

Dose transformational leadership facilitate SBU innovation? The moderating roles of SBU culture and incentive compensation

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Abstract

The present research attempts to investigate the relationship of transformational leadership with technological innovation and the moderating effects of organizational culture and incentive compensation on this relationship. Useful paired data was gathered from 102 senior managers and 267 employees in 102 Taiwanese SBUs, and The response rate was 26.15 percent and 22.82 percent for senior managers and employees, respectively. The results showed that transformational leadership had a significantly positive influence on technological innovation, including product, process, and service innovation. However, the positive moderating effects of organizational culture and incentive compensation on the relationship between transformational leadership and technological innovation were not significant. We also implemented the mediated regression analysis of organizational culture for the leadership-innovation linkage but without significant effects in our data set.

Keywords: transformational leadership, technological innovation, organizational culture, incentive compensation

INTRODUCTION

Leadership is crucial for enhancing innovation practices and achieving strategic competitiveness in organizations. The topic is important because firms facing the global competitive environment are under constant pressure to innovate their products and services. In addition, transformational leadership has been regarded to be more effective than other leadership styles in enhancing organizational innovation because it targets at change and innovation (e.g., Lowe, Kroeck, & Sivasubramaniam, 1996; Howell & Avolio, 1993).

The interaction between transformational leadership and organizational innovation has attracted increasing attention in empirical studies, which have shown the positive effect in the relationship (e.g. Elenkov, Judge, & Wright, 2005; Jung, et al. 2008; Jung, et al. 2003). However, research explored the role of transformational leadership in fostering specific type or nature of organizational innovation was scarce. Also the relationship of transformational leadership and organizational innovation is influenced by the contextual factors, for example, organizational culture, organizational structure, TMT tenure heterogeneity, top management compensation, the external environment, and so on (e.g., Elenkov, Judge, & Wright, 2005; Gumusluoglu & Ilsev, 2009; Jung, Wu, & Chow, 2008). And several researchers still emphasized that there was a lack of studies examining contextual conditions under transformational leadership-organizational innovation linkage (e.g. Gumusluoglu & Ilsev, 2009). Because leadership behaviors exists within the context of organization, it's incomplete without considering characteristics of the organizational or environmental contexts in which organizational innovation occurs (Damanpour, 1991; Jung, Chow, & Wu, 2003).

In this study, we address the above two research points. First, we focus on the

influence of top managers' transformational leadership behaviors on technological innovation in business units. Organizational units differ in their internal knowledge, practices, and capabilities (Tsai, 2001) as well as their technological innovation outcomes. Technological innovation drives most organizations, and it reflects the impact on firm performance directly, for example, investment on R&D or the number of patents. Second, we propose two moderating effects from organizational attributes (organizational culture and incentive compensation) to test the impact on the transformational leadership- technological innovation linkage. Organizational culture and transformational leadership have been theoretically and empirically linked to organizational effectiveness, but there is little research examining the relation between transformational leadership and different culture orientations as well as their interaction on important organizational outcomes (Xenikou & Simosi, 2006). Some authors examined the moderators of climate for innovation or support of innovation but without comparing the innovation influence under different culture orientations (e.g. Jung, et al. 2008; Sarros, Cooper, Santora, 2008). Besides, the focus of reward systems most lights on top managers' compensation or CEO pay, little empirical research explores incentive compensation of employees to enhance organizational innovation. To sum up, the present research attempts to investigate the relationship of transformational leadership with technological innovation and the moderating effects of organizational culture and incentive compensation on this relationship. And the proposed research framework is depicted in Figure 1.

Insert Figure 1 about here

THEORETICAL BACKGROUD AND HYPOTHESES DEVELOPMENT

Transformational leadership behaviors

Burns (1978) introduced the two different leadership concepts: transactional and transformational leadership. After that, a great number of research has been conducted to support the effectiveness of those two leadership styles (Avolio, 1999; Bass, 1985; Podsakoff, MacKenzie, & Bommer, 1996; Yukl, 1998), especially for transformational leadership behaviors, which applied by top business executives to respond to the rapid changing environment (Avolio, Bass, Jung, & Berson, 2003). Transformational leaders refer to those who transform followers' personal values and self-concepts to higher levels of needs and aspirations, and arouse them to transcend their own self-interest for the sake of the organization (Bass, 1985; Jung, 2001).

Numerous scholars have characterized transformational leadership as encompassing distinct components. Howell and Avolio (1993) proposed transformational leadership composed of charismatic influence, intellectual simulation, and individualized consideration. Bass et al. (2003) argued that transformational leadership included charisma, idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. And Podsakoff, MacKenzie, and Bommer (1996) have extended transformational leadership in six dimensions, including articulation a vision, providing an appropriate model, fostering the acceptance of group goal, high performance expectations, providing individualized

support, and intellectual stimulation. However, some components were found to be highly intercorrelated or similar, for example, charisma and idealized influence (Shamir, House, & Arthur, 1993), articulation a vision, providing an appropriate model, and fostering the acceptance of group goal (Podsakoff et al., 1996). Therefore, most researchers adopted the definition with four components of transformational leadership provided by Bass (1985). Transformational leadership is consisted of four different components: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass, 1985). *Idealized or charismatic influence* represents the degree to which leaders are admired, respected, and trusted. *Inspirational motivation* means that leaders provide meaning and challenge to follows' work by articulating an attractive vision of the future. *Intellectual stimulation* refers to the degree that leaders encourage followers to challenge existing assumptions, to reframe problems, and to approach old situations in new ways. *Individual consideration* involves paying attention to followers' individual need for achievement and growth by acting as a coach or mentor.

Technological innovation

Innovation can be a new product or service, a new production process technology, a new structure or administrative system, or a new plan or program pertaining to organizational members (Damanpour, 1991: p. 555). As for the typology of innovation, Damanpour (1987) have suggested that innovation encompasses technological, administrative, and ancillary innovations. Furthermore, Lin and Chen (2007) reviewed the related literature and noted four types of innovation, including technological, marketing, administrative, and strategic innovation. Since innovation is a multi-faced concept, we highlight the type of technological innovation in this study.

Technological innovation pertains to products and services, as well as production processes and operations related to the central activities of the organizations (Bantel & Jackson, 1989). They can be categorized based on incremental or radical innovation (Soni, Lilien, & Wilson, 1993). Lin and Chen (2007) have defined that technological innovation encompasses product, service and process innovations. Product innovation indicates improvements or changes of a product features, a product function, modeling, material quality and packing. Service innovation is the delivery of new and improved services distinct from products. Innovative service content and attitudes are also included. Process innovation relates to operational processes of a firm, such as process reengineering, process reduction or combination, and innovative production.

The Impact of transformational leadership on technological innovation

Transformational leaders can influence followers' behaviors toward innovation outcomes through idealized influence, inspirational motivation, intellectual stimulation, and individual consideration. Transformational leaders can display unconventional and creative behaviors and serve as role models for innovation (Howell & Higgins, 1990). Because transformational leaders put more emphasis on articulate an appealing and challenging future vision, they can focus on increasing followers' intrinsic motivation to reach the future goal of innovation. As Jung, Chow, & Wu (2003) stated that transformational leaders can facilitate unconventional and innovative thinking for followers by providing intellectual stimulation. To be a mentor or coach, transformational leaders can guide and enable followers to work more creative and innovative and yield productive performance. In particular, inspirational motivation and intellectual stimulation which transformational leaders use are more critical for organizational innovation (Elkin & Keller, 2003).

Elenkov, Judge, and Wright (2005) also synthesized the past literature and stated four ways that transformational leaders can influence organizational innovation. Effective transformational leaders can influence organizational innovation through the creation of an exciting vision in the future to adopt innovation successfully, seeing environmental trends and communicating with the rest of the organization to lead to innovation, selecting and promoting change champions, and finally, creating an organizational culture in which foster organizational innovation.

In general, the relationship with innovation is a main issue in conceptually investigating transformational leadership. Jasen, Vera, and Crossan (2009) have identified that transformational leadership as being helpful for exploration and exploitation innovation (or radical and incremental innovation). Jung, Wu, and Chow (2008) empirically tested a positive relationship between transformational leadership and organizational innovation and they measured innovation as R&D expenditures, the number of patents, and process and service improvements that a company adopted. Along the same vein, the present study argues that transformational leadership behaviors should be appropriate to foster technological innovation. Then, we specify the following hypothesis:

Hypothesis 1. Transformational leadership behaviors are positively related to technological innovation.

Moderators of the transformational leadership-technological innovation relationship

Organizational culture

Organizational culture can be defined as the personality of the organization that

is composed of the assumptions, values, beliefs, attitudes, and behaviors of organizational members (Schein, 2004). Deshpande, Farley, and Webster (1993) identified four types of organizational cultures, including market, adhocracy, clan, and hierarchical cultures. The market culture emphasizes competitive advantage and market superiority, and a strong external orientation of a market culture makes it compatible with the customer-orientated values (Kilie & Dursun, 2010). The hierarchical culture emphasizes stability, predictability, and smooth operations, and follows rules, policies, and procedures strictly (Deshpande, Farley, & Webster, 1993). The clan culture relies on loyalty, tradition, and interrelationships among organizational members (Deshpande, Farley, & Webster, 1993). Finally, the adhocracy culture embraces innovation, growth, and new resources, and it highly values flexibility, adaptability, creativity, risk taking, and entrepreneurship (Deshpande, Farley, & Webster, 1993). This current study focuses on market and adhocracy culture and terms them as market orientation and innovative culture, which present external- and internal-focus organizational culture, to accommodate with previous research. The relational is that organizational innovation is one of strategically import organizational outcomes, and previous studies indicated that innovative culture and market orientation both facilitate organizational performance (e.g. O’Cass & Viet Ngo, 2007).

Innovative culture is internally-focused and competitive-advantage seeking, since it encourages openness to new ideas and cultivates internally-based capabilities to adopt new ideas, processes, or products (Hurley & Hult, 1998). Prior research has identified that innovative culture is likely a contextual variable to moderate the effect of leadership on innovation. Howell and Avolio (1993) found that when there was a climate of support for innovation within the organizational unit, there was a

significant positive relationship between the intellectual stimulation provided by the leader and the unit's innovation performance. Jung, Wu, and Chow (2008) either confirmed that a climate for innovation provided the positive effect in the relationship of transformational leadership and firm innovation. Obviously, innovative culture is regarded as a supportive context for promoting innovation.

As for market orientation, Deshpande and Webster (1989) have argued that market orientation is considered as an aspect of organizational culture that is created and maintained to provide individual behavior norms in organizations. Market orientation is inclined to respond customer needs and preferences in order to create value; therefore, customer-oriented organizations outperform others who are less customer-oriented (Narver & Slater, 1990). In addition, numerous empirical studies found the positive role that market orientation plays in promoting radical and incremental innovation and organizational performance (e. g. Carmen & Maria Jose, 2008; Grinstein, 2008; Hernández-Espallardo & Delgado-Ballester, 2009; Jimenez-Jimenez & Sanz Valle, 2008; Laforet, 2008). These innovation practices pertain to introducing new products, improving existing products, providing service innovation and process innovation. As such, it is argued that technological innovation may reside in the degree of organizational market orientation that organizations promote.

Moreover, market orientation has also been shown to be positively affected by transformational leadership (Menguc, Auh, & Shih, 2007). Narver, Salter, and Tietje (1998) found that transformational leadership can form powerful guiding coalition to determine customer orientation, create and communication a vision of customer orientation, and empower others to act on the vision. Transformational leaders will influence employees to be customer-oriented in their interaction with customers to

align the values and goals of the customer-oriented culture. In brief, customer orientation, transformational leadership, and technological innovation may be interacted. And this research demonstrates that market orientation may play a moderator to influence transformational leadership behaviors in their relation with technological innovation. Thus, we propose the following hypotheses:

Hypothesis 2a. The relationship of transformational leadership behaviors on technological innovation is moderated by innovative culture.

Hypothesis 2b. The relationship of transformational leadership behaviors on technological innovation is moderated by market orientation.

Incentive compensation

The literature of incentive compensation systems or mechanisms has been toward two aspects. Financial incentives increase pressure to perform better under conditions of imperfect information and nonzero monitoring costs, for example, bonus, variable pay, and stock option; and non-financial incentives based on psychological theories argue that incentives may motivate performance under certain conditions, for instance, feedback on performance, challenging work and difficult goals, and task interdependence (Fey & Furu, 2008). Nowadays, most employers use both financial and non-financial incentives for boosting positive motivational and performance effects (Huff, 2006). The rationale for the positive effects of incentive compensation is rooted in the expectancy theory of motivation (Vroom, 1964). Apply expectancy theory in this study, motivation will be high when employees believe their efforts will lead to innovation (expectancy), and that innovation will result in actually obtaining the rewards (instrumentality), and the rewards are perceived valuable for employees

(valence).

Previous empirical studies have shown that incentive compensation has positive effects on technological innovation. Josephberg, Pollack, Victoriano, & Gitig (2003) indicated that boards of many Japanese companies recognized the importance of compensating innovators, and these companies offer financial rewards to individuals who develop innovation as part of their jobs. Cabrales, Medina, Lavado, & Cabrera (2008) also analyzed the effect of team incentives on the degree of radical innovation, and they found that the combined use of long- and short-term incentives were associated with incremental innovation. That means that employees will be motivated via the rewards encouraged technological innovation.

The influence of transformational leadership, encompassing idealized influence, inspirational motivation, intellectual stimulation, and individual consideration, makes employees believe that their efforts will increase technological innovation. Kerr (1975) also emphasized the importance of very carefully designing incentive compensation to ensure that we are in fact rewarding the behaviors we want. Therefore, transformational leaders may prefer to motivate employees' innovative behaviors through compensation based on the contribution to the creation, adoption and implementation of process, service, and product innovation. Employees are further reinforced to adopt or implement innovative behaviors actually and connect the value of incentive compensation to their technological innovation outcomes. Hence, we hypothesize:

Hypothesis 3. The relationship of transformational leadership behaviors on technological innovation is moderated by incentive compensation.

METHODS

Sample and data collection

Our research sample targeted to Taiwanese companies. According to Innovation Development Report 2009-2010 released by European Business School (EBS), Taiwan ranked 13th in the world and second in Asia (it was only surpassed by Singapore) in terms of its innovative capacity. In addition, Lin and Chen (2007) indicated that Taiwanese companies place more emphasis on technological innovation, no matter the nature of incremental or radical innovation. Therefore, Taiwan is an ideal context for examining technological innovation.

Strategic business unit (SBU) is the unit of analysis in the current study. Comparing with the entire company, each participant is more likely to be acquainted with the strategies, processes, management, and performance of the SBU (Naver, Slater, & MacLachlan, 2004). Purposive sampling was adopted in this study, and we surveyed 390 Taiwanese owned strategic business units. To avoid the problem of common method bias (CMV), we used separate surveys to gather data for independent and dependent variables. Each survey package contained one senior manager questionnaire and three questionnaires for employees. In each SUB, the senior manager was asked to answer the degree of the technological innovation adoption, and employees were inquired to fill out the questions related to transformational leadership behaviors about their senior managers, organizational culture orientation, and incentive compensation for innovation. Useful paired data was gathered from 102 senior managers and 267 employees in 102 Taiwanese SBUs. The response rate was 26.15 percent and 22.82 percent for senior managers and employees, respectively.

As for the profile of our sample, the average SBU size is 909 employees, average age of the SBUs was 19.18 years, and 94.4 percent of the SBUs were privately owned. About the business areas of our sample, 17.3 percent of the SBUs are in the business of producing consumer products, 29.6 percent of the SBUs provide consumer services, 35.8 percent produce industrial products, and 17.3 percent provide industrial services.

Measures

Dependent variable

Technological innovation. In this study, we examined three types of technological innovation, namely, process innovation, service innovation, and product innovation. All items of technological innovation investigated in this study were measured on a seven-point Likert scale, anchored by 1= strongly disagree and 7=strongly agree. Product innovation was measured by four items (Cronbach's $\alpha=0.88$), which was adopted from the work of Atuahene-Gima (2005) and Cooper & Kleinschmidt (2000), and they are "This SBU frequently introduced incremental new products into new markets during the past three years," "Compared to your major competitor, this SBU introduced more incremental new products into new markets during the past three years," "This SBU frequently introduced radical new products into new markets during the past three years," and "Compared to your major competitor, this SBU introduced more radical new products into new markets during the past three years."

For the consistent measurement of technological innovation, we designed the scales of process and service innovation based on the work of Atuahene-Gima (2005) and Cooper & Kleinschmidt (2000). Process innovation was measured by two items

(Cronbach's alpha=0.84), including "This SBU frequently adopted internal process innovation during the past three years" and "Compared to your major competitor, this SBU adopted more internal process innovation during the past three years."

Service innovation was measured by three items (Cronbach's alpha=0.93), which encompassed "This SBU frequently introduced service innovation to existing markets during the past three years," "This SBU frequently introduced service innovation to new markets during the past three years," and "Compared to your major competitor, this SBU introduced more service innovation during the past three years."

Moderating variables

Organizational culture. (1) Innovative culture: The measure of innovative culture was drawn from the work of O'Reilly, Chatman, & Caldwell (1991), and we used four items from part of it, including being innovative, being quick to take advantage of opportunities, a willingness to experiment, and risk taking. These four items are descriptive as "We are energetic to being innovative in this SBU," "We are encouraged to take a risk in this SBU," "We are encouraged to try new things and take advantage of opportunities in this SBU," and "We will be rewarded for our risk taking in this SBU." Cronbach's alpha for innovative culture was 0.91. (2) Market orientation: The measure of market orientation was adopted from the work of Narver, Slater, and MacLachlan (2004). It was measured by three items, including "We help customers anticipate developments in the markets in this SBU," "We continuously try to discover additional needs of our customers of which they are unaware in this SBU," and "We incorporate solutions to unarticulated customer needs in our new products and services in this SBU." These items were measured on a seven-point Likert scale which 1 indicates "strongly disagree" and 7 indicates "strongly agree."

Cronbach's alpha for market orientation was 0.93.

Incentive compensation. We used financial and non-financial incentives in this scale, and incentive compensation was measured by four items based on four-point scales, anchored 1=least adopted and 4=most frequently adopted. Financial incentives are "This SBU provides merit pay based on individual performance" and "This SBU provides monetary compensation but not salary or bonus." Non-financial incentives include "This SBU provides more freedom and responsibilities to challenge individual growth" and "This SBU provides opportunities for professional development and industry recognition." Cronbach's alpha for financial and non-financial incentive compensation was 0.61 and 0.67 respectively.

Independent variable

Transformational leadership behaviors. We used the scales designed by Podsakoff et al. (1996) and Garcia-Morales, Matias-Reche, and Hurtado-Torres (2008) for measuring transformational leadership in a technological context. We established a Likert-type seven-point scale (1= strongly disagree and 7=strongly agree) for six items to reflect the employees' perceptions of transformational leadership behaviors, especially for inspirational motivation and intellectual stimulation which are more critical for organizational innovation (Elkin & Keller, 2003). These items are "I believe that our SUB top leader is capable of overcoming any obstacles," "Our SBU top leader will act as the leading force if we encounter dangers," "Our SBU top leader paints a clear picture of the future vision," "Our SBU top leader has provided me with new ways of looking at things which used to be a puzzle for me," "Our SBU top leader has ideas that have forced me to rethink some of my own ideas I have never

questioned before,” and “Our SBU top leader has stimulated me to think about old problems in new ways.”

Exploratory factor analysis using the principal components method and varimax rotation was conducted on these six items, and the results both represented that all items loaded on one factor, which accounted for 82.54 percent of the variance. Therefore, a composite transformational leadership score was computed from those items. Cronbach’s alpha for transformational leadership was 0.95.

Control variables

SBU size and age were used as control variables in this study, since prior studies reported their positive relationship with organizational innovation (Elenkov et al. 2005; Jung et al. 2003; Jung et al. 2008). SBU size refers to a log transformation of the total number employees, and SBU age equals to the SBU tenure.

Aggregation analysis

To identify the aggregation of individual SBU employees’ survey responses to the SBU level, we calculated interrater agreement following the formula developed by James, Demaree, and Wolf (1984) for the transformational leadership, organizational culture, and incentive compensation scales. For transformational leadership, r_{wg} mean was 0.71 and r_{wg} median was 0.87. For organizational culture, r_{wg} mean was 0.67 and r_{wg} median was 0.87. For incentive compensation, r_{wg} mean was 0.82 and r_{wg} median was 0.88. All r_{wg} values were above the conventionally accepted value of 0.60 (De Luca & Atuahene-Gima, 2007). Therefore, it was appropriate to aggregate individual responses to the SBU level.

Additional analysis

Since some researchers have advocated that innovative culture and market orientation would be mediators or predictors of the relationship between leadership and innovation (e.g. Eisenbeiss, Knippenberg, & Boerner, 2008), we also implemented the mediated regression analysis. The result indicated that transformational leadership positively related to innovative culture ($\beta = 0.660$, $p < .001$) and market orientation ($\beta = 0.567$, $p < .001$). In addition, transformational leadership had a slightly positive effect on product innovation ($\beta = 0.203$, $p < .1$). Innovative culture and market orientation positively relate to product, process, and service innovation but without significant effects. They would be the predictors or mediators of the relationship between transformational leadership and technological innovation; however, our data set didn't show the mediating effect.

RESULTS

Table 1 shows descriptive statistics and pair-wise correlations for all independent and dependent variables. Transformational leadership had significant correlations with innovative culture ($r = .649$, $p < .001$), market orientation ($r = .550$, $p < .001$), and product innovation ($r = .219$, $p < .05$). Innovative culture both significantly correlated with financial and non-financial incentives ($r = .294$, $p < .01$; $r = .256$, $p < .05$), and market orientation significantly correlated with non-financial incentives ($r = .310$, $p < .01$). In addition, the components of technological innovation were significantly inter-correlated, and the largest correlation was found between product innovation and service innovation ($r = .845$, $p < .001$).

Insert Table 1 about here

We implemented hierarchical regression analysis to examine the direct effect of transformational leadership and the moderating effects of organizational culture and incentive compensation for technological innovation. For each type of technological innovation, the control variable (SBU size and SBU age) was entered first. Next, the predictor variables (transformational leadership, organizational culture, and incentive compensation) were entered. For the third and fourth steps, the multiplicative interaction terms were entered separately. Table 2 represents that, after controlling for SBU size and age, transformational leadership had significant positive effects on product innovation ($\beta=2.206, p< .05$), process innovation ($\beta=3.142, p< .001$), and service innovation ($\beta=3.152, p< .001$). It reveals that transformational leadership was significantly related to technological innovation. Therefore, H1 was supported.

H2 and H3 were related to the moderating effects of organizational culture and incentive compensation on the relationship between transformational leadership and technological innovation. Market orientation ($\beta=2.800, p< .01$) and financial incentives ($\beta=1.327, p< .05$) had significantly positive effects on process innovation; however, both the interactions of market orientation ($\beta=-4.543, p< .01$) and financial incentives ($\beta=-1.458, p< .05$) for transformational leadership and process innovation showed significantly negative effects (as shown in Figure 2). Change in the R^2 when interaction terms were added was also significant ($\Delta R^2=0.199, p< .001$). Beyond our expectation, transformational leadership and organizational culture or transformational leadership and incentive compensation had some joint effects on technological innovation, but the results were opposite to our hypotheses. Hence, H2 and H3 were not supported.

Insert Table 2 about here

Insert Figure 2 about here

DICUSSION AND CONCLUSIONS

In line with prior studies (e.g. Gumusluoglu & Lisev, 2009; Jung et al., 2003; Jung, et al. 2008), this study found that transformational leadership had a significantly positive influence on technological innovation. Furthermore, the findings also suggest that transformational leadership behaviors will promote various kinds of technological innovation, including product, process, and service innovation. Thus, managers should be cultivated as transformational leaders to boost the positive outcomes from technological innovation.

Interestingly, these results indicated that market orientation and financial incentives moderated the relationship between transformational leadership and process innovation with negative effects, but they were contrary to our hypotheses development. For the negative joint effect of transformational leadership and financial incentives on innovation, Deci, Koestner, and Ryan (1999) have examined the effects of extrinsic rewards on intrinsic motivation, and they pointed out that extrinsic rewards had a direct effect on job performance; however, for those who had intrinsic motivation to do the job, these external incentives would diminish their intrinsic motivation. And self-determination theory (SDT) identifies a basic psychological need

for autonomy as a central feature plays an important role to facilitate intrinsic motivation (Ryan & Deci, 2000). In other words, when transformational leaders regard extrinsic rewards, like financial incentives, as a main mechanism to motivate employees to enhance innovation activities, may ignore those employees preferring intrinsic motivation, such as job autonomy and achievement, and then diminish the efforts of innovation adoption.

About the negative joint effect of transformational leadership and market orientation on process innovation, the possible rationale is argued as follows. This study stresses inspirational motivation and intellectual stimulation of transformational leadership, and these leadership behaviors motivate and guide employees in SBUs to implement internal process innovation. Nevertheless, proactive market orientation is associated with radical innovation, and a lead-the-customer firm usually pays high attention to discover and to grasp the latent needs of customers or markets, and to develop new products and/ or services that satisfy those want (Li & Lin, 2007). Therefore, employees perceived the culture with proactive market orientation will enhance other innovative activities related to grip customers' needs and then less involve in internal process innovation or improvement. These results imply that organizational culture and incentive compensation are the contextual variables to influence the level of technological innovation adoption but they may show the negative effect. And transformational leaders should pay attention to the possible dark side of organizational culture and incentive compensation on technological innovation.

Research limitation and future research direction

This study has some limitations in the results that require further explanation. First, although we avoided the CMV problem to gather data from different sources,

the cross-sectional design may not indicate causal relationships between transformational leadership and technological innovation. Longitudinal research should be empirically designed for the model. Second, previous studies stated that market orientation and financial incentives were positively related to technological innovation (e. g. Aldas-Manzano, Kuster, & Vila, 2005; Cabrales, Medina, Lavado, & Cabrera, 2008; Jimenez-Jimenez & Sanz Valle, 2008; Josephberg, Pollack, Victoriano, & Gitig, 2003), although not hypothesized in this study; we also found that market orientation had a direct effect on fostering SBU innovation. Additionally, the positive moderating effects of organizational culture and incentive compensation on the relationship between transformational leadership and technological innovation were not supported. Do organizational culture and incentive compensation constitute the organizational context for enhancing technological innovation? Or are they predictors of technological innovation? Future research should explore the both direct and interaction effect simultaneously. Third, the generalization of the findings is limited to the scope of our paired sample of Taiwanese SBUs, but it may provide some valuable information for Taiwanese managers to adopt technological innovation.

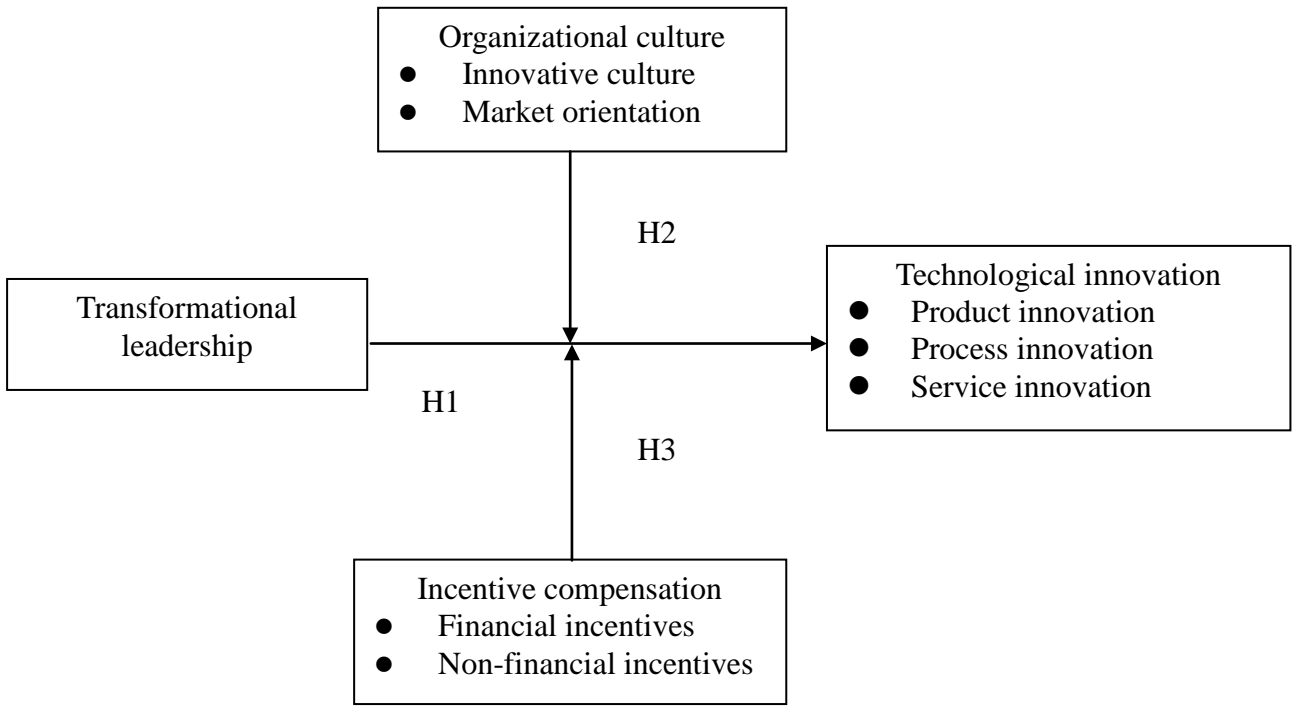


Figure 1. The Proposed Research Framework

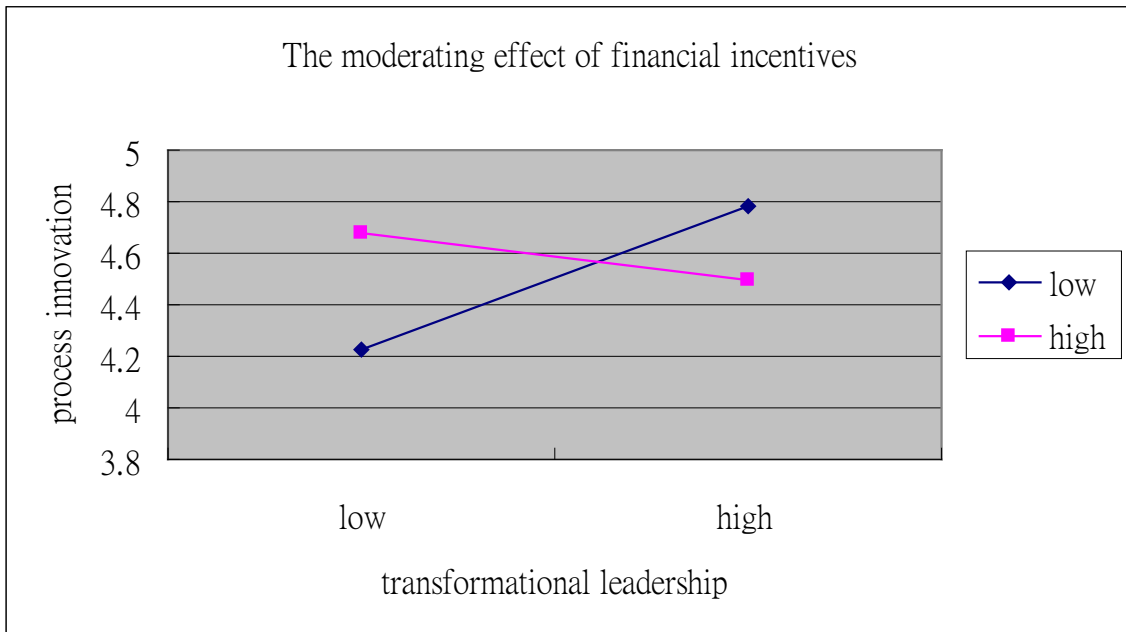
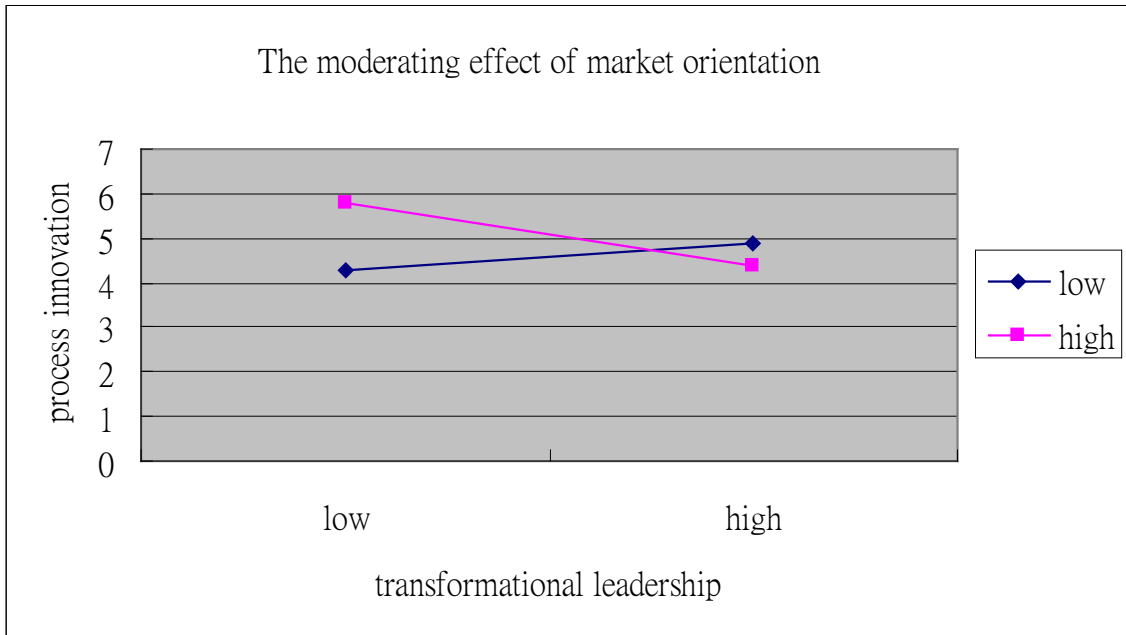


Figure 2. The Moderating Effect of Market Orientation and Financial Incentives

TABLE 1
Descriptive Statistics and Correlations among Variables

| | <i>Variable Name</i> | <i>Mean</i> | <i>Std.</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----|-----------------------------|-------------|-------------|-------|-------|---------|---------|--------|-------|-------|---------|---------|
| 1 | SBU size ^a | 2.06 | .90 | - | | | | | | | | |
| 2 | SBU age | 19.18 | 14.63 | .226* | - | | | | | | | |
| 3 | Transformational leadership | 5.25 | .94 | .071 | .107 | - | | | | | | |
| 4 | Innovative culture | 4.51 | .81 | -.112 | .042 | .649*** | - | | | | | |
| 5 | Market orientation | 4.81 | .77 | .090 | -.057 | .550*** | .655*** | - | | | | |
| 6 | Financial incentives | 2.24 | .63 | -.054 | .023 | -.049 | .294** | .146 | - | | | |
| 7 | Non-financial incentives | 2.46 | .55 | .037 | .097 | .148 | .256* | .310** | .092 | - | | |
| 8 | Product innovation | 4.17 | 1.35 | .118 | .071 | .219* | .197 | .149 | -.078 | -.147 | - | |
| 9 | Process innovation | 4.55 | 1.48 | .138 | -.035 | .052 | .056 | .114 | .024 | -.116 | .550*** | - |
| 10 | Service innovation | 4.10 | 1.48 | .160 | .010 | .172 | .142 | .111 | -.005 | -.113 | .845*** | .639*** |

*: p< .05; **: p< .01; ***: p< .001

a SBU size is log-transformed

TABLE 2**Results of the Moderated Regression Analysis for Technological Innovation**

| Dependent variable: | Product innovation | Process innovation | Service innovation |
|---|--------------------|--------------------|--------------------|
| SBU size ^a | 0.143 | 0.124 | 0.184+ |
| SBU age | 0.073 | 0.005 | -0.002 |
| Transformational leadership | 2.206* | 3.142*** | 3.152*** |
| Innovative culture | 0.514 | -0.205 | 0.974 |
| Market orientation | 1.035 | 2.800** | 0.938 |
| Financial incentives | 0.273 | 1.327* | 0.589 |
| Non-financial incentives | 0.462 | -0.534 | 0.838 |
| Transformational leadership × Innovative culture | -0.610 | 0.011 | -1.629 |
| Transformational leadership × Market orientation | -1.600 | -4.543** | -1.503 |
| Transformational leadership × Financial incentives | -0.491 | -1.458* | -0.718 |
| Transformational leadership × Non-financial incentives | -1.089 | 0.481 | -1.525 |
| <i>F</i> | 2.135* | 2.434* | 2.606** |
| <i>R</i> ² | 0.246 | 0.263*** | 0.276** |
| ΔR^2 | 0.015 | 0.199*** | 0.172** |

+: $p < .10$; *: $p < .05$; **: $p < .01$; ***: $p < .001$

a SBU size is log-transformed

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