved team performance. Finally, Shin and Zhou (in press) have found that transformational leadership was positively related to follower creativity among 290 employees and their supervisors from 46 Korean companies.

While the arguments in support of transformational leadership encompass the organizational level, these prior studies have focused on outcomes at individual or organizational subunit levels. They also are characterized by a predominance of experimental settings and/or subjective measures of creativity (e.g., subjective supervisor ratings). As such, there is room for testing the effects of transformational leadership at the level of the organization, and with a more encompassing set of outcome measures. Our first hypothesis provides focus to such an undertaking:

Hypothesis 1: Transformational leadership is positively related to organizational innovation.

Although it is reasonable to expect top executives' leadership behavior to directly influence organizational innovation, it is important to recognize that such behavior operates within the larger context of the organization. As such, the analysis would be incomplete without also considering attributes of the organizational context (Damanpour, 1991; Scott & Bruce, 1994; Mumford et al., 2002). Amabile, Conti, Coon, Lazenby, and Herron (1996) have labeled this the "context of creativity." In the following subsections, we develop expectations of how three sets of mediators--organizational culture, structure, and the external environment--would affect the hypothesized relationship between transformational leadership and organizational innovation.

CULTURAL MEDIATORS OF ORGANIZATIONAL INNOVATION

Organizational culture provides a social context in which employees interact, and serves as the "gel" that ties together various constituencies and mobilizes collective efforts towards organizational goals (Daft, 2001). A number of studies have suggested that top executives are the main architects of organizational culture (Schein, 1992). They do so by communicating what strategy to implement, and also how the goals of the organization are relevant to the personal values and desires of the employees. When top executives continually emphasize organizational innovation and display a favorable attitude towards change, it becomes part of the organization's culture and normative expectations that are conducive to creative behaviors and innovative work processes (Damanpour, 1991).

We expect that two aspects of organizational culture/climate would mediate how leadership behavior affects organizational innovation. First, companies differ in how much they empower employees with decision-making and encourage experimenting with nontraditional and longer-term oriented solutions to problems. Empowerment creates a sense of ownership and control over the work to be performed (Mumford et al., 2002), which Amabile et al. (1996) have identified as an

important determinant of organizational creativity because individuals produce more creative work when they perceive more personal control over how to accomplish given tasks. Consistent with this view, Jung and Sosik (2002) have argued that people who are empowered also are more likely to be intrinsically motivated, which in turn promotes creative endeavors. Thus, by creating an organizational culture that has a high level of empowerment, or at least working within such a culture, transformational leaders' positive impact on the company's innovative potential could be materialized.

The other relevant factor is whether the organization has a climate of support for innovation. As Scott and Bruce (1994: 582) have explained, "climate represents signals individuals receive concerning organizational expectations for behavior and potential outcomes of behavior." Typically, innovation requires long-term investments and risk-taking (Balkin et al., 2000), and employees need to perceive that the organization supports working on innovative yet more risky ideas and products rather than focusing on short-term profit and immediate financial results (Kanter, 1983). When an organization reinforces the importance of innovation by recognizing and rewarding creativity, employees are more likely to pursue new ideas and product innovation (Mumford et al., 2002). Stated differently, a transformational leader's efforts to promote innovation may not resonate well among employees when there is not a climate that supports or values innovative behaviors and work approaches.

Taken together, the preceding discussion provides the basis for the following hypothesis:

Hypothesis 2: The effect of transformational leadership on organizational innovation will be positively mediated by (a) empowerment and (b) climate for innovation.

STRUCTURAL MEDIATORS OF ORGANIZATIONAL INNOVATION

Since the idea was introduced by classic writings like Burns and Stalker (1961) and Lawrence and Lorsch (1967), researchers have examined how an organization's structure affected its ability to implement creative ideas and to come up with innovative products (Frambach & Schillewaert, 2002). While top executives can directly influence organizational structure (House & Aditya, 1997; Miller, Droege, & Toulouse, 1988), such change may take considerable time. Hence, the effects of their leadership style may be mediated by aspects of their organization's structure that they do not fully control. In the present study, we consider how two structural variables, centralization and formalization, may mediate the effects of leadership on organizational innovation.

Centralization refers to the degree to which top management delegates decision-making authority to lower-level personnel (Daft, 2001). As such, it is the conceptual opposite of empowerment. In a highly centralized organization, employees below the top level have limited autonomy. This can impede efforts at innovation because people tend to become more creative when they feel that they have control over their work (Amabile et al., 1996; Quinn, 1985). Consistent with this view, Damanpour (1991) has suggested that a participatory work environment, which is a common characteristic of decentralized organizations, facilitates innovation by increasing employees' awareness, commitment, and involvement. Additionally, organizational innovation typically requires considerable coordination and collaboration across departments and functional specialties (Miller, Droge, & Toulouse, 1998). A highly centralized organizational structure can impede such collaborative efforts even when top managers are supportive of innovation.

Formalization differs from centralization in that it is the extent to which an organization regulates employees' work related activities with written rules and formal procedures (Grinyear & Yasai-Ardekani, 1980). Empirically, Damanpour (1991) has found a negative relation between

formalization and organizational innovation. One reason may be that a highly formalized organization tends to be bureaucratic, and its employees are likely to resist necessary changes to embrace new technology and shifts in market trends (Hage, 1988; Kanter, 1989). At the individual employee level, a formalized organizational structure constrains deviant approaches that employees sometimes need to maximize their creative potential. It also may constrain collaborative work processes needed to develop innovative products (Dougherty & Hardy, 1996). Thus, as with centralization, formalization can hinder transformational leaders' efforts at increasing organizational innovation. Our third hypothesis formalizes our expectations from the preceding discussion:

Hypotheses 3: The effect of transformational leadership on organizational innovation will be negatively mediated by (a) formalization and (b) centralization.

ENVIRONMENTAL MEDIATORS OF ORGANIZATIONAL INNOVATION

The external environment also can mediate the effects of transformational leadership on organizational innovation. This effect can arise through conditions that the environment imposes on the context in which innovative work processes occur, and/or its impact on the benefits that accrue from organizational innovativeness.

We hypothesize that two specific environmental attributes—uncertainty and competition—would mediate the effects of transformational leadership. Organizational innovation becomes more valuable when the environment is uncertain and turbulent, there exist multiple competing products, and/or customers have shifting preferences (Miller et al., 1988). When members of an organization perceive a high level of environmental uncertainty, a sense of crisis or urgency is created, and innovation becomes more widely accepted as a necessary condition for survival (Frambach & Schillewaert, 2002). Thus, at the same time that an uncertain and unstable business environment

motivates top executives to stimulate innovation, it also can increase employees' receptivity to such change initiatives.

Consistent with this view, a number of early studies had found a positive relation between environmental uncertainty and firm innovation (e.g., Hambrick, 1981). More recently, Song and Montoya-Weiss (2001) have reported that perceived technological uncertainty moderates new product development in Japanese companies. Specifically, Japanese project managers' perceived level of technological uncertainty affected how they manage the new product development process by selectively focusing on different competitive advantages such as marketing proficiency, cross-functional integration, and technical synergy. Our study expands the scope of investigation to the organization as a whole.

In contrast, the net effect of competition is indeterminate because it has potentially offsetting effects. When an organization operates in a highly competitive market, or when members of the organization perceive that they are operating under such market conditions, employees are more likely to accept innovation as a necessary condition for survival (Frambach & Schillewaert, 2002). In a highly competitive industry such as computers and consumer electronics, for example, "the value and uniqueness of knowledge-intensive resources can be swiftly lost to competitors" (Balkin et al., 2000: 1118). As such, just like the case of environmental uncertainty, competition can increase leaders' attempts at motivating innovation, and employees' responsiveness to such efforts.

Yet competition also can reduce the available resources (e.g., via reduced profit margins) for supporting innovation initiatives. Nohria and Gulati (1996) defined slack as "the pool of resources in an organization that is in excess of the minimum necessary to produce a given level of organizational output" (p. 1246), and found an inverse U-shaped relationship between slack and

innovation. Thus, at the same time that competition increases attention to innovation, it also may reduce available resources for supporting long-term and risky initiatives.

In summary, uncertainty and market competition create a situation where innovation becomes a strategic imperative for organizational survival (Drazin & Schoonhoven, 1996). Our discussion above suggests that uncertainty will positively mediate the effects of transformational leadership on organizational innovation, while the net effect of competition is indeterminate. These expectations are summarized in our fourth hypothesis:

Hypotheses 4: The effect of transformational leadership on organizational innovation will be mediated by employees' perception of (a) environmental uncertainty and (b) competition.

METHOD

Sample and Procedures

We focused on a single industry so as to limit extraneous influences due to different industry types. Our sample was comprised of 53 Taiwanese companies from the electronics and telecommunications industry. This industry was selected because new product development and creative R & D efforts are critical for company survival due to the industry's rapid technological advances and highly competitive markets (Carey & Nahavandi, 1996; Balkin et al., 2000; Chartier, 1998; Schilling & Hill, 1998). All companies in the sample are traded on either the Taiwan Stock Exchange or over-the-counter.

To eliminate common response biases, six different sources were used for data on transformational leadership, mediating variables, and firm innovation. Three sources were used to measure each company's innovation: its public financial reports, a government report on patents granted, and financial analysts. The first two sets of variables were obtained from surveying managers with at least three years' work experience in their companies. First, three senior-level

managers from each company were asked to complete Survey A, which measured their company's demographic characteristics (e.g., age, size) and CEO/President's (CEO for short) transformational leadership. The respondents were selected from those who worked closely with, and/or had frequent interaction with the CEO. Another group of managers (usually four mid- to senior-level managers per firm) was given Survey B that measured their companies' empowerment and organizational climate. A third group of managers (usually four mid- to senior-level managers per firm) was given Survey C that measured their perception of their companies' organizational structure. In total, there were 146, 149, and 202 completed responses to Surveys A, B, and C.

The sample was generated as follows. First, we used a database of published financial statements (the "Taiwan Economic Journal Taiwan Data Bank") by companies traded on the Taiwan Stock Exchange or over-the-counter, and identified all companies in the electronics and telecommunications industry. An initial set of 50 companies was randomly selected, and personal contact and referrals from major CPA and consulting firms were used to seek cooperation from the CEO, president, or a top-level manager of each firm. As we encountered (initial) refusals to participate, other firms were randomly selected as replacements. In total, we contacted 62 firms, out of which 53 ultimately participated in the study.

Each company provided a contact person to whom we delivered the set of surveys. The contact person was given explicit instructions on the number and type of managers needed to complete each version of the survey. Participants who had questions in answering the survey could contact us to get clarification. To encourage truthful responses in light of many questions' sensitive nature (e.g., assessing their CEO's leadership style, organizational structure and culture), complete confidentiality and anonymity was guaranteed for both respondents and their companies, and a postage-paid, self-addressed envelope was provided for direct return of completed surveys to us.

Since the responses from each company had to be grouped for analysis, all surveys provided to a company had a common identification code. The presence and purpose of this code was explained in the survey instructions.

On average, the participating companies had been in existence for about 17.3 years (range: 4.5 to 37 years). The average tenure of the CEOs was about 9.9 years. The participating companies were relatively large. Only three companies had fewer than 100 full-time employees. Twenty-five companies had between 101 and 1000 employees, and the remaining 25 companies had more than 1000 full-time employees.

The respondents' demographic profiles suggest that they were well qualified to answer the survey questions. The majority of the Survey A respondents were male (72 %), and were evenly spread between 30 to 40 years old (42 %) and 41 to 50 years old (45 %). On average, they had been working for their company for 8.38 years (*sd* = 6.07 years) and for the current CEO for 5.77 years (*sd* = 5.02 years). The vast majority (97 %) had a college degree or above. Their average tenure in their current job was about 4.4 years and the majority (70 %) indicated that they interacted with their CEO either fairly often or regularly. Similarly, most of Survey B respondents were male (83 %), and they were quite evenly distributed between 30 to 40 years old (38 %) and 41 to 50 years old (57 %). On average, they had been working for their company for 8.81 years (*sd* = 5.69 years), with an average tenure at the current job of 4.19 years. The vast majority (98 %) had a college degree or above. Finally, the Survey C respondents were slightly younger than the other two groups. One hundred and thirty five (67 %) were between 30 and 40 years old, and their average lengths of organizational and positional tenure were 7.6 and 3.5 years, respectively. This group also had a more balanced gender ratio (64 % male). Like the other two groups, they were well educated (96 % had college or above levels of education).

Measures

The CEO's extent of transformational leadership was measured using Bass and Avolio's (1997) Multifactor Leadership Questionnaire (MLQ). The MLQ has been extensively used and is considered a well-validated measure of transformational leadership (Awamleh & Gardner, 1999). Its construct validity has recently been demonstrated using Confirmatory Factor Analysis (cf. Avolio, Bass, & Jung, 1999). Each participant was asked to rate 20 aspects of his/her CEO's behavior on a 5-point scale, with 1="strongly disagree" and 5="strongly agree." Sample items are "My CEO/President talks optimistically about the future," and "My CEO/President gets me to look at a task from many different angles."

Employees' perception of empowerment was measured using a 12-item scale developed by Spreitzer (1995). A sample item is "I have significant autonomy in determining how I do my job." All items were rated using a 7-point scale anchored by 1 = "Very strongly disagree" and 7 = "Very strongly agree."

Existence of an innovation supporting organizational climate was measured with a 22-item scale originally developed by Siegel and Kaemmerer (1978), and later modified by Scott and Bruce (1994). It contains two subscales (support for creativity and tolerance of differences). A sample item is "This organization gives me free time to pursue creative ideas during the workday." All items were rated on a 7-point scale anchored by 1 = "Very strongly disagree" and 7 = "Very strongly agree."

The centralization and formalization measures were adapted from surveys developed by Khandwalla (1977) and Pugh, Hickson, Hinings, and Turner (1968) and extensively used in prior research with adequate levels of reliability (Gordon & Narayanan, 1984; Chow, Shields, & Wu, 1999). Some minor modifications were made to fit the context of the current study. Specifically,

(de)centralization was measured via a question asking respondents to indicate the lowest managerial level to which authority has been delegated to make each of eight decisions (e.g., preparation of operating procedures and project calendars). The formalization question also focused on the same eight decisions, and asked respondents to identify the highest managerial level for which their companies had written manuals that specify how to make each decision. All questions were based on a 7-point scale anchored by 1 = Top management; 4 = Middle management; and 7 = First line supervisors. The decentralization scale was reverse scored to yield a measure of centralization.

Perceived competition and environmental uncertainty were measured by questions adapted from Khandwalla's (1977) instrument. Specifically, we asked respondents to rate the intensity of competition in their industry on (a) obtaining inputs and (b) price. The 7-point response scale was anchored by 1 = "Of negligible intensity" and 7 = "Extremely intense." For environmental uncertainty, respondents were asked "How stable/dynamic is the external environment facing your company in terms of these aspects (a) economic; (b) technological; and (c) political/regulatory?" The 7-point response scale was anchored by 1 = "Very stable (changing slowly)" and 7 = "Very dynamic (changing rapidly)."

In developing our measure of innovation, we followed the conceptualization of Woodman, Sawyer, and Griffin (1993: 293) that it is "the creation of a valuable, useful new product, service idea, procedure, or process by individuals working together in a complex social system." We also heeded Balkin et al.'s (2000) recommendation that a composite measure be used to capture broad aspects of innovative activities more accurately. Thus, we used four measures to tap into various aspects of innovation. First was annual R & D expenditures as a percentage of gross revenues over the three years prior to our survey (2000 through 2002). Many authors (e.g., Hitt, Hoskisson, & Kim,

1997; Balkin et al., 2000) have argued that this ratio proxies for a firm's emphasis on innovation. The data were obtained from the sample firms' publicly disclosed financial statements.

Since inputs may not succeed in producing outputs, we also included the number of patents that a company had obtained during the same three-year period. This measure has been commonly used by past research as an indicator of creative performance (Oldham & Cummings, 1996). The data came from the patent database of the Ministry of Economic Affairs' Intellectual Property Office.

While the number of patents has face validity, it is limited to innovations that are amenable to patent application, and for which firms consider patents to offer meaningful property rights protection. As such, its scope excludes other fruits of innovation efforts, such as process and service improvements. To move towards a more inclusive measure, we also calculated a financial index called Tobin's Q, which is the ratio of a firm's market value to the book value of its assets. This index is widely accepted as a reflection of investors' assessments (presumably based on a broad set of information) of companies' future growth potential (Bharadwaj & Konsynski, 1997; Lee & Tompkins, 1999). For each sample firm, Tobin's Q was calculated for each year from 2000 to 2002, using data from its publicly available financial reports.

Finally, we sought financial analysts' ratings of each sample firm's innovativeness. This choice was based on the belief that financial analysts have a professional interest in understanding the fundamental strengths and weaknesses of each firm that they follow, and they would have access to an extensive database for doing so. Altogether, we contacted 20 financial analysts in Taiwan with an active interest in the electronics and telecommunications industry. Each analyst was asked two questions about each sample firm. The first question was his/her familiarity with the company. The three possible answers were 1 = "Not familiar with this company at all"; 2 = "Somewhat familiar with this company"; and 3 = "Very familiar with this company". The second question asked for a

rating of the company's innovativeness. The 7-point response scale was anchored by 1 = "Totally lacking in innovation"; 4 = "Average in innovation"; and 7 = "Highly innovative". Only the answers of analysts who had answered at least a "2" to the first question were kept. All sample companies had valid ratings from at least 10 different analysts, which were arithmetically averaged.

Because the survey was administered in Chinese, we followed Brislin's (1986) recommendation of translation and back-translation to ensure conceptual equivalence between the original instruments (in English) and the Chinese versions. All three surveys were first translated into Chinese by a bilingual individual who was not told the objective of the study. Then another bilingual person back-translated these into English without having access to the original instruments. Several minor changes were made to the Chinese surveys based on comparing the back-translated and original English versions.

RESULTS

We tested our hypotheses with the partial least squares (PLS) structural equations modeling technique (Wold, 1985). PLS is increasingly being adopted by leadership researchers (e.g., House, Spangler, & Woycke, 1991; Howell & Avolio, 1993) because it is suitable for small sample sizes as in the present study. It is also known to be suitable for testing multivariate main and indirect effects models like those in our study (Sosik & Dworakivsky, 1998). PLS generates estimates of standardized regression coefficients (i.e., path coefficients) for the model paths, which can then be used to measure the relationships between latent variables (see Sambamurthy & Chin, 1994 for more information on PLS). A jackknifing procedure called blindfolding was used to evaluate the statistical significance of the path coefficients (Sambamurthy & Chin, 1994). The blindfolding procedure omits a part of the data matrix for a particular variable and then estimates model parameters (e.g., path coefficients) associated with that variable. An omission distance of 10 was

used.

Since there were multiple raters of CEO leadership and the mediating variables, we first tested within company variance using James, Demaree and Wolf's (1984) r_{wg} procedure. Out of r_{wg}s calculated for each scale within each of the 53 companies, well over 80% were above the .7 cut-off value suggested by James et al. (1984) for justifying data aggregation. Based on this result, we aggregated our data to the company level and all subsequent data analyses were conducted at this level (n = 53).

Our PLS analyses used the individual items as indicators for all scales except for transformational leadership, which used five scale scores (i.e., charisma, idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration) as indicators (see Sosik & Dworakivsky, 1998 for a similar approach). Given the large number of items used to measure the constructs of interest, we first ran a preliminary PLS analysis with all of the survey items to test the scales' psychometric properties. Three criteria were used to determine whether any item indicator should be retained. First, to ensure adequate reliability, the factor loadings of indicators associated with each construct had to be .60 or above (Bagozzi & Youjae, 1988). Second, the composite scale reliability for each construct (an internal consistency estimate similar to alpha) had to exceed the recommended cutoff of .70. Finally, the average variance extracted by the latent constructs from their indicators had to exceed the recommended cutoff of .50 (Fornell & Larcker, 1981).

Applying these criteria led to retention of 8 items for empowerment, 10 items for climate for innovation, 6 items for centralization, 8 items for formalization, 2 items for competition, and 3 items for environmental uncertainty.[1] Finally, all indicators of organizational innovation except for the R&D expenditure ratio loaded onto a single construct consistently. Although the R&D expenditure

measure had a relatively low factor loading (.50), we decided to keep it because of its prevalent use in prior research (Hitt et al., 1997). Table 1 shows descriptive statistics and inter-correlations among the scales.

Insert Table 1 about here

Results of PLS Analysis

In response to the findings of past research (e.g., Miller, Burke, & Glick, 1998), we included each company's age and size (number of full-time employees) as control variables. Additionally, the CEO's organizational tenure was used to control for the possible effects of time sharpening or dulling responses to his/her leadership behaviors. The PLS analysis showed that both covariates, company age ($\beta = -.27$, $p < .001$) and size ($\beta = .51$, $p < .001$), were significantly related to organizational innovation. The CEO's tenure with his/her organization was significantly and positively related to subordinates' perception of transformational leadership ($\beta = .17$, $p < .001$).

As expected in Hypothesis 1, the CEO's transformational leadership was positively and significantly related to organizational innovation ($\beta = .11$, $p < .001$). The mediating effects of organizational structure, culture/climate, and the external environment were tested in two steps. We first examined the path coefficients from transformational leadership to each mediator and from the mediator to organizational innovation. Then, we computed the interaction term by multiplying these two path coefficients, and tested the statistical significance of the interaction term (Baron & Kenny, 1986; Sosik & Dworakivsky, 1998).

The positive mediating roles of empowerment and climate for innovation received mixed support. As expected, transformational leadership was positively and significantly related to both empowerment ($\beta = .33$, $p < .001$) and climate for innovation ($\beta = .35$, $p < .001$). However, while

climate for innovation (β = .36, $p < .001$) was positively related to innovation, the effect of empowerment (β = -.28, $p < .001$) was negative. As a result, the indirect effect of transformational leadership on innovation through empowerment was -.09 (.33 x -.28), thus not supporting Hypothesis 2a. On the other hand, the indirect effect of transformational leadership through climate for innovation was .13 (.35 x .36), thus supporting Hypothesis 2b.

The negative mediating roles of the two structural variables were supported. Transformational leadership was negatively related to centralization (β = -.25, $p < .001$) and formalization (β = -.12, $p < .001$), both of which were further negatively related to organizational innovation (β = -.08 and β = -.24, respectively). Therefore, the indirect effect of transformational leadership on innovation through centralization was .02 (-.25 x -.08), thus supporting Hypothesis 3a. Similarly, the indirect effect of transformational leadership through formalization was .03 (-.12 x -.24), thus supporting Hypothesis 3b. Finally, the mediating roles of the environmental variables were supported. The indirect effect of transformational leadership on innovation through perception of competition was -.08 (.34 x -.23), while the indirect effect of transformational leadership on innovation through perception of uncertainty was, as expected, positive in sign (.04 (.16 x .22)).

SUMMARY AND DISCUSSION

This study extends the literature on leadership and organizational innovation in two important ways. First, it proposes an integrative model that links transformational leadership to organizational innovation both directly, and through mediators at the organizational and environmental levels. To our knowledge, this is the first study to introduce contextual mediators of transformational leadership's effect on organizational innovation. This bridging of micro- and macro-level variables allowed us to identify what Klein, Tosi, and Cannella (1999) had called "a deeper, richer portrait of organizational life" (p. 243). Managers typically have many avenues for

influencing working relationships within their organizations (e.g., the design of systems, structure and processes, performance measurement and reward systems, how resources are allocated, their own leadership behaviors). Understanding how these many "levers" act and interact can improve managers' ability to move their organizations forward in the current competitive environment, and the current study represents a step in this direction.

Second, this study uses a multi-dimensional measure of organizational innovation that is more comprehensive that that of prior research. It includes R & D expenditures as a percent of gross revenues, which is commonly used in prior research and can be considered an indicator of a company's emphasis on innovation (Balkin et al., 2000). Another component is the number of patents that a company had successfully obtained. Although patents do not always lead to innovative final products, and not all innovations are in patentable form (e.g., internal process improvements), this still represents one important outcome of companies' efforts at innovation. In this regard, a major advance over much of prior research is that the number of patents is obtained from an official government database, rather than via subjective responses to a survey.

Our innovation measure also includes two other components. First, the Tobin's Q statistic proxies for capital market participants' assessment of a company's future growth potential, and should capture a broad information set about each company's innovative capacity. Finally, financial analysts tend to closely scrutinize the companies that they follow. Hence, their ratings of company innovativeness can capture other intangible aspects related to each company's ability to innovate. Dell Computer is a good example of why a holistic measure of firm innovation is needed. The company is well known for its innovative operational processes such as a made-to-order manufacturing system and responsive customer services, which have fueled its market dominance in

the U.S. computer industry. Yet, the company's innovative processes may not be well reflected in its R & D percentage or number of patents obtained.

Results of our PLS analysis supported both full and partial mediating relationships, and showed several interesting paths whereby transformational leadership's effects arise. As expected, the CEO's transformational leadership was positively related to organizational innovation. This is consistent with previous research suggesting that transformational leaders act as change agents and challenge followers' long-held assumptions for more creative solutions (Bass, 1985; Howell & Avolio, 1993; Nanus, 1992). Our study extends the current literature by demonstrating that transformational leadership not only makes subordinates more creative (Sosik, Avolio, & Kahai, 1997), but it also increases innovation at the organizational level. As Keller (1992: 489) has noted, "(T)raditional leader behavior, such as initiating structure and consideration, have had only limited success in their application to R & D settings where quality rather than quantity and innovation rather than cost are the primary performance criteria." Companies increasingly are faced with an ambiguous, complex, and turbulent environment, and a new type of leadership is required to build human and social capital for organizational innovation (Hitt & Ireland, 2002; Boal & Hooijberg, 2000). Our study suggests that transformational leadership can be an effective response to this challenge. It can foster firm innovation by effectively communicating the need for employees to think and act creatively, initiating necessary changes to realize the vision, and directing resources to facilitate creative work processes and innovative products.

The findings also revealed indirect effects of transformational leadership that deserve scrutiny. As expected, four (climate for innovation, centralization, formalization, and uncertainty) out of the six proposed mediators had significant mediating effects on firm innovation. This finding has two important implications. First, managers need to be cognizant of the organizational and

environmental context in which they work, and ensure a match between their leadership behaviors and the contextual variables. Second, by working towards reconfiguring attributes of their organizations and perhaps even external environment, managers can further leverage the impacts of their leadership behaviors. For example, our findings indicated that an organizational climate supportive of innovation can buttress the effects of transformational leadership. Such a climate can increase employees' willingness to seek more fundamental and longer-term solutions to problems. In fact, in interviewing successful senior executives from high-tech companies, Sosik et al. (in press) specifically noted that a culture that tolerates mistakes is critical for success.

Our study also found organizational structure to mediate the effect of transformational leadership on organizational innovation. The negative mediating effects of formalization and centralization provide support for the current movement towards more loosely-coupled and organic types of organizational structure, which are characterized by short chains of command, wide spans of control, cross-functional teams, and participative decision making (Sethi, Smith, & Park, 2001). They also indirectly validate Galunic and Eisenhardt (2001), whose case study of a high technology organization found an adaptive and flexible organizational structure to positively impact firm innovation. They argued that dynamic capabilities based on an adaptive structure improve a company's ability to reconfigure its products and production systems to create new productive assets. Along the same vein, Pillai and Meindl (1998) have argued that transformational leaders are more likely to emerge in an organic and flexible organizational structure, and such leaders in turn reinforce the same type of structure. These observations from the literature, together with the findings from the current study, underline the desirability of understanding the interplay between leadership style and organizational structure, and how it in turn affects firm innovation. The specific

implication of our study is that innovation is facilitated by an organizational structure that is decentralized and not highly formalized.

We also found a negative mediating effect due to perceived market competition. We interpret this as indicating that competition limits companies' ability to undertake innovation initiatives even when they have a desire to do so. A positive mediating effect was found due to environmental uncertainty. Bass (1985) has argued that transformational leaders often emphasize crisis in order to bring about changes, and we had proposed that when employees perceive a great deal of uncertainty surrounding their organization, they may develop a sense of crisis and become more responsive to top management's push for change and innovation. The recent turnaround of Samsung Electronics illustrates how this may come about. When Yun Jong Young became the vice-chairman and CEO in 1997, Samsung Electronics was in perilous financial shape, with US$11 billion in debt and a brand name that was mainly associated with low-end consumer products. Within five years, the company had turned around completely, earning US$5.9 billion on sales of US$33.8 billion in 2002. Many observers attributed this transformation to Young's leadership, with a vision to make his company a world-class organization which could charge premium prices (Business Week, 2002). Towards this end, he continually emphasized the uncertainty in the high tech industry as a way to motivate his employees and to promote changes. Our finding of a positive mediating effect for environmental uncertainty is consistent with its serving such a motivational role.

But we also found an unexpected result. While transformational leadership had the expected positive relationship with empowerment, we found that empowerment was negatively related to organizational innovation. The data we collected precluded identification of the underlying reasons for the latter finding, though we do have some conjectures. As reported, our sample companies had come from Taiwan, where cultural values are relatively high in power distance (Hofstede, 1997).

According to Hofstede, power distance indicates dependence relationships in a country. People from a high power distance culture expect leaders to act strongly, and become uncomfortable when leaders try to delegate heavily (Adler, 2002). In a work setting, this translates into a preference for paternalistic leaders, with considerable dependence of subordinates on their superiors. Indeed, subordinates in such a culture may get confused when left alone to figure out what they need to do and how to accomplish their goals. This may be especially so in the case of innovations, which requires careful orchestration of necessary resources and processes. Our finding of a negative effect for empowerment suggests that transformational leaders may need to maintain a balance between letting people feel empowered, and providing structure and control by defining goals and agenda (Mumford et al., 2002). Sosik et al. (in press) also stressed the importance of maintaining such balance in many high-tech oriented companies by saying "The challenge for executives is to also set the boundaries that help direct those creative individuals towards achieving innovation. In an R&D organization, … establishing guidelines and boundaries is important, and then giving people freedom to operate within those boundaries is important". What remains to be explored, however, is whether a different balance is needed in high vs. low power distance cultures.

Alternatively, the negative relationship between empowerment and innovation might be due to the unique nature of a high tech industry with rapidly changing technology. In the hyper-competitive consumer electronics industry from which our sample companies were drawn, even top-selling innovative products can become obsolete in a relatively short period of time (Bharadwaj & Konsynski, 1997). The resultant need to continuously develop innovative products might require what Brown and Eisenhardt (1998) have referred to as structured chaos. They argued that there is a redefined role of leaders as architects and cultural guardians, who need to go beyond the traditional managerial responsibilities by carefully monitoring and controlling organizational reconfiguration

processes. As such, there may be a threshold past which additional empowerment may dilute managers' ability to lead change.

Limitations and Implications for Future Research

Although our study has found interesting and encouraging results, it also has several limitations that need to be addressed in future research. First, even though we have developed and tested a comprehensive model with both direct and indirect effects, we have only included a small subset of the potentially applicable variables. Examples of other variables that can affect organizational initiatives and employee behavior include firm strategy, performance measurement and compensation policies, and diversity. Additionally, organizational innovation is manifested not only in the products and services that organizations produce, but also in the process through which people work. Measures that tap into these aspects of the organization can increase the completeness and richness of our understanding.

Second, we had bypassed variables at the individual level. Often, organizational innovations and innovative products are initiated by a small group of highly creative individuals in an organization (Amabile et al., 1996; Mumford et al., 2002). Without incorporating characteristics of individual employees, our understanding of innovation processes would not be complete. In turn, employees' ability and willingness to experiment and take risks may also depend on the resource and time constraints that they face at work. Therefore, it is desirable to explore how variables at the environmental, organizational, group, and individual levels interact in affecting innovation.

Third, in analyzing cross-sectional data, our findings can only reveal correlation but not causation. It is possible, in fact likely, that some of the variables in the model are causally related across time. For example, we had hypothesized that an organizational climate supportive of innovation would positively mediate the effects of transformational leadership. But it is likely that

transformational leaders consciously develop such a favorable climate as part of their innovation initiatives. Similarly, across time managers may seek to remove impediments to innovation (e.g., formalization). A longitudinal study is required to shed light on these relationships.

A related limitation of our survey method is that it was silent on the processes and pathways whereby effects arise. For example, what are the differences between innovative efforts under more vs. less formalized work arrangements? In the case of empowerment where we had obtained an unexpected result, how do employees respond to different levels of empowerment and in turn, how do these responses feed forward to their innovation activities? And does competition increase the will to innovate at the same time that it imposes severe restrictions on available resources? Other ways of gathering data, such as in-depth interviews and field observation, are more likely to provide insights into such issues.

Finally, our data had come from a relatively homogeneous sector in Taiwan. As we had noted earlier, there is room for exploring whether the relationships we have found (especially the negative relationships between empowerment/competition and innovation) are due to unique aspects of the industry and/or culture from which we had drawn our sample. Expanding the sample to include other industries and cultures can increase the generalizability of the current findings. This is especially desirable in light of the increasing globalization of economic activities.

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TABLE 1

Descriptive Statistics and Intercorrelations among Constructs (n = 53 companies) [a]

Variable	*Mean*	*s.d.*	Intercorrelations													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Transformational leadership	3.72	.42	.87													
2. Empowerment	5.49	.44	.25*	.84												
3. Climate for innovation	4.78	.63	.30***	.43***	.90											
4. Centralization	3.04	.74	-.19	-.10	-.24*	.70										
5. Formalization	2.01	.69	-.07	.06	.10	.12	.90									
6. Uncertainty	5.16	.76	.08	.22*	-.04	-.07	-.14	.71								
7. Competition	6.07	.64	.32*	.16	.08	.01	.19	.44***	.74							
8. R & D expenditure (as % of annual revenues) [b]	4.13	3.66	-.09	.06	.28**	-.05	-.11	.06	-.04	-						
9. # of patents obtained per year [b]	36.03	98.43	-.09	-.03	.12	.03	.12	.26**	-.06	.09	-					
10. Tobin's Q [b]	1.88	.53	.13	-.07	.12	-.21	-.31**	.19	-.10	.21	.29**	-				
11. Analysts' ratings [b]	4.15	.76	.25*	-.03	.38***	-.31**	-.16	.26*	.05	.32**	.49***	.60***	-			
12. CEO tenure with his/her organization	9.93	6.61	.18	.11	-.01	.01	.16	.01	.09	-.22	-.09	-.11	-.17	-		
13. Company age	17.37	6.69	.25*	-.02	-.05	.22	.15	-.05	.02	-.30**	-.02	-.04	-.10	.43***	-	
14. Company size [c]	3.13	1.21	.05	.12	.07	-.08	.22*	.39**	.11	.08	.47***	.21	.41***	.08	.24*	-

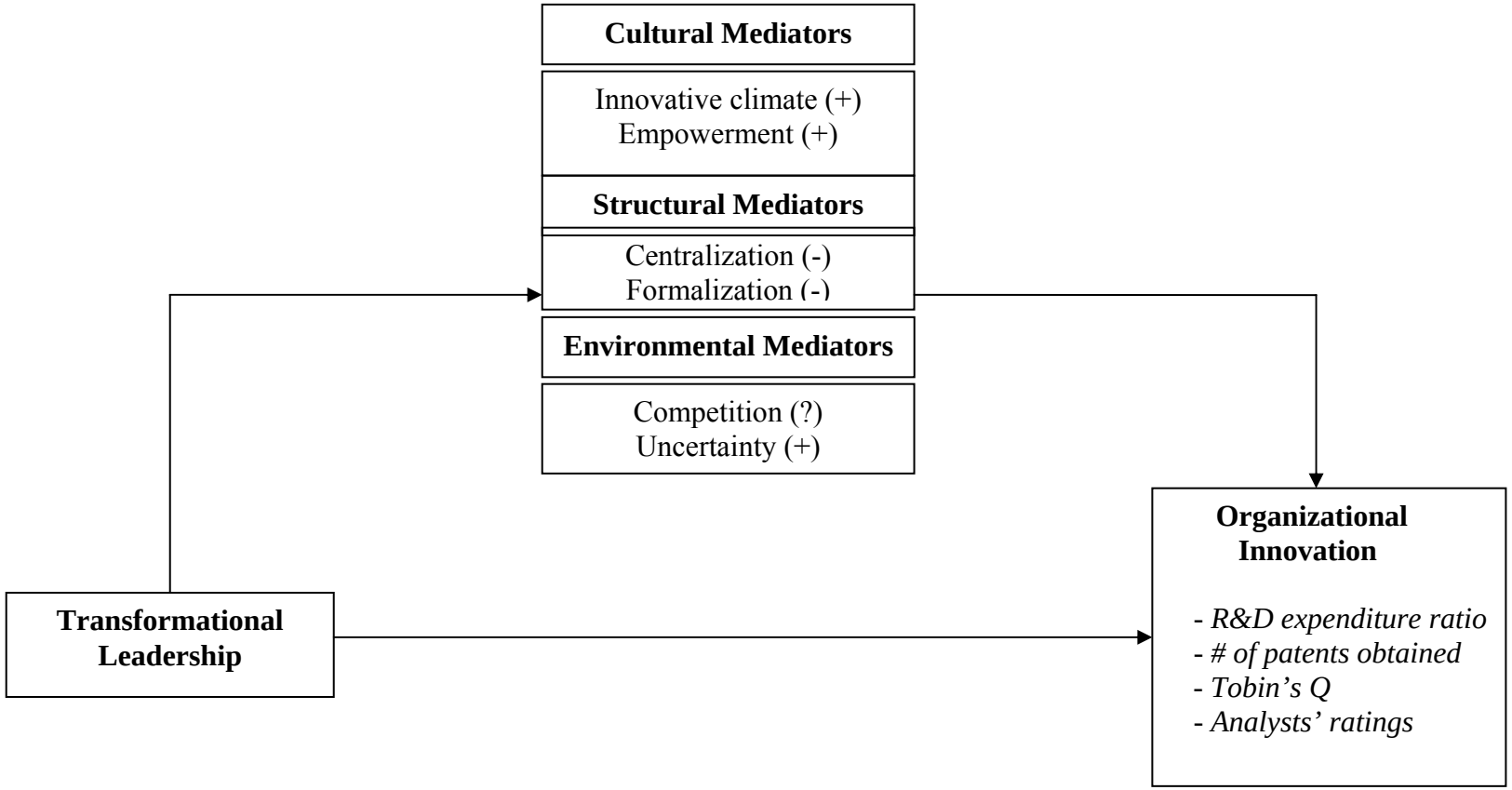
[a] Values on the diagonal represent Cronbach alphas. Values off the diagonal are correlations between constructs.

[b] These constructs were measured with single-item indicator. Therefore, average variance extracted for these measures could not be calculated with PLS.

[c] Company size ranged from 1 (less than 100 employees), 2 (101 – 500), 3 (501 – 1000), 4 (1001 – 5000), 5 (5001 – 1000) to 6 (over 10,000 employees).

** $p < .01$.

Figure 1
A Model of Direct and Indirect Effects of Transformational Leadership on Organizational Innovation



[1] Due to space limitation, factor loadings, weights of measures, and composite scale reliabilities are not shown. They are available from the first author.