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Influence of leadership competency and leader-member exchange quality on research project performance

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The primary purpose of this study was to investigate the relationships of the project leader's competencies with leader-member exchange (LMX) quality, and their impact on project performance in research institutions. The structural equation modeling (SEM) approach was used to validate the research model. Using data from more than 200 research projects, the analyses find that leadership competency is positively associated with LMX quality in a research team. Additionally, research project performance can be achieved with higher levels of LMX quality. The results also show that LMX quality mediates the effects of leadership competency on research project performance. Finally, the findings indicate that team relationship, owner regulation, and project budget have a moderating effect on the relationship between LMX quality and research project performance.

Key Words: Leadership, Competency, LMX, Team, Research Institution.

Introduction

In the highly competitive environment, organizations are constantly searching for proven practices that offer a competitive advantage. In recent years, many organizations use project management techniques to attain certain predetermined objectives (Hyväri, 2006). Research institutions play an important role in scientific research and development. The research institutions also attempt to employ project teams and project management techniques to attain research objectives and enhance research performance. Project is an autonomous organization but connected to parent organization (Artto et al., 2008). A project is a series of tasks with a start and end date, specific goals and conditions, defined responsibilities, a budget, and multiple parties involved. Every project is unique in nature and does not involve any repetitive processes. Turbulence in the project's environment,

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dynamism, uncertainty, and complexity tend to be important issues that affect a project and its strategy (Artto et al., 2008). The research-based project teams adopt temporary work processes to deliver products and services to clients, which creates a dynamic work environment, where additional pressures can be imposed on the employee from fluctuating work-loads, uncertain requirements, and multiple role demands (Turner et al., 2008). Additionally, leadership development, processes and practices in the research-based project teams are in some way supportive of project-oriented working and are different from more traditional processes and practices (Wright and Boswell, 2002) which are designed for the classically-managed organization where the emphasis is not on projects but instead on routine products and services and where the job requirements are well defined and stable (Keegan and Turner, 2003). Leadership development, processes and practices also need to be designed to meet the specific needs of the research-based project teams (Huemann et al., 2004).

Leadership is the accomplishment of goals through communication towards others (DuBrin, 2004). It is the ability to influence groups for purposes of goal accomplishment (Koontz and Weihvich, 1990). Research has made considerable progression exploring the relationship between leadership and organizational performance. The literature indicated that leadership is one of the most important elements in organizational success (Elenkov, 2002; Ogbonna and Harris, 2000; Barling et al., 1996). In addition, leadership behaviors are considered important in being able to evoke performance among subordinates, thus improving firms' competitiveness (Zacharatos et al., 2000). On the other hand, leader-member exchange (LMX) quality is central to improving organizational performance (Settoon et al., 1996; Varma and Stroh, 2001). LMX theory is defined as a relationship-based approach to leadership research (Graen and Uhl-Bien, 1991). The theory assumed that effective leadership processes occur when leaders and followers develop and sustain mutual relationships and, therefore, gain access to tremendous benefits brought by these partnerships (Goertzen and Fritz, 2004). The leader-member exchange theory addresses increasing organizational success by creating positive relations between a leader and subordinates and focuses its attention on the linkages that leaders have with every subordinate. Research on LMX has shown the value of high-quality leader-member relationships in organizations (Graen and Uhl-Bien, 1995; Liden et al., 1997; Maslyn and Uhi-Bien, 2001).

Leadership appears to be related to desirable performance outcomes. However, conceptualizing leadership in the project context is still rudimentary. The literature on project success factors has largely ignored the impact of a project manager and his or her leadership on project success (Turner and Müller, 2005). Research leaders and their impacts on research projects remain understudied within existing scholarship (Campbell et al., 1993; Fu and Tsui, 2003; Huang et al., 2006; Ismail and Ford, 2010; Tian and Lau, 2001; Trevor-Roberts et al., 2003; Xu, 1986; Yang, 2006). Additionally, research has poorly explained the role of LMX quality in achieving project success. Although theoretical arguments have been made in favor of the LMX quality, there is relatively weak empirical support for the theory in the project management domain. There is thus a need to examine how leadership and LMX quality influence project success.

To address these limitations and advance the understanding of leadership and LMX quality in the project context, the first objective of this study was to validate a framework for assessing the relationships among a project leader's competency, LMX quality, and project performance in research institutions. The second objective was to determine whether LMX quality plays a mediating role in the relationship between leadership competency and research project performance. The third objective was to examine the moderating role of project characteristics in the relationship between LMX quality and research project performance. This research reveals the importance of developing leadership competency to increase research quality and to reduce interpersonal conflicts in a research team. The results offer guides to improve LMX quality and further gain a number of potential benefits to a research project.

Literature review and hypotheses

Four schools of leadership have evolved over the past several decades. The trait school of leadership focused on leaders' traits, such as their physical appearance and personalities. Representatives of this school include Kirkpatrick and Locke (1991) for general leadership, as well as Turner (1999) for leadership in project management (Müller and Turner, 2010). The behavioural school argued that effective leaders demonstrate given behaviours or styles, which can be learned and are not a trait that people are born with. Blake and Mouton (1978) and Hersey and Blanchard (1988) are the representatives of the school. In addition, most authors from the behavioural school argued that different behaviours or styles are appropriate in different circumstances, but that was formalized by the contingency school (Müller and Turner, 2007). Robbins (1997) is one of the representatives for this school, who proposed four styles of directive, supportive, participative, and achievement oriented leadership, contingent on the personality of the person being led and the situational ambiguity. Furthermore, the visionary school discovered two types of leadership, transactional and transformational leadership. Transactional leadership is often contrasted with transformational leadership. Transactional leadership emphasizes contingent rewards. The transactional leader rewards subordinates for meeting performance objectives. Unlike the transactional leaders who indicate how current needs of subordinates can be satisfied, transformational leaders show charisma and create pride, respect, trust, and a vision. Transformational leadership provides inspiration and intellectual stimulation, motivates followers by creating high expectations and modeling appropriate behaviors, and challenges follows with new ideas and approaches (Bass, 1990). Partly in response to these criticisms and partly because of a zeitgeist that is sensitive to a paradigm shift that seems to permeate the field of leadership studies, a wave of new perspectives has emerged including spiritual leadership, complex leadership, contextual leadership, paradoxical leadership, servant leadership, stewardship, connective leadership, self-sacrificial leadership, shared leadership, authentic leadership, emotional intelligence, and leadership competence (Klenke, 2007). Many of these approaches are in the early stages of development and/or lack a strong theoretical infrastructure as well as reliable and valid measures of the foundational constructs (Klenke, 2007).

Among the emergent perspectives mentioned, spiritual leadership and authentic leadership are gaining increased attention in the scholarly and practitioner communities. The theory of spiritual leadership is developed within an intrinsic motivation model that incorporates vision, hope/faith, and altruistic love, theories of workplace spirituality, and spiritual survival; where the spiritual survival variables are meaning/calling and membership (Fry, 2003). Spiritual leadership taps into the fundamental needs of both leader and follower for spiritual survival so they become more organizationally committed and productive (Fry, 2003). The purpose of spiritual leadership is to create vision and value congruence across the strategic, empowered team and individual levels and, ultimately, to foster higher levels of organizational commitment and productivity (Yusof and Tahir, 2011). Specifically, scholars have advocated that spiritual leadership theory incorporates and extends the characteristics associated with transformational leadership (Boorom, 2009). On the other hand, Avolio et al. (2004) defined authentic leaders as those individuals who are deeply aware of how they think and behave and are perceived by others as being aware of their own and others' values/moral perspective, knowledge, and strength; aware of the context in which they operate; and who are confident, hopeful, optimistic, resilient, and high on moral character. Although authentic leadership shows some overlap with other contemporary perspectives such as transformational, charismatic, servant, and spiritual leadership; the construct is gaining legitimacy in its own right as researchers are beginning to differentiate authentic leadership from related constructs by grounding it in theory and seeking support in empirical research (Klenke, 2007).

Emotional intelligence emerged shortly before the

year 2000. It focused on self management and interaction management (Müller and Turner, 2010). Goleman (1995) is the representative of this school, who contended that emotional capabilities are more important for leadership than intellectual capabilities. Most recently, Dulewicz and Higgs (2005) did an extensive review of existing theories and their assessment tools, and identified 15 leadership dimensions, which they then clustered under three competences of intellectual (IQ), emotional (EQ) and managerial (MQ). Leadership competence encompasses all the previous schools because traits and behaviours are competencies, it says certain competency profiles are appropriate in different situations, it can define the competency profile of transformational and transactional leaders, and it suggests emotional intelligence as one of the groups of competencies (Müller and Turner, 2007).

Leadership is the accomplishment of goals through communication towards others (DuBrin, 2004). It is the ability to influence groups for purposes of goal accomplishment (Koontz and Weihvich, 1990). Several studies have discussed the factors which may influence leadership (Davis, 1972; Fiedler, 1967; Fiedler, 1974). Previous research conducted on leadership also stressed the importance of leadership competency. The literature emphasized developing highly transferable generic abilities that are required for most jobs or particular occupations or job roles (Stasz, 1997; Delamare Le Deist and Winterton, 2005). Many conceptions of competency now include knowledge and skills alongside attitudes, behaviors, work habits, and personal characteristics (Delamare Le Deist and Winterton, 2005; Green, 1999; Lucia and Lepsinger, 1999; Russ-Eft, 1995). The specialties of leaders include four categories: physiological characteristics, social background, intelligence, personality related to work, and social interpersonal (Ivancevich et al., 1977). In addition, the leader's specialty can also be categorized into five groups: ability, achievement, responsibility, participation, and position (Stogdill, 1948). From the perspective of ability, leadership, analytical thinking, communication, decision making, building relationships, strategic planning, and emotional intelligence are the primary ability categories (Emiliani, 2003). Furthermore, Goleman (2004) claimed that emotional intelligence may be the key attribute that distinguishes outstanding performers from those who are merely adequate. Five components associated with emotional intelligence were found in this study: self-awareness, self-regulation, motivation, empathy, and social skill.

The previous studies also provided valuable knowledge regarding development of leadership competency frameworks and methods which could be used in the development of such abilities (Cooper, 2000; Humphreys and Einstein, 2003; Emiliani, 2003). Competency models have been employed to align individual capabilities with the core competence of the organization (Rothwell and Lindholm, 1999; Lucia and Lepsinger, 1999). For example, Dulewicz and Higgs (2005) proposed a model that reflects the research and thinking on leadership. The elements in this model were divided into two tracks: competence areas and personal characteristics.

Leadership behaviors are considered important in being able to evoke performance among subordinates (Barling et al., 1996; Berson et al., 2001; Bryman, 1992; House and Shamir, 1993; Howell and Frost, 1989; McColl-Kennedy and Anderson, 2002; Ogbonna and Harris, 2000; Tsai et al., 2009; Zacharatos et al., 2000). Elenkov (2002) noted that leadership may directly and positively predict organizational performance. Furthermore, Ahearn et al. (2004) demonstrated the effects of leadership skills on team performance. Based on the relevant literature, the following hypothesis was developed:

H1: Leadership competency positively influences project performance in research institutions.

In addition to the literature on leadership abilities, some focused on discussion of leader-member exchange and its associations with leadership. LMX theory is defined as a relationship-based approach to leadership research (Graen and Uhl-Bien, 1991). The theory assumed that effective leadership processes occur when leaders and followers develop and sustain mutual relationships and,

therefore, gain access to tremendous benefits brought by these partnerships (Goertzen and Fritz, 2004). It comes from the Vertical Dyad Linkage (VDL) Model, which proposed that a leader has a different relationship or patterns of behavior with each individual he/she supervises (Cashman et al., 1976; Graen and Cashman, 1975). This relationship-based approach to leadership theory has advanced through four stages (Graen and Uhl-Bien, 1995). The first stage of LMX evolution investigated the leader-member exchange issues in the context of socialization (Graen et al., 1973) and Vertical Dyad Linkage (Dansereau et al., 1975). The second evolutionary stage of LMX theory addressed its relationship with organizational outcomes (Graen and Uhl-Bien, 1995). In addition, stage three in the evolution of LMX focused on the processes for developing effective leadership relationships (Graen and Uhl-Bien, 1995). Finally, the fourth stage in the development of LMX theory concentrated on a systems-level perspective "mapping" the leadership structure by the formally defined roles of organizational members (Graen and Uhl-Bien, 1995). Currently, this area of LMX theory has been unexplored, but it has been suggested that it offers great possibilities for future research (Graen and Uhl-Bien, 1995).

The leader-member exchange theory addresses increasing organizational success by creating positive relations between a leader and subordinates and focuses its attention on the linkages that leaders have with every subordinate. The relationships were classified in two groups: the in-group and the out-group. The LMX theory attempts to evaluate the quality of each dyadic association and its impacts on organizational performance. Research on LMX has shown the value of high-quality leader-member relationships in organizations (Graen and Uhl-Bien, 1995; Liden et al., 1997; Maslyn and Uhi-Bien, 2001). Prior research indicated that high LMX relationships may enhance levels of satisfaction and effectiveness, as well as mutual influence, more open and honest communication, greater access to resources, and more extra-role behaviors (Gerstner and Day, 1997). On the other hand, low LMX relationship may put followers at a relative disadvantage in terms of job benefits and career progress (Vecchio, 1997). In low LMX quality relationships, members may have less access to the supervisor, fewer resources, and more restricted information, potentially leading to dissatisfaction in the job, lower organization commitment, and employee turnover (Gerstner and Day, 1997; Maslyn and Uhi-Bien, 2001). In summary, most research on LMX focused on the characteristics of leaders and followers, the interaction of these characteristics, and contextual variable (Liden et al., 1997).

Although research on LMX has investigated differences in LMX relationships and their effects on individuals and organizations, an area that has not received much attention is LMX relationships in a project team. In addition, examination of the leader-member exchange quality in a team and its association with the project leader's competency has been essentially left to theory. Since prior research has ignored this topic, empirically testing the issue is necessary. Previous studies identified demographic and interpersonal influences on leader-member exchange (Larwood and Blackmore, 1978; Green et al., 1996; Varma et al., 1996). As such, leader traits and behavior play an important role in leader-member exchange. In addition, leadership style and leadership ability are also a highly influential factor in leader-member exchange quality (Graen and Cashman, 1975; Graen and Ginsburgh, 1977; Graen and Scandura, 1987; Schriesheim et al., 1999). Originally leader-member exchange was developed to explain the quality of dyadic leader-follower-relationships. This study extends previous studies by addressing the impact of leadership competency on leader-member exchange quality in a research team. Based on the relevant literature, the following hypothesis was postulated and tested:

H2: Leadership competency has a positive effect on LMX quality in a research team.

As indicated in prior research, the leader's behavior alone may not be responsible for the performance of workers, nor for the attainment of organizational goals (McColl-Kennedy and Anderson, 2002). LMX quality also plays an important role in performance outcomes (Graen

et al., 1982; Settoon et al., 1996; Varma and Stroh, 2001). Earlier studies supported the notion that leadership behaviors may contribute to organizational outcomes or team performance. Additionally, LMX quality may play a mediating role in the relationship between leader traits and performance outcomes (Koh et al., 1995; Kraus, 2002). This study extends previous studies by addressing the impact of leadership competency on research project performance. Based on the relevant literature, the following hypotheses were proposed:

H3: Leader-member exchange quality in a research team has a positive effect on research project performance.

H4: Leader-member exchange quality acts as a mediator between leadership competency and research project performance.

A review of the literature suggests that LMX quality as a means to enhance the performance of teams has been supported. As such, projects can be made more successful by improving LMX quality. However, project characteristics were proposed for examination as a possible moderator of the relationship between practice use and project performance (Gelbard and Carmeli, 2009; Müller and Turner, 2007). Prior research also indicated that project characteristic variable is a highly influential factor in project performance (Pheng and Chuan, 2006; Oya and Walter, 1998). While project success can be achieved by improving LMX quality, the above-mentioned studies have suggested that the relationship between practice use and project outcomes should depend on project characteristics. In other words, the prior research has stated that project characteristics may play a moderating role in the relationship between practice use and project success. Based on the previous research, the following research hypothesis was developed:

H5: Project characteristics act as a moderator between LMX quality and research project performance.

Method

Survey instrument and process

A survey instrument was used to measure the project leader's competency, LMX quality, and the performance of projects in the Taiwanese research institutions. The survey was composed of five sections: 1) the project leader's competency, 2) LMX quality in a research team, 3) research project performance, 4) project characteristics, and 5) personal information. These research projects were categorized according to nine data class variables: number of groups, team relationship, team size, owner regulation, project budget, levels of knowledge retention, number of members quit, complexity, and organizational support. These variables are defined as follows (Müller and Turner, 2007; Pheng and Chuan, 2006; Oya and Walter, 1998; Gelbard and Carmeli, 2009): 1) Number of groups - Respondents were asked to identify number of groups participating in the research project. Five optional responses were provided: 2, 3, 4, 5, and >5; 2) Team relationship - Three categories are presented: willing to cooperate, medium, and unwillingness to cooperate; 3) Team size (number of team members) - Six optional responses were provided: <4, 4-6, 7-9, 10-12, 13-15, and >15; 4) Owner regulation - Three optional responses were provided: private owner, government, and other non-profit organization; 5) Project budget - Three cost categories are presented: <$40 thousand, $40-400 thousand, and >$400 thousand; 6) Knowledge retention - Respondents were asked to compare the subject project to other research projects relative to levels of knowledge retention. Three optional responses were provided: high, medium, and low; 7) Number of members quit - Number of members quit within six months after the project began. Four optional responses were provided: 0, 1, 2, and >2; 8) Complexity – Respondents were asked to compare the subject project to other research projects relative to complexity. Three optional responses were provided: high, medium, and low; and 9) Organizational support – Three categories are presented: high, medium, and low.

Data collection and sample

This research employed a mail survey methodology

for data collection. The sample for this study focused on projects in the Taiwanese research institutions. The survey list for the study is Science and Technology Organization Directory (the list of Science and Technology Organizations in Taiwan) provided by Science & Technology Policy Research and Information Center, National Applied Research Laboratories. The targeted respondents were identified as the senior individuals who were a research project team member and familiar with the project leader's competency and research project performance. In order to obtain a truly representative sample, a diverse mix of participation was sought with respect to project type. Additionally, a specified mix of project team size was targeted in order to obtain a representative sample of the industry.

All of the research institutions were contacted via phone or email to identify the person involving in research projects by name and title. Using phone or email is an effective way to identify the persons with adequate background and experience. The investigators then contacted the respondents to confirm their participation in this study. This approach helped the investigators select the right respondents who possess adequate knowledge to properly evaluate the LMX quality in a research team and are capable of answering all of the survey questions. The respondents investigated were asked to identify a recent research project that they were familiar with for assessment.

The survey questionnaire was sent to 400 practitioners of research institutions in Taiwan on January 19, 2011. Reminders were sent by e-mail or phone after survey mailing. Finally, after the initial mailing a second mailing of the survey was made to non-respondents. A reminder e-mail or phone, too, followed the second mailing. Of the 400 questionnaires sent, 245 were returned. The overall response rate was 61.25 percent. Among the returned surveys, three was discarded since it contained missing values. In addition, the responses were examined to ensure that no duplicate project information was collected. Ultimately, 242 survey responses were used in the analysis. Table 1 presents characteristics of sampled projects.

Table 1 Characteristics of sampled projects

Characteristic	Class	Number
Number of groups	2	42
Number of groups	3	58
Number of groups	4	70
Number of groups	5	12
Number of groups	>5	60
Team relationship	Willing to cooperate	66
Team relationship	Medium	148
Team relationship	Unwillingness to cooperate	28
Number of team member	<4	28
Number of team member	4-6	108
Number of team member	7-9	34
Number of team member	10-12	20
Number of team member	13-15	20
Number of team member	>15	32
Owner regulation	Private owner	122
Owner regulation	Government	72
Owner regulation	Other non-profit organization	48
Project budget	<$40 thousand	80
Project budget	$40-400 thousand	18
Project budget	>$400 thousand	30
Project budget	Not available	114
Level of knowledge retention	Low	54
Level of knowledge retention	Medium	132
Level of knowledge retention	High	56
Number of members quit	0	122
Number of members quit	1	32
Number of members quit	2	34
Number of members quit	>2	54
Complexity	Low	42
Complexity	Medium	132
Complexity	High	68
Organizational support	Low	28
Organizational support	Medium	130
Organizational support	High	84

The respondents consisted of project leaders (14.9%), senior specialist (43.8%), project analyst (21.5%), project planner (8.3%), engineer (4.1%), and others (7.4%). With respect to age, 10.7 percent of the respondents are more than 40, 8.3 percent are between 36 and 40, 28.9 percent are between 31 and 35, 44.6 percent are between 26 and 30, and the remaining 7.4 are less than 26. Finally, 55.3 percent of the respondents indicated that they held a master's or Ph.D. degree, while another 43.0 percent held a bachelor's degree. The remaining 1.7 percent held associate's degree.

Measures

The items used to measure leadership competency were based on the questionnaires utilized by Müller and Turner (2010) and Dulewicz and Higgs (2005). On the other hand, the scales developed by Graen et al. (1982) and Liden and Maslyn (1998) were employed to evaluate LMX quality. Finally, questions from Deephouse et al. (1996), Wang et al. (2006), Gelbard and Carmeli (2009), Na et al. (2007), and Barki and Hartwick (2001) were adapted to measure research project performance. Each item was rated on a seven-point scale, where 1 represented strongly disagree and 7 represented strongly agree. The results of reliability analysis for the previous studies are acceptable. For example, the results of reliability analysis for Müller and Turner's (2010) and Dulewicz and Higgs's (2005) studies are acceptable. All 15 leadership dimensions questionnaire (LDQ) scale coefficient reached an acceptable level, being above 0.7 (Nunnally, 1978). Cronbach's alphas for the LMX measures in Liden and Maslyn's (1998) study are 0.89 and 0.91 for student and organization samples respectively. In addition, the αvalues for the project performance construct in Wang et al.'s (2006) study are 0.92 and 0.89 for Taiwan and US samples respectively. Cronbach's alphas in Gelbard and Carmeli's (2009) study are 0.88 and 0.87 for budgetary and time performance and functionality performance respectively. The reliability scores (Cronbach's alphas) for the measures in Na et al.'s (2007) study range from 0.83 to 0.84. These scores represent an acceptable level of internal consistency. Finally, in Barki and Hartwick's (2001) study, Cronbach's alphas are 0.90 and 0.82 for user and information system (IS) staff samples respectively.

Non-responses bias and content validity

Non-response bias was examined using the procedures recommended by Armstrong and Overton (1977). It was assessed by comparing early (those responding to the first mailing) and late (those responding to the second mailing) respondents. Using a t-test, each variable was tested to determine if there is a significant difference in means between early and late respondents at the 5 percent significance level. The results from the t-tests suggest that the early respondents do not significantly differ from the late responses. Accordingly, non-response bias was not considered a problem.

Content validity refers to the extent to which a measure represents all facets of a given concept. The content validity of the survey used in this study was tested through a literature review and interviews with research practitioners. The industry interviews encompassed 12 executives. Each of the professionals has over 20 years of senior research project management experience. Personal information of these executives is presented in Table 2. The refined assessment items were included in the final survey. Finally, copies of a draft survey were sent to several professors to pre-test for the clarity of questions. Their insights were also incorporated into the final version of the survey.

Adequate sample sizes for analysis

The number of "number of groups" classifications was reduced from five to four in order to obtain a sufficiently large sample for analysis. The four categories with a large sample size include: number of groups=2, number of groups=3, number of groups=4, and number of groups>4. In addition, the number of "project budget" classifications was reduced from three to two in order to obtain a sufficiently large sample for analysis. The two categories with a large sample size include: budget<$400 thousand and budget>$400 thousand.

Table 2 Personal information of executives

Research Institution	Position	Education
Industrial Technology Research Institute	Project Manager	Master's Degree
Industrial Technology Research Institute	Project Manager	Master's Degree
Industrial Technology Research Institute	Project Manager	Master's Degree
Chung-Hua Institution for Economic Research	Research Fellow	Master's Degree
Taiwan Institute of Economic Research	Research Fellow	Master's Degree
Institute for Information Industry	Senior Industrial Analyst	Master's Degree
Institute for Information Industry	Industrial Analyst	Ph.D. Degree
Institute for Information Industry	Research Fellow	Master's Degree
Institute for Information Industry	Industrial Analyst	Master's Degree
Institute for Information Industry	Industrial Analyst	Master's Degree
Institute for Information Industry	Project Specialist	Master's Degree
Institute for Information Industry	Project Specialist	Bachelor's Degree

Results and analysis

Construct validity

In order to test the construct validity of the variables in the study, an exploratory factor analysis was conducted using principal components. Factor analysis with Varimax rotation was used to decide the grouping of leadership competency construct. Eigenvalue greater than one was used to determine the number of factors in data set. Only variables with a factor loading greater than 0.5 were extracted (Hair et al., 1995). The 12 items of leadership competency construct are classified into three factors. The three constructs categorized are intellectual competency, managerial competency, and emotional and social competency. The analysis shows factor loadings ranging from 0.753 to 0.918. In addition, the 14 items of LMX quality are classified into three factors. They are trust and support, communication quality, and work affections. All of the factor loadings range from 0.597 to 0.928. Finally, the 16 items of project performance construct are classified into four factors. The four constructs categorized are schedule performance, quality performance, overall benefits, and innovation performance. The analysis shows factor loadings ranging from 0.609 to 0.845. Cronbach's coefficient (α) was computed to test the reliability and internal consistency of the responses. Reliability was assessed for leadership competency at 0.960, LMX quality at 0.968, and project performance at 0.955. The values of 0.5 to 0.7 are considered acceptable and those above 0.7 are considered meritorious (Nunnally, 1978). The α values for the constructs are above 0.9, indicating a high degree of internal consistency in the responses.

This study utilized the item-to-total correlations to delete scale items that do not correlate well with the rest of the items in the scale. The most common guidepost is the deletion of items with a corrected item-to-total correlation of less than 0.50 (Bearden et al., 1993; Lankford & Howard, 1994; Zaichkowsky, 1985). Because all of the items had an item-to-total correlation of more than 0.50, no items were deleted.

Measurement model

Confirmatory factor analysis (CFA) was conducted on each scale to examine the validity of the measures. Multiple fit criteria are used to assess the overall fit of the model. In the proposed model, leadership competency, LMX quality, and project performance are a second order

construct. Leadership competency and LMX quality are a three-dimensional construct. In addition, project performance is a four-dimensional construct. In other words, the latent variable (project performance) is represented by four latent variables. The second order approach was used to maximize the interpretability of both the measurement and the structural models (Hair et al., 2006). The data were analyzed using the AMOS/SPSS statistical package. The model refinement was performed to improve the fit to its recommended levels as shown in Table 3. Based on several trials resulting in elimination of some of the items, all of the scales met the recommended levels. Furthermore, the composite reliability for all constructs was above the 0.7 level suggested by Hair et al. (2006), indicating adequate reliability for each construct. Thus, the results provide evidence that the scales are reliable (see Table 3).

Table 3 Properties of the main constructs

Metric	Composite reliability	GFI (>0.90 desired)	AGFI (>0.80 desired)	CFI (>0.90 desired)	NFI (>0.90 desired)	RMSEA (<0.08 desired)
Leadership competency	0.956	0.911	0.847	0.969	0.943	0.077
LMX quality	0.957	0.908	0.852	0.979	0.950	0.076
Project performance	0.940	0.902	0.837	0.969	0.931	0.077

All of the factor loadings were statistically significant at the five percent level and exceeded the arbitrary 0.5 standard (Fornell and Larcker, 1981), as shown in Table 4. In addition, all constructs have an average variance extracted (AVE) greater than 0.5. Thus, these constructs demonstrate adequate convergent validity. Discriminant validity assesses whether the constructs are measuring different concepts. The discriminant validity of each constructs was assessed. First, a procedure recommended by Bagozzi et al. (1991) was adopted. Each set of construct measures was paired with another set of measures. Each model was run twice, once by constraining the correlations between the two constructs to unity and once by freeing this parameter (Li and Cavusgil, 2000), then a chi-square difference test was conducted. The results show that the chi-square values are significantly lower for the unstrained models at the five percent level, which suggests that the constructs exhibit discriminant validity.

Table 4 Results of CFA

Construct and item	Standardized factor loading
Leadership competency – Intellectual competency (IC)	--
Critical analysis and judgment	0.941
Strategic perspective	0.805
Vision and imagination	0.730
Leadership competency – Managerial competency (MC)	--
Developing	0.729
Resource management	0.910
Engaging communication	0.878

Table 4 Results of CFA (continued)

Construct and item	Standardized factor loading
Leadership competency – Emotional and social competency (EC)	--
Self-awareness	0.708
Intuitiveness	0.918
Motivation	0.792
Conscientiousness	0.830
LMX quality – Trust and support (TS)	--
The manager would come to a member's defense if he/she was attacked by others.	0.843
When the team members communicated with the manager, they could obtain feedback from him/her.	0.892
The manager would defend a member to others in the team if he/she made an honest mistake.	0.912
The manager would use his/her power to help the team members solve problems in their work.	0.929
The manager recognized the team members' potential.	0.702
LMX quality – Communication quality (CQ)	--
The team members could obtain adequate information from the manager to do their work.	0.927
The team members could obtain updated information from the manager when they needed help.	0.941
The manager used verbal communication effectively to tell the team members what to do.	0.530
LMX quality – Work affections (WA)	--
The manager was a lot of fun to work with.	0.973
The manager was the kind of person one would like to have as a friend.	0.826
The team members did work for the manager that goes beyond what is specified in the job description.	0.709
Project performance – Schedule performance (SP)	--
All project assignments were proceeding as planned.	0.712
The research project was completed ahead of schedule.	0.846
Each phase of the research project was completed before deadline.	0.828
Project performance - Quality performance (QP)	--
The research project's deliverables met owner expectations.	0.905
The research project's deliverables complied with the contractual requirements.	0.775
The research project ran smoothly.	0.745
Project performance – Overall benefits (OB)	--
The research project outcomes could be applied to other projects.	0.862
The research project achieved a successful outcome.	0.902
The research project outcomes promoted the organization's reputation.	0.862
Project performance – Innovation performance (IP)	--
New professional knowledge and techniques were generated on the project.	0.809
New methods and inventions were obtained on the research project.	0.875
Many useful ideas were produced on the research project.	0.923

Structural model

Figure 1 presents results of the overall model fit in the structural model. A feasible model was selected based on the recommended Goodness-Of-Fit (GOF) measures. The model that satisfies both theoretical expectations and GOF was selected for SEM analysis. The chi-square statistic for the full measurement model was nonsignificant ($p = 0.071 > 0.05$), indicating a good fit between the data and the proposed model. The normed fit index (NFI), comparative fit index (CFI), and goodness of fit index (GFI), with values of 0.965, 0.990, and 0.936 respectively, were all above the recommended acceptable 0.90 level (Chau, 1997). In addition, the adjusted goodness of fit index (AGFI = 0.889) was above the 0.80 minimum recommended value. Finally, the root mean square error of approximation (RMSEA) is 0.057, which is below the cut-off level of 0.08 recommended by Browne and Cudeck (1993). The overall fit measures of the structural model indicate adequate fit of the model to the data.

The standardized parameter estimates for the proposed model is presented in Figure 1. Concerning the hypothesized relationships, the coefficient on the path from leadership competency to project performance is -0.11 ($p>0.05$). Thus, the positive relationship suggests that H1 is not supported. The path coefficient from leadership competency to LMX quality is 0.91 ($p<0.001$), which supports H2. Finally, the direct impact from LMX quality to project performance is significant (coefficient=0.59, $p<0.05$), and therefore H3 is supported.

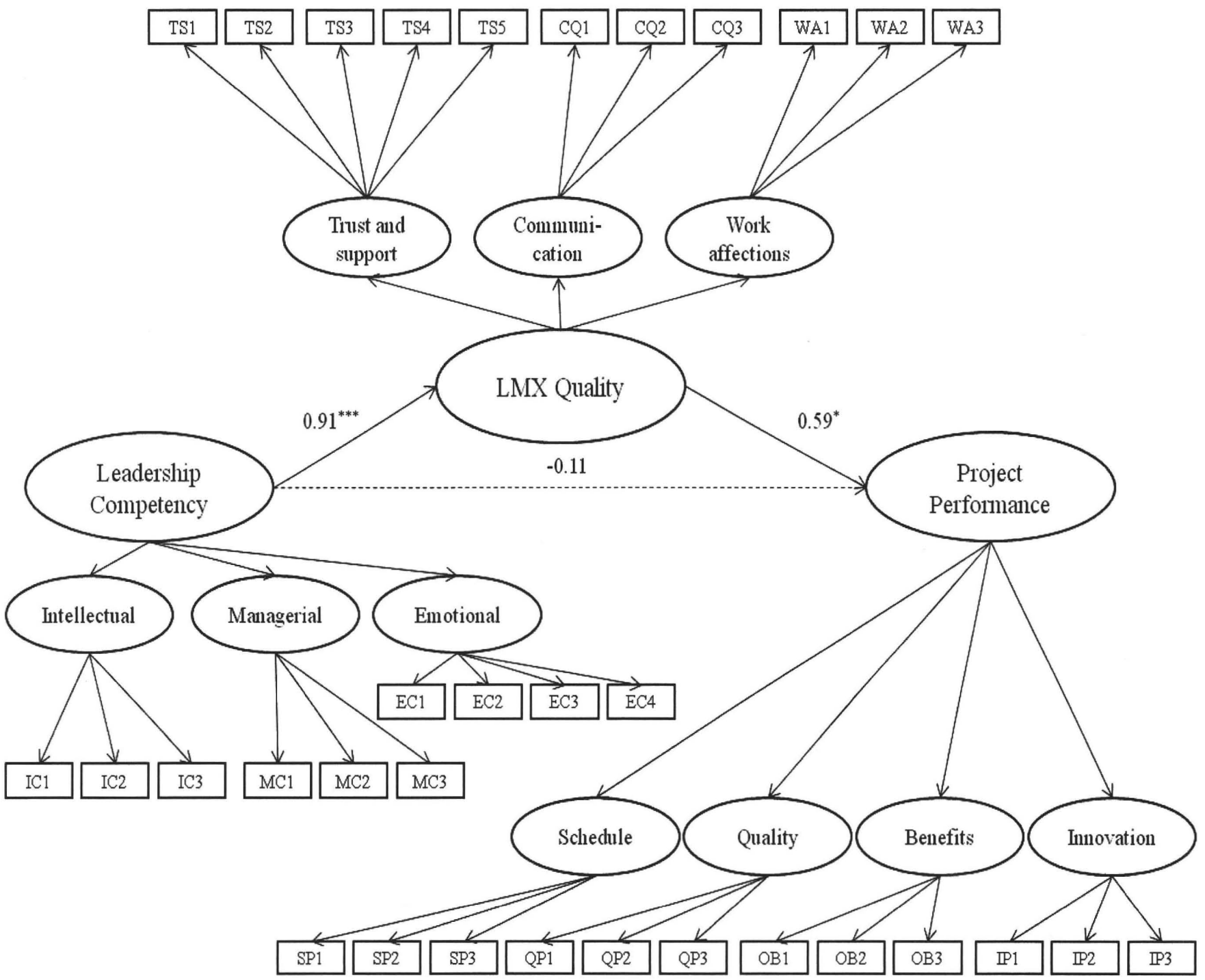

Figure 1 Research model estimation results

Mediating role of LMX quality

To test the mediating role of LMX quality, four additional analyses were conducted (Frazier et al., 2004). The results are presented in Table 5. First (Model 1), a direct positive relationship between leadership competency (LC) and project performance (PP) was established with a coefficient value of 0.43 ($p<0.001$). Second (Model 2), the direct link between leadership competency (LC) and LMX quality (LMX) was found with a coefficient value of 0.91 ($p<0.001$). Third (Model 3), the direct link between LMX quality (LMX) and project performance (PP) was also exhibited (coefficient=0.48 and $p<0.001$). Finally (Model 4), the links between leadership competency and LMX quality, between LMX quality and project performance, and between leadership competency and project performance were simultaneously considered. The significant relationship between leadership competency and project performance was not significant after including LMX quality, that is, the existence of complete mediation by LMX quality in the effect of leadership competency on project performance, which supports H4.

Table 5 Mediating effect of LMX quality

Structural path	Model 1	Model 2	Model 3	Model 4
LC→PP	0.43***	--	--	-0.11
LC→LMX	--	0.91***	--	0.91***
LMX→PP	--	--	0.48***	0.59*

* significant at the 0.05 level;
*** significant at the 0.001 level

Moderating role of project characteristics

Cluster analysis was used in an exploratory mode to develop an objective classification of projects. In order to identify homogeneous projects clusters with the same levels of LMX quality, a K-means cluster analysis was performed on the basis of the three dimensions of LMX quality. To validate the results of the cluster analysis, a discriminant analysis was also conducted. The cluster analysis has identified two clusters for LMX quality, with the cluster mean values of discriminating variables given in Table 6. The discriminant analysis classified 99.2 percent of the projects as the cluster analysis did, indicating extremely good differentiation and a correct classification. These results further suggest that the two clusters are distinctive. In addition, the independent-samples *t* tests shown in Table 6 confirm that the variables of LMX quality do significantly differentiate across the two clusters. The first cluster was labeled projects with high levels of LMX quality. The second cluster consists of projects with low levels of LMX quality.

Table 6 Discriminating variables of LMX quality

Variable	Projects with high levels of LMX quality		Projects with low levels of LMX quality		t-statistic	*p*-value
	Number	Mean	Number	Mean		
Trust and support	160	5.22	82	2.58	16.196	0.000
Communication quality	160	5.42	82	3.22	13.476	0.000
Work affections	160	5.30	82	2.76	12.767	0.000

The study revealed two segments for the three LMX quality dimensions. In addition, the subject projects were also categorized according to nine project characteristics variables. Thus, for example, to test for the moderating influence of team relationship on the association between LMX quality and project performance, 2 (LMX quality) x 3 (team relationship) analysis of variance (ANOVA) was performed. The two-way ANOVA was utilized to determine the joint effect of LMX quality and team relationship on project performance. Table 7 summarizes

the results of the ANOVAs. The results suggest a significant interaction of LMX quality (LMX) and team relationship (TR) for project performance, $F = 5.076$, $p < 0.01$. The findings indicate that team relationship has a moderating effect on the relationship between LMX quality and project performance. There was also a significant interaction of LMX quality (LMX) and owner regulation (OR) for project performance, $F = 3.497$, $p < 0.05$. Additionally, the results suggest that project budget has a moderating effect on the relationship between LMX quality and project performance. Thus, the results support H5.

Table 7 Results of ANOVAs

Variable	Project performance		
	Team relationship (TR)	Owner regulation (OR)	Project budget (PB)
LMX quality (LMX)	5.076**	3.497*	4.062*

* significant at the 0.05 level; ** significant at the 0.01 level

Since the interaction term was significant, the form of interaction was graphically represented to evaluate the direction of the differences within each of the conditions. Figure 2(a) shows the relationship between LMX quality and project performance at different levels of team relationship. The findings indicate that projects with worse team relationship may achieve higher levels of project performance when they experienced high levels of LMX quality than those with better team relationship.

Figure 2(b) and (c) graphically presents the relationship between LMX quality and project performance for owner regulation and project budget. It is clear that government projects were more likely to be successful when they experienced a high level of LMX quality than private projects and other non-profit projects. Additionally, the analyses suggest that large projects (budget>$400 thousand) were more likely to be successful when they experienced a high level of LMX quality than small projects (budget<$400 thousand).

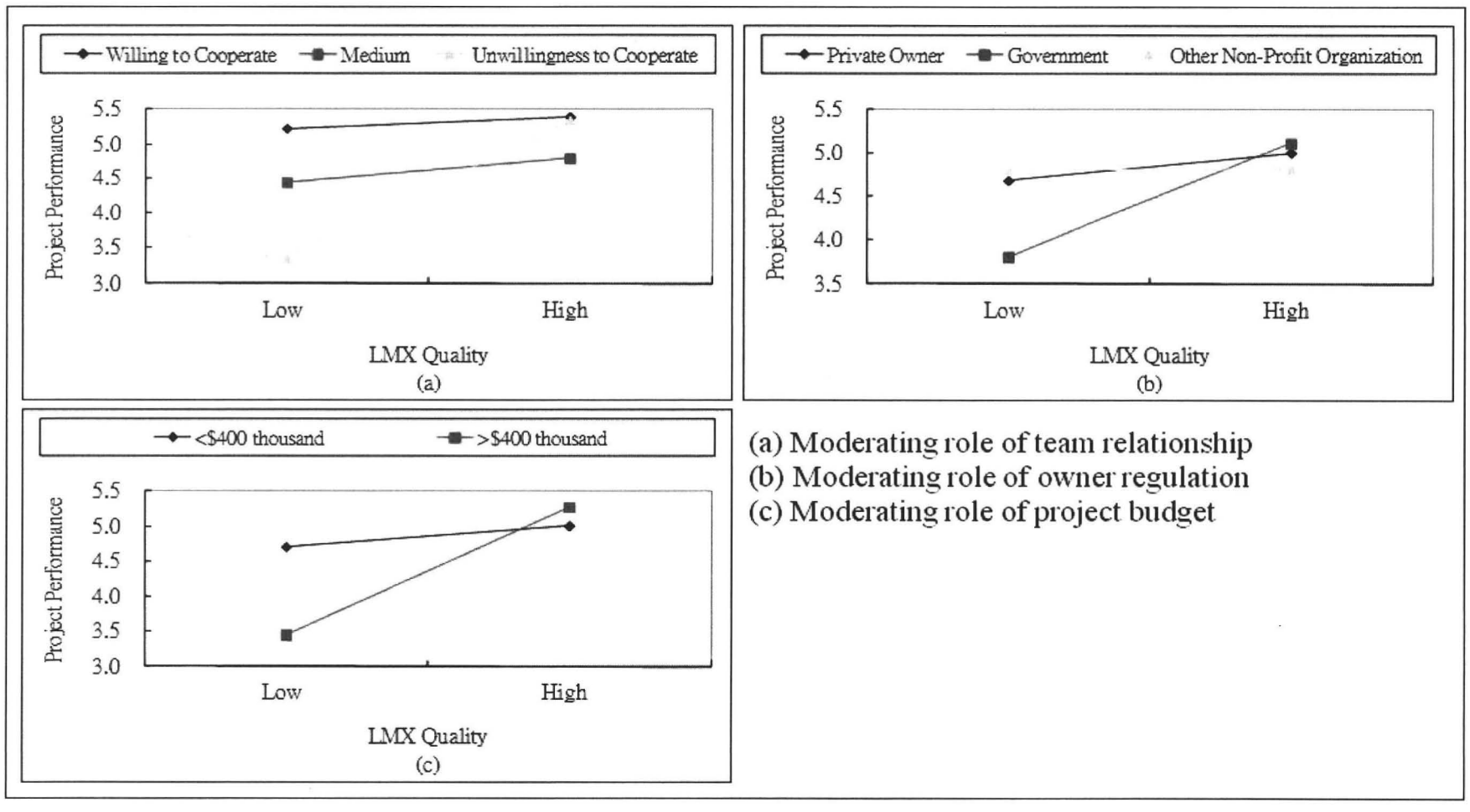

Figure 2 Moderating role of team relationship, team relationship, and project budget

Discussion and conclusions

Key findings and research implications

This research is the first to provide empirical evidence that supports the expectation of gaining significant benefits from improving the research project leader's competency. This study adds to the literature in three valuable ways. First, it validated a framework for assessing the relationships among leadership competency, LMX quality, and research project performance. Prior research (Fiol et al., 1999; Lowe et al., 1996; Higgs and Dulewicz, 2004) examined the importance of developing transactional and transformational leadership to improve project success and stakeholder satisfaction, but few previous studies have empirically analyzed the effects of leadership competency on project performance. This research reveals the importance of developing the leader's abilities to increase research quality and reduce interpersonal conflicts in a research team. The findings indicate that leadership competency in terms of intellectual, managerial, emotional, and social competency is associated with LMX quality in a research team. These results are in line with previous studies (Dulewicz and Higgs, 2005; Hobday et al., 2004; Müller and Turner, 2010; Perrons, 2009), which have shown that leadership competency may act as a catalyst for trust, communication, and shared values and vision. The research findings imply that leadership competency may enhance the relationship between a team leader and team members, while it may also helps improve the associations among team members by gaining greater interdependency. Based on investigations of the hypothesized relationships, the results also suggest that LMX quality is a key factor influencing research project performance. The results are in line with previous findings (Kotlarsky and Oshri, 2005; Solomom, 2001) in that cooperation and communication between a project leader and team members are crucial for project performance.

Second, it offers important results on the identification of mediating roles of LMX quality in the relationship between leadership competency and research project performance. Prior research indicated that leadership behavior should encourage effective communication and cooperation between a leader and followers (Graen and Scandura, 1987; Schriesheim et al., 1999). Additionally, LMX quality may be positively related to performance outcomes (Settoon et al., 1996; Varma and Stroh, 2001). However, the previous studies did not provide insights into the mediating roles of LMX quality in the relationships between leadership competency and project performance. The results of this research further prove that LMX quality fully mediates the effects of leadership competency on research project performance in terms of schedule, quality, and innovation performance as well as overall benefits. In other words, leadership competency may influence the performance of research projects via leader-follower relationship. This result confirms the suggestion in literature that mediators exist between leadership behavior and final examined outcomes.

Third, this research investigated the relationships between leader-member relationship and research project performance for different types of projects. Project characteristics in terms of number of groups, team relationship, team size, owner regulation, project budget, levels of knowledge retention, number of members quit, complexity, and organizational support serve as a moderator, and the results show that the positive association between leadership competency and project performance depends on team relationship, owner regulation, and project budget. The relationship is stronger for government projects, large projects, and projects with worse team relationship than it is for the remaining types of projects. Specifically, the findings indicate that government projects may achieve higher levels of project performance when they experienced high levels of leader-follower relationship than private projects and other non-profit projects. It is also clear that projects with more budget may achieve higher levels of project performance when they experienced high levels of leader-member relationship than projects with less budget. The results also suggest that projects with worse team relationship

were more likely to be successful when they experienced a high level of leader-member exchange quality than projects with better team relationship. Since few previous studies have empirically analyzed the moderating effect of project characteristics on the relationship between LMX quality and project performance, this study attempts to fill this gap in the literature.

Managerial implications

The research provides empirical evidence that supports the expectation of gaining significant benefits from improving leadership competency. This paper reports on the findings of empirical research and provides recommendations for improving project performance in research institutions. Findings from this study are helpful to research project leaders in deciding whether to develop certain competencies. Research project leaders can use the results to modify their current leadership behavior. This study has several implications for practitioners. The research results show that the project leader's intellectual, managerial, emotional, and social competency may improve leader-member relationship in a research team. From the perspective the intellectual competence, research project leaders should develop critical analysis and judgment. They need to gather relevant information from a wide range of sources, probe the facts, and identify advantages and disadvantages. In addition, they must have a clear vision of the future and forecast the impact of changes on implementation issues and business realities. Research project leaders should also be aware of the wider issues and broader implications. They need to identify strength, weakness, opportunities, and threats of a research project. For managerial competences, research project leaders should encourage team members to take on ever more-demanding tasks, roles, and accountabilities. They need to develop team members' competencies and invest time and effort in coaching them. On the other hand, research project leaders must organize resources and use them efficiently and effectively. Establishing clear objectives and converting long term goals into action plans are also an important issue in resource management. More importantly, they must engage communication. Research project leaders should win team members' support through communication tailored for each audience. They should be approachable and accessible. Finally, the research project leader's emotional and social competency is critical to LMX quality. Research project leaders should be aware of their own feelings and able to recognize and control them. Having drive and energy to achieve clear results and make an impact is also important. They need to balances short- and long-term goals with a capability to pursue demanding goals in the face of rejection or questioning. For developing intuitiveness competency, research project leaders must drive their implementation in the face of incomplete or ambiguous information by using both rational and emotional perceptions. In addition, they should display clear commitment to a course of action in the face of challenge and encourage team members to support the chosen direction.

In agreement with previous studies, the research results show that leader-member relationship has a significant positive impact on research project performance in terms of schedule performance, quality performance, overall benefits, and innovation performance. The results of this research further prove that leader-member exchange quality fully mediate the effects of leadership competency on research project performance. In other words, the project leader's competency may influence research project performance via improving leader-member relationship. Project leaders must pay attention to leader-follower relationship in a research team. In order to enhance the trust and support of the team members, they should come to a member's defense if he/she is attacked by others. When the team members communicate with the leader, it is important to provide them with feedback. The leader should also defend a member to others in the team if he or she makes an honest mistake. Using his/her power to help the team members solve problems in their work is also an important issue for improving the trust and support of the team members. Research project leaders must also recognize the team members' potential. In addition, this paper also has certain specific implications with respect to improving

communication quality. Research project leaders should provide team members with adequate information to do their work. When the team members need help, the research project leaders should offer updated information. They must use verbal communication effectively to tell the team members what to do. Prior research indicated that team communication is a key factor influencing project performance (Jewell and Reitz, 1981; Schwarz, 1994; Trist, 1981). The research project leaders should also prompt different departments to cooperate in research and development and exchange information so that each group is aware of the needs and resources of the others. One approach to promote the interaction between a leader and team members as well as the different groups is to conduct shared meetings, which facilitate information sharing among the team members. Additionally, offering the team members with education is also an important method to improve cross-functional cooperation. Project leaders should deal properly with the conflicts between team members and encourage communication to eliminate disagreement. They must promote trust between different departments and educate team members to consider different perspectives. Work affection is also an important issue for enhancing leader-follower relationship. Research project leaders should become the kind of person a team member would like to have as a friend. If the research project leader was a lot of fun to work with, the team members may do work for the leader that goes beyond what is specified in the job description.

Finally, the results show that research project performance can be improved when the project team seeks to enhance LMX quality. However, the findings indicate that government projects were more likely to be successful when they experienced a high level of LMX quality than private projects and other non-profit projects. Project leaders, particularly for government projects, should attempt to improve leader-member exchange quality and encourage team members to share their knowledge and enhance team competency. The results also suggest that research projects with worse team relationship (i.e., unwilling to cooperate) may achieve higher levels of project performance when they experienced high levels of LMX quality than those with better team relationship (i.e., willing to cooperate and medium). Additionally, the findings indicate that large projects (budget>$400 thousand) were more likely to be successful when they experienced a high level of LMX quality than small projects (budget<$400 thousand). Knowledge sharing and integration is not an easy task on projects with worse team relationship. On the other hand, large projects may involve more complicated tasks. Leader-member relationship is important to incorporate all the key knowledge and integrate the complicated tasks which are influential on project success. In addition, improving leader-follower relationship may produce associations that create bridges between entities within a research project. It is also a key to team communication and an essential element for integrating knowledge from different sources. These may be the reasons why LMX quality may be more closely associated with project performance for projects with worse team relationship and projects with more budget.

Limitations and directions for future research

While this study offers important insights into research leaders, there are some limitations. A total of 242 research projects were investigated in the study. Thus, it is not an efficient way to collect the necessary data from all team members participating in a research project. The targeted respondents were identified as the senior individuals in research institutions. This study attempted to select the right respondents who possess adequate knowledge and are capable of answering all of the survey questions. It employed a single perspective to analyze the leader-member relationship. Although the experienced member plays an important role in a research project team, he or she is not the only stakeholder involved in the work process. Future research may measure LMX quality from the viewpoints of several team members. It may focus on the joint consideration of the various perspectives. Interpersonal conflict among the team members should also be investigated in future research.

However, this study was designed to eliminate mono-source bias. The mono-source bias was not a threat in this study for the following reasons: 1) this study attempted to

select the right respondents who possess adequate knowledge and are capable of answering all of the survey questions, 2) third-party reports have been shown to be moderately consistent with self-reported measure (Van Dyne and LePine, 1998), and 3) the confirmatory factor analysis showed that the one-factor measurement model was a poor fit to the data (Podsakoff and Organ, 1986). In addition, because all the research data are self-reported and collected through the same questionnaire during the same period of time, a common method variance (CMV) may result in a systematic measurement error and may further bias the estimates of the true relationship between the theoretical constructs (Podsakoff and Organ, 1986). This study used the Harman's one-factor test to investigate the potential problem of common method variance, suggesting that common method bias was not considered a serious threat to this study.

Another limitation is associated with project team size. Most research projects in the sample have fewer than six team members. The smaller size of project teams may affect comparisons of the research results with those from other countries. On the other hand, qualitative investigation should be conducted to understand more reasons why team relationship moderates the proposed direct relationship. The sample for this study focused on projects in research institutions. Consideration should be given to investigate the projects in other industries. This could also lead to greater insights into the importance of developing leadership competency. In addition, competency prioritization for research projects also needs to be considered in further research. Finally, it would be worthwhile to examine the factors which may influence leadership competency and situation parameters in relation to leadership practice.

References

Ahearn, K. K., G. R. Ferris, W. A. Hochwarter, C. Douglas, and A. P. Ammeter, 2004. Leader political skill and team performance, ***Journal of Management***, 30, 309-327.

Armstrong, J. S., and R. S. Overton, 1977. Estimating nonresponse bias in mail surveys, ***Journal of Marketing Research***, 14(3), 396-402.

Artto, K., J. Kujala, P. Dietrich, and M. Martinsuo, 2007. What is project strategy?, ***International Journal of Project Management***, 26(1), 4-12.

Avolio, B., W. Gardner, F. Walumbwa, and D. May, 2004. Unlocking the mask: a look at the process by which authentic leaders impact follower attitudes and behaviors, ***Leadership Quarterly***, 15(6), 801-823.

Bagozzi, R. P., Y. Yi, and L. W. Phillips, 1991. Assessing construct validity in organizational research, ***Administrative Science Quarterly***, 36(3), 421-458.

Barki, H., and J. Hartwick, 2001. Interpersonal conflict and its management in information system development, ***MIS Quarterly***, 25(2), 195-228.

Barling, J., T. Weber, and E. K. Kelloway, 1996. Effects of transformational leadership training and attitudinal and financial outcomes: a field experiment, ***Journal of Applied Psychology***, 81(6), 827-832.

Bass, B. M., 1990. From transactional to transformational leadership: learning to share the vision, ***Organizational Dynamics***, 18(3), 19-31.

Bearden, W. O., R. G. Netemeyer, and M. F. Mobley, 1993. ***Handbook of Marketing Scales: Multi-item Measures for Marketing and Consumer Behavior Research***, Newbury Park, California: Sage Publications.

Berson, Y., B. Shamir, B. J. Avolio, and M. Popper, 2001. The relationship between vision strength, leadership style and context, ***The Leadership Quarterly***, 12, 53-73.

Blake, R. R., and S. J. Mouton, 1978. ***The Managerial Grid***, Houston, Texas: Gulf.

Boorom, R., 2009. ***Spiritual Leadership: A Study of the Relationship between Spiritual Leadership Theory and Transformational Leadership***, Virginia Beach, Virginia: Regent University.

Browne, M. W., and R. Cudeck, 1993. ***Alternative Ways of Assessing Model Fit***, Newbury Park, California: Sage Publications.

Bryman, A., 1992. ***Charisma and Leadership in***

Organizations, London: Sage Publications.

Campbell, D. J., W. Bommer, and E. Yeo, 1993. Perceptions of appropriate leadership style: participation versus consultation across two cultures, ***Asia Pacific Journal of Management***, 10(1), 1-19.

Cashman, J., F. Dansereau, G. Graen, and W. J. Haga, 1976. Organizational understructure and leadership: a longitudinal investigation of the managerial rolemaking process, ***Organizational Behavior and Human Performance***, 15, 278-296.

Chau, P., 1997. Re-examining a model for evaluating information center success using a structural equation modelling approach, ***Decision Sciences***, 28(2), 309-334.

Cooper, K. C., 2000. ***Effective Competency Modeling and Reporting***, New York: AMACOM.

Dansereau, F. Jr., G. Graen, and W. J. Haga, 1975. A vertical dyad linkage approach to leadership within formal organizations: a longitudinal investigation of the role-making process, ***Organizational Behavior and Human Performance***, 13, 46-78.

Davis, K., 1972. ***Human Relations at Work: The Dynamics of Organization Behaviour***, New York: McGraw-Hill.

Deephouse, C., T. Mukhopadhyay, D. R. Goldenson, and M. I. Kellner, 1996. Software processes and project performance, ***Journal of Management Information Systems***, 12(3), 187-205.

Delamare Le Deist, F., and J. Winterton, 2005. What is competence?, ***Human Resource Development International***, 8(1), 17-36.

DuBrin, A. J., 2004. ***Leadership Research Findings, Practice, and Skills***, 4th ed., Indianapolis: Houghton Mifflin Company.

Dulewicz, V., and M. Higgs, 2005. Assessing leadership styles and organisational context, ***Journal of Managerial Psychology***, 20(2), 105-123.

Elenkov, D. S., 2002. Effects of leadership on organizational performance in Russian companies, ***Journal of Business Research***, 55, 467- 480.

Emiliani, M. L., 2003. Linking leaders' beliefs to their behaviors and competencies, ***Management Decision***, 41, 9, 893-910.

Fiedler, F.E., 1967. ***A Theory of Leadership Effectiveness***, New York: McGraw-Hill.

Fiedler, F.E., 1974. The contingency model-new directions for leadership utilization, ***Journal of Contemporary Business***, 3(4), 65-79.

Fiol, C. M., D. Harris, and R. J. House, 1999. Charismatic leadership: strategies for effecting social change, ***Leadership Quarterly***, 10(3), 449-482.

Fornell, C., D. F. Larcker, 1981. Evaluating structural equation models with unobservable variables and measurement error, ***Journal of Marketing Research***, 18(1), 39-50.

Frazier, P. A., K. E. Barron, and A. P. Tix, 2004. Testing moderator and mediator effects in counseling psychology research, ***Journal of Counseling Psychology***, 51, 115-134.

Fry, L. W., 2003. Toward a theory of spiritual leadership, ***The Leadership Quarterly***, 14(6), 693-727.

Fu, P. P., and A. S. Tsui, 2003. Utilizing printed media to understand desired leadership attributes in the People's Republic of China, ***Asia Pacific Journal of Management***, 20(4), 423-446.

Gelbard, R., and A. Carmeli, 2009. The interactive effect of team dynamics and organizational support on ICT project success, ***International Journal of Project Management***, 27(5), 464-470.

Gerstner, C. R., and D. V. Day, 1997. Meta-analytic review of leader–member exchange theory: correlates and construct ideas, ***Journal of Applied Psychology***, 82,827-844.

Goertzen, B. J., and S. M. Fritz, 2004. Does sex of dyad members really matter? , A review of leader-member exchange. ***Journal of Leadership Education***, 3(2), 3-18.

Goleman, D., 1995. ***Emotional Intelligence***, New York: Bantam Books.

Goleman, D., 2004. What makes a leader? , ***Harvard Business Review***, 82(1), 82-91.

Graen, G. B., and J. Cashman, 1975. A Role-Making Model of Leadership in Formal Organizations: A Development Approach, in J. G. Hunt and L. L.

Larson (Eds.), ***Leadership Frontiers***, Ohio: Kent State University Press.

Graen, G. B., and S. Ginsburgh, 1977. Job resignation as a function of role orientation and leader acceptance: a longitudinal investigation of organizational assimilation, ***Organizational Behavior and Human Performance***, 19, 1-17.

Graen, G. B., M. A. Novak, and P. Sommerkamp, 1982. The effect of leader-member exchange and job design on productivity and satisfaction: testing a usual attachment model, ***Organizational Behavior and Human Performance***, 30, 109-131.

Graen, G., J. B. Orris, and T. W. Johnson, 1973. Role assimilation processes in a complex organization, ***Journal of Vocational Behavior***, 3, 395-420.

Graen, G. B., and T. A. Scandura, 1987. Toward a psychology of dyadic organizing, ***Research in Organizational Behavior***, 9, 175-208.

Graen, G. B., and M. Uhl-Bien, 1991. The transformation of professionals into self-managing and partially self-designing contributors: toward a theory of leadership-making, ***Journal of Management Systems***, 3, 25-39.

Graen, G. B., and M. Uhl-Bien, 1995. Relationship-based approach to leadership: development of leader-member exchanges (LMX) theory of leadership over 25 years: applying a multi-level multi-domain perspective, ***Leadership Quarterly***, 6, 219-247.

Green, P. C., 1999. ***Building Robust Competencies***, San Francisco, California: Jossey-Bass.

Green, S. G., S. E. Anderson, and S. L. Shivers, 1996. Demographic and organizational influences on leader-member exchange and related work attitudes, ***Organizational Behavior and Human Decision Processes***, 66, 203-214.

Hair, J. F., R. E. Anderson, R. L. Tatham, and W. C. Black, 1995. ***Multivariate Data Analysis with Reading***, 4th ed., Englewood Cliffs, New Jersey: Prentice-Hall.

Hair J. F., W. C. Black, B. J. Babin, R. E. Anderson, and R. L. Tatham, 2006. ***Multivariate Data Analysis***, 6th ed., Upper Saddle River, New Jersey: Prentice-Hall.

Hersey, P., and K. H. Blanchard, 1988. ***Management of Organizational Behavior***, Englewood Cliffs, New Jersey: Prentice Hall.

Hobday, M., H. Rush, and J. Bessant, 2004. Approaching the innovation frontier in Korea: the transition phase to leadership, ***Research Policy***, 33(10), 1433-1457.

House, R. J., and B. Shamir, 1993. Toward the Integration of Transformational, Charismatic, and Visionary Theories, in M. M. Chemers and R. Ayman (Eds.), ***Leadership Theory and Research: Perspectives and Directions***, San Diego, California: Academic Press, pp. 81-107.

Howell, J. M., and P. J. Frost, 1989. A laboratory study of charismatic leadership, ***Organizational Behavior and Human Decision Processes***, 43(2), 243-269.

Huang, X., K. Shi, Z. Zhang, and Y. L. Cheung, 2006. The impact of participative leadership behavior on psychological empowerment and organizational commitment in Chinese state-owned enterprises: the moderating role of organizational tenure, ***Asia Pacific Journal of Management***, 23(3), 345-367.

Huemann, M., J. R. Turner, and A. E. Keegan, 2004. Human resource management in the project-oriented company, in J. Pinto and P. W. G. Morris (Eds.), ***The Wiley Guide to Managing Projects***, New York: Wiley.

Humphreys, J., and W. Einstein, 2003. Nothing new under the sun: transformational leadership from a historical perspective, ***Management Decision***, 41(1), 85-95.

Hyväri, I., 2006. Project management effectiveness in project-oriented business organizations, ***International Journal of Project Management***, 24(3), 216-225.

Ismail, K., and D. L. Ford, 2010. Organizational leadership in Central Asia and the Caucasus: research considerations and directions, ***Asia Pacific Journal of Management***, 27(2), 321-340.

Ivancevich, J. M., A. D. Szilagyi, and M. J. Wallace, 1977. ***Organizational Behavior and Performance***, California: Goodyear Publishing.

Jewell, L. N., and H. J. Reitz, 1981. ***Group Effectiveness in Organizations***, Illinois: Scott Foresman and Company.

Keegan, A. E., and J. R. Turner, 2003. Managing human resources in the project-based organization, in J. R. Turner (Ed.), ***People in Project Management***, Aldershot: Gower.

Kirkpatrick, S. A., and J. A. Locke, 1991. Leadership: Do traits matter?, ***Academy of Management Executive***, 5(2), 48-60.

Klenke, K., 2007. Authentic leadership: a self, leader, and spiritual identity perspective, ***International Journal of Leadership Studies***, 3(1), 68-97.

Koh, W. L., M. Richard, and J. R. Terborg, 1995. The effects of transformational leadership on teacher attitudes and student performance in Singapore, ***Journal of Organizational Behavior***, 16, 319-334.

Koontz, H., and C. Weihrich, 1990. ***Essentials of Management***, 5th ed., New York: McGraw Hill.

Kotlarsky, J., and I. Oshri, 2005. Social ties, knowledge sharing and successful collaboration in globally distributed system development projects, ***European Journal of Informational Systems***, 14(1), 37-48.

Kraus, E., 2002. ***Personality and Job Performance: The Mediating Roles of Leader-Member Exchange Quality and Action Control,*** Miami, Florida: Florida International University.

Lankford, S. V., and D. R. Howard, 1994. Developing a tourism impact scale, ***Annals of Tourism Research***, 17(4), 121–139.

Larwood, L., and J. Blackmore, 1978. Sex discrimination in managerial selection: testing predictions of the vertical dyad linkage model, ***Sex Roles***, 4(3), 359-367.

Li, T., and T. Cavusgil, 2000. Decomposing the effects of market knowledge competence in new product export, ***European Journal of Marketing***, 34(1), 57-80.

Liden, R. C., and J. M. Maslyn, 1998. Multidimensionality of leader-member exchange: an empirical assessment through scale redevelopment, ***Journal of Management***, 24, 43-72.

Liden, R. C., R. T. Sparrowe, and S. J. Wayne, 1997. Leader–Member Exchange Theory: The Past and Potential for the Future, in G. R. Ferris and K. M. Rowland (Eds.), ***Research in Personnel and Human Resources Management***, Greenwich Connecticut: JAI Press, pp. 47-119.

Lowe, K. B., G. K. Kroek, and N. Sivasubramaniam, 1996. Effectiveness correlates of transformational and transactional leadership: a meta-analytic review of the MLQ literature, ***Leadership Quarterly***, 7(3), 385-425.

Lucia, A. D., and R. Lepsinger, 1999. ***The Art and Science of Competency Models: Pinpointing Critical Success Factors in an Organization***, San Francisco, California: Jossey-Bass/Pfeiffer.

Maslyn, J. M., and M. Uhl-Bien, 2001. Leader-member exchange and its dimensions: effects of self-effort and other's effort on relationship quality, ***Journal of Applied Psychology***, 86(4), 697-708.

McColl-Kennedy, J. R., and R. D. Anderson, 2002. Impact of leadership style and emotions on subordinate performance, ***The Leadership Quarterly***, 13(5), 545-559.

Müller, R., and J. R. Turner, 2007. Matching the project manager's leadership style to project type. ***International Journal of Project Management***, 25(1), 21-32.

Müller, R., and J. R. Turner, 2010. Leadership competency profiles of successful project managers, ***International Journal of Project Management***, 28(5), 437-448.

Na, K. S., J. T. Simpson, X. Li, T. Singh, and K. Y. Kim, 2007. Software development risk and project performance measurement: evidence in Korea, ***The Journal of Systems and Software***, 80(4), 596-605.

Nunnally, J. C., 1978. ***Psychometric Theory***, 2nd ed., New York: McGraw-Hill.

Ogbonna, E., and L. C. Harris, 2000. Leadership style, organizational culture and performance: empirical evidence from UK companies, ***The International Journal of Human Resource Management***, 11(4), 766-788.

Oya, I. T., and O. R. Walter, 1998. Analysis of the characteristics of projects in diverse industries, ***Journal of Operations Management***, 16(1), 43-61.

Perrons, R. K., 2009. The open kimono: How Intel balances trust and power to maintain platform leadership, ***Research Policy***, 38(8), 1300-1312.

Pheng, L. S., and Q. T. Chuan, 2006. Environmental factors and work performance of project managers in the construction industry, ***International Journal of Project Management***, 24(1), 24-37.

Podsakoff, P. M., and D. W. Organ, 1986. Self-reports in organizational research: problems and prospects, ***Journal of Management***, 12(4), 531-544.

Robbins, S. P., 1997. ***Essentials of Organizational Behavior***, Englewood Cliffs, New Jwesey: Prentice Hall.

Rothwell, W. J., and J. E. Lindholm, 1999. Competency identification, modeling and assessment in the USA, ***International Journal of Training and Development***, 3(2), 90-105.

Russ-Eft, D., 1995. Defining competencies: a critique, ***Human Resource Development Quarterly***, 6(4), 329-335.

Schriesheim, C. A., S. L. Castro, and C. C. Cogliser, 1999. Leader-member exchange (LMX) research: a comprehensive review of theory, measurement, and data-analytic practices, ***Leadership Quarterly***, 10, 63-113.

Schwarz, R., 1994. ***The Skilled Facilitator: Practical Wisdom for Developing Effective Groups***, California: Jossey-Bass Publishers.

Settoon, R. P., N. Bennett, and R. C. Liden, 1996. Social exchange in organizations: perceived organizational support, leader-member exchange, and employee reciprocity, ***Journal of Applied Psychology***, 81, 219-227.

Solomom, C., 2001. Managing virtual teams, ***Workforce***, 80(6), 60-65.

Stasz, C., 1997. Do employers need the skills they want? Evidence from technical work, ***Journal of Education and Work***, 10(3), 205-233.

Stogdill, R. M., 1948. Personal factors associated with leadership: a survey of the literature, ***Journal of Psychology***, 25(1), 35-71.

Tian, J. J., and C. Lau, 2001. Board composition, leadership structure and performance in Chinese shareholding companies, ***Asia Pacific Journal of Management***, 18(2), 245-263.

Trevor-Roberts, E., N. M. Ashkanasy, and J. C. Kennedy, 2003. The egalitarian leader: a comparison of leadership in Australia and New Zealand, ***Asia Pacific Journal of Management***, 20(4), 517-540.

Trist, E. L., 1981. ***The Sociotechnical Perspective: The Evolution of Sociotechnical Systems as a Conceptual Framework and as an Action Research Program, in Perspectives on Organization Design and Behavior***, New York: John Wiley and Sons.

Tsai, W. C., H. W. Chen, and J. W. Cheng, 2009. Employee positive moods as a mediator linking transformational leadership and employee work outcomes, ***The International Journal of Human Resource Management***, 20(1), 206-219.

Turner, J. R., 1999. ***Handbook of Project-Based Management: Improving the Process for Achieving Strategic Objectives***, UK: McGraw-Hill.

Turner, J. R., and R. Muller, 2005. The project manager's leadership style as a success factor on projects: a literature review, ***Project Management Journal***, 36(2), 49-61.

Turner, R., M. Huemann, and A. Keegan, 2008. Human resource management in the project-oriented organization: employee well-being and ethical treatment, ***International Journal of Project Management***, 26(5), 577-585.

Van Dyne, L., and J. A. LePine, 1998. Helping and voice extra-role behaviors: evidence of construct and predictive validity, ***Academy of Management Journal***, 41, 108-119.

Varma, A., A. S. Denisi, and L. H. Peters, 1996. Interpersonal affect and performance appraisal: a field study, ***Personnel Psychology***, 49(2), 341-360.

Varma, A., and L. K. Stroh, 2001. The impact of same-sex LMX dyads on performance evaluations, ***Human Resource Management***, 40(4), 309-320.

Vecchio, R. P., 1997. Are you in or out with your boss?, in R. P. Vecchio (Ed.), ***Leadership: Understanding the Dynamics of Power and Influence in Organizations***, Notre Dame, Indiana: University of Notre Dame Press, pp. 274-277.

Wang, E. T. G., H. L. Wei, J. J. Jiang, and G. Klein, 2006. User diversity impact on project performance in an environment with organizational technology learning and management review processes, ***International Journal of Project Management***, 24(5), 405-411.

Wright, P. M., and W. R. Boswell, 2002. Desegregating HRM: A review and synthesis of micro and macro human resource management research, ***Journal of Management***, 28, 247-276.

Xu, L., 1986. A cross-cultural study on the leadership behaviour of Chinese and Japanese executives, ***Asia Pacific Journal of Management***, 4(3), 203-209.

Yang, I., 2006. Jeong exchange and collective leadership in Korean organizations, ***Asia Pacific Journal of Management***, 23(3), 283-298.

Yusof, J. M., and I. M. Tahir, 2011. Spiritual leadership and job satisfaction: a proposed conceptual framework, ***Information Management and Business Review***, 2(6), 239-245.

Zacharatos, A., J. Barling, and E. K. Kelloway, 2000. Development and effects of transformational leadership in adolescents, ***The Leadership Quarterly***, 11(2), 211-226.

Zaichkowsky, J. L., 1985. Measuring the involvement construct, ***Journal of Consumer Research***, *12*, 341-352.

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領導能力與主管－部屬交換關係品質對於研究專案績效的影響

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本研究主要目的為調查專案領導者能力與主管－部屬交換關係品質的關聯性，及其對於研究機構中專案績效的影響。研究中使用結構方程模式來驗證所提出的模式，根據超過 200 個研究專案的資料分析發現，專案領導能力可增進研究團隊中的主管－部屬交換關係品質，而進一步可提升研究專案績效。研究結果並顯示主管－部屬交換關係品質可中介專案領導能力對於研究專案績效的影響，此外，團隊關係、業主屬性與專案預算對於主管－部屬交換關係品質與研究專案績效的關係具有干擾效果。

關鍵字：領導、能力、主管－部屬交換關係品質、團隊、研究機構。

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