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THE HONG KONG POLYTECHNIC UNIVERSITY  
DEPARTMENT OF MANAGEMENT AND MARKETING

INNOVATION-ORIENTED LEADERSHIP,  
CONTINGENCIES AND OUTCOMES IN THE  
MULTIPLE STAGES OF INNOVATION PROCESS

KONG HAO

A thesis submitted in partial fulfilment of the requirements for the  
degree of Doctor of Philosophy

May, 2012

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**KONG HAO** \_\_\_\_\_ (Name of student)

## **ABSTRACT**

Innovation is a process of related activities that can be grouped into stages. This process starts from idea generation, progresses further by idea promotion, and ends with idea implementation. Employee performance at each stage of innovation will be influenced by different factors because the requirements and targets of each stage vary. Leadership is argued to be one of the most immediate and potent forces that encourage innovation among followers. At different stages, leaders deemed effective in motivating followers to be innovative may exhibit a different range of qualities and behaviors. In spite of the leader's prominent role in innovation, according to the substitute of leadership theory (SLT), certain features of the person, situation, or task can reduce or even replace the effects of leadership on innovation. Team learning behavior (TLB), work contacts, and team initiative are conceptually associated with idea generation, idea promotion, and idea implementation, respectively. These factors jointly influence innovation with leadership behaviors.

Given the importance of leadership in innovation, most of the existing leadership theories, nevertheless, are not comprehensive in light of the multistage nature of the innovation process. Some of the models may arguably be more appropriate at the idea generation stage, whereas some may be more appropriate at the promotion or implementation stage. Through a combination of literature search and in-depth interviews, Study 1 identified 57 innovation-oriented leadership behaviors that influence followers to fulfill the objective of innovation and respond to the call for a comprehensive but distinctive model of leadership for innovation. Exploratory factor analysis was performed and three factors were extracted. Twenty-four leadership behaviors were categorized into

three dimensions, namely, leadership behaviors for idea generation, idea promotion, and idea implementation.

Study 2 examined the effectiveness of innovation-oriented leadership as a whole on the overall innovation of followers by combining the three dimensions of leadership behaviors specific to each innovation stage. The results suggested that the effect of innovation-oriented leadership on innovation is stronger than that of transformational leadership. Innovation-oriented leadership behaviors specific to idea generation, idea promotion, and idea implementation were also associated with their increased corresponding innovative performances. Furthermore, SLT was used to explain in what way TLB, work contacts, and team initiative influence the positive relationship between leadership and its corresponding outcomes. TLB, work contacts, and team initiative reduced the effectiveness of leadership on the outcomes and were thus qualified as substitutes.

In addition to verifying the results of Study 2, Study 3 extended the findings by incorporating objective measures of innovation (quantity and quality of innovation) and involving line workers, a sample different from knowledge workers in Study 2. The findings of Study 3 showed that innovation-oriented leadership as a whole not only enhances leader-rated innovative work behaviors, but also increases the quantity of innovation, an effect which transformational leadership cannot accomplish. Leadership behaviors for idea promotion and implementation were related to the correspondent innovative behaviors of employees. Work contacts and team initiative were found to act as substitutes for leadership behaviors.

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## **CHAPTER 1. INTRODUCTION**

In an era characterized by global competition and rapid technological change, innovation is crucial for organizations to succeed (Amabile, 1988; Bettis & Hitt, 1995; Boisot, 1998; Oldham & Cummings, 1996). Innovation is a multistage process that involves primarily “intentional creation, introduction and application of new ideas” (Janssen, 2000, p. 288). According to this definition, innovation is composed of three main stages: idea generation, idea promotion, and idea implementation. Much of the prior research related to innovation focused mainly on the first stage of innovation, understood as creativity, whereas the latter part of innovation is under-researched (De Jong & Den Hartog, 2007). Generating novel ideas is a basis for innovation, while new ideas will remain dormant if no efforts are exerted to promote them to stakeholders and implement them appropriately (e.g., Howell & Boise, 2004; Howell, Shea, & Higgins, 2005). In fact, the rate of success in introducing new innovative products to the market is relatively low (Dougherty, 1992; Goldenberg, Lehmann, & Mazursky, 2001). What happens to the latter stages of innovation is thereby worthy of in-depth research. The investigation of factors that enhance or prohibit the promotion or implementation of ideas is an important emerging issue (Holman et al., in press; Mumford, 2003).

As Amabile, Schatzel, Moneta, and Kramer (2004) pointed out, “Of all of the forces that impinge on people’s daily experience of the work environment in the organizations, one of the most immediate and potent is likely to be the leadership of these teams...” (p. 6). Many researchers echoed this argument, suggesting that for innovation to occur, leaders and their behaviors should play an active role (e.g., Mumford, Scott, Gaddis, &

Strange, 2002; Shalley & Gilson, 2004; Shalley, Zhou, & Oldham, 2004). Much discussion occurs in the literature regarding how leadership influences the innovation of followers. For instance, in their review, Mumford et al. (2002) described that leaders can use influence tactics such as intellectual stimulation, involvement, support, and freedom to stimulate and facilitate the innovative efforts of followers. Nevertheless, leadership may not be universally applicable to all situations because the effectiveness of leadership depends on other factors. Contextual factors also account for the variances in outcomes (Cole, Bruch, & Shamir, 2009; Wang & Rode, 2010). Considering both leadership and contextual factors on employee innovation, a situational approach to leadership can thus provide a more complete picture about how employees engage in innovative performances. A situational approach to leadership has been examined with outcomes such as satisfaction, commitment, trust, and organizational citizenship behaviors (Podsakoff, MacKenzie, & Bommer, 1996). However, only a few studies adopted such an integrative approach to examine the influences of leadership and contextual factors as well as their interactive effects contributing to innovative performance (e.g., Kahai, Sosik, & Avolio, 2003; Wang & Rode, 2010). Instead, the majority of studies on innovation focused on the role of either the leader or the context.

In addition, each of the three stages of innovation imposes different requirements on employees and consists of distinct activities. Hence, leaders have to adopt different behaviors and to adjust to diverse contextual factors, which presumably change from idea generation to idea promotion and finally to idea implementation. For example, idea generation calls for thinking “out of the box” and generating novel and useful ideas, whereas idea promotion entails enlisting support from key stakeholders. One leadership

style or behavior cannot cater to all the distinct requirements of each innovation stage. Similarly, rather than having one contextual factor applied to all stages, the contextual factors will change with the innovation stage. Therefore, in order to fully understand how leadership and contextual factors influence innovation, we need to take each stage of innovation into consideration. Except for one study (cf. Michaelis, Stegmaier, & Sonntag, 2010), none of the few studies mentioned above which adopted an integrative approach to predict innovation considered the latter two stages of innovation, concentrating instead on the influences of leadership and factors such as organizational climate on idea generation (e.g., Kahai et al., 2003; Wang & Rode, 2010).

Waldman and Bass (1991) noted that “little theory exists regarding leadership in relation to the entire innovation process” (p.172). Mumford and Licuanan (2004) also pointed out that one cannot expect existing leadership models originally developed to predict performance in routine settings to be entirely applicable to innovation. Existing leadership models mainly have a rather narrow focus and are conceptually more relevant to certain innovation stages instead of all. For instance, transformational leadership, the most studied leadership theory in relation to creativity or innovation, was found to lead to idea generation but has little to do specifically with promotion and implementation. Through intellectual stimulation, individual consideration, and inspiration motivation, transformational leaders stimulate and motivate employees to develop and generate more ideas (Bass, Avolio, Jung, & Berson, 2003; Shin & Zhou, 2003; Waldman & Bass, 1991; Wang & Rode, 2010). However, intellectual stimulation, individual consideration, and inspiration motivation are less relevant to other stages of innovation. In another well-researched leadership model, championship was postulated to be a key driver in the

success of technological innovation (Howell & Boise, 2004; Howell & Higgins, 1990). Championship mainly deals with activities at the stage of idea promotion because championship behaviors involve selling ideas and obtaining stakeholder support. Recently, Krause (2004) proposed a leadership model specifically designed to tap into the last stage of innovation, namely, influence-based leadership. This leadership model suggests that granting freedom and autonomy as well as openness in the decision-making process are the two most influential power bases related to idea implementation. Although Krause's (2004) study examined the five power bases on both idea generation and implementation, it neglected the importance of idea mobilization. Ideas cannot be implemented in a vacuum if no efforts are exerted to promote them to stakeholders. Implementing a new idea inherently involves an intensive amount of resources and conflicts. Hence, the implementation can be conducted only when stakeholders accept the idea. A stage-specific innovation-oriented leadership model grounded on the available leadership models but more applicable to the entire innovation process than those ones will be introduced to address the inadequacies of the current leadership models, thus clarifying the leader's role at each stage.

Given the change in leader behaviors and requirements and tasks across stages of innovation, contextual factors also vary. In general, idea generation relies heavily on intensive information and knowledge (Rietzschel, Nijstad, & Stroebe, 2006). A learning environment is essential for sharing information, asking feedback, helping one another, and feeling safe from criticisms because of mistakes (Hirst, Knippenberg, & Zhou, 2009). Regarding the idea promotion stage, the main purpose is to get ideas accepted and to solicit approval. A well-developed network of connections in the organization and



frequent contact with outsiders are of prime importance to promote ideas effectively (Mumford et al., 2002). The social context influences idea promotion through increased interpersonal interactions and the accessibility of diversified information and knowledge (Perry-Smith & Shalley, 2003). Contact with individuals or groups within and outside the organization allows individuals to interact with different people and access diverse information and knowledge. The stage of idea implementation involves changing the status quo, which implies resistance, conflict, and a requirement for sustained effort (West, 2002). Moreover, unexpected problems, barriers, and setbacks occur along the way during the implementation of ideas. The collective efforts and behaviors of teams that take a proactive, self-starting, and persistent approach toward work can favor the execution of ideas (Baer & Frese, 2003).

The previous research integrating leadership and contexts on innovation performance lacks an overarching theory guiding the selection of antecedents, rationale formulation, and result interpretation. The “Substitutes for Leadership” model of Kerr and Jermier (1978) will be adopted as an overarching framework to address this problem, to identify contexts specific to different phases of the innovation process, and to match those contexts with phase-specific leadership behaviors. Although named as “substitutes for leadership,” the substitute of leadership theory (SLT) proposes that certain characteristics of the subordinates, the task, and the organization may enhance, neutralize, or substitute for the impact of a leader’s behavior (Dionne, Yammarino, Howell, & Villa, 2005; Podsakoff et al., 1996). Compared with other situational approaches to leadership, SLT explicitly depicts the effects of contextual factors (i.e., enhancing, neutralizing, and substituting) on the leadership-outcome relationship, enabling a better understanding of

how employees engage in innovative behaviors across stages of innovation under the joint influence of leadership and contextual variables. In other words, SLT provides an integrative model to address the following three questions: When does a leader behavior have a significant (main) effect? How is that effect influenced (moderated) by some phase-specific contextual factors? Do these factors also have an independent effect on the outcomes on their own?

In sum, the present study is expected to make significant theoretical and practical contributions. First, this study contributes to the innovation literature by providing a comprehensive and process-based framework for understanding the effects of leadership behaviors and various contextual factors on the innovation process, through which new ideas get generated, mobilized, and implemented. The front-end of innovation, understood as idea generation, has been studied intensively (e.g., Jung, Chow, & Wu, 2003; Kahai et al., 2003; Shin & Zhou, 2003; Wang & Rode, 2010). In comparison, little is known about the back-end of innovation (De Jong & Den Hartog, 2007; Krause, 2004) in terms of what patterns of leadership behaviors can effectively enhance the performance of the latter stages and under what conditions these behaviors are more or less effective. The present study advances our knowledge about the under-researched area of innovation, exploring the ways that facilitate and enhance performance of idea promotion and implementation. Furthermore, many researchers advocated to use more objective measure of innovation to avoid the potential bias of supervisors' subjective ratings (e.g., Liao, Liu, & Loi, 2010; Zhou, 2003). Research reports, patent announcements, invention disclosure forms, and ideas proposed during suggestion programs have been used to operationalize employees' creativity or innovation (e.g., Oldham & Cummings, 1996; Taggar, 2001;

Tierney, Farmer, & Graen, 1999). By adopting both supervisor ratings and objective measures of innovation as suggested by Zhou (2003), this study compares the results involving both measures and hence contributes to the innovation literature.

Second, the introduction of innovation-oriented leadership enriches the leadership literature by addressing the inadequacies of existing leadership models on innovation. Innovation-oriented leadership is based on the current leadership theories relevant to innovation, but it is better than the other theories because innovation-oriented leadership is grounded on the innovation process, explicitly taking various targets and tasks across stages into account. By adopting a situational approach to innovation-oriented leadership, the present study provides an integrated leadership model that clarifies the influencing process of leadership by matching leader behaviors with various stages of the innovation process. The model presents a comprehensive view of innovation-oriented leadership, suggesting that it can work best under some conditions and be less effective under other conditions. Moreover, innovation-oriented leadership behaviors will be developed through the combination of literature search and qualitative approaches, and empirically tests by quantitative studies to examine its reliability, validity, and relationship with innovation. In addition, the effectiveness of transformational leadership on innovation would be compared with that of innovation-oriented leadership to verify whether innovation-oriented leadership is more applicable to the employee outcome of innovation as argued in the present study.

Third, this study also contributes to substitutes for leadership literature in three aspects. It reinforces the call of some scholars (e.g., Kerr & Jermier, 1978; Podsakoff et al., 1996) to examine the substitutes for leadership theory with a wider range of

leadership behaviors and a broader range of characteristics, which may act as substitutes for behaviors. A few scholars (e.g., Gronn, 1999; Villa, Howell, Dorfman, & Daniel, 2003) also contended that much of the research on the effects of substitutes on the leadership-outcome relationship either lacked a sound theoretical rationale or did not clearly explain the mechanisms of substitution. Thus, the current study draws on literature on organizational learning, network theory, and action theory to identify the contextual factors at different stages. The integration of the three theories in SLT helps specify the process by which these factors achieve their effects. Besides, substitutes for the leadership model have been implied as being relatively static, implying that one substitute (including “true substitute,” neutralizer, and enhancer) applies to an outcome no matter how many stages are included. This study suggests that substitutes can be applied and adapted based on the existing constraints and contexts. In other words, substitutes, neutralizers, or enhancers change with the different requirements of each stage - from idea generation to promotion to implementation.

Finally, the findings of the present study provide a guideline for team leaders to encourage and facilitate employee innovation stage by stage. The findings also have practical implications to the organization. Organizations can arrange and deliver training to their managers, guiding them to be innovation-oriented leaders to enhance the innovative performance of all employees. The goal of training innovation-oriented leaders can be achieved because behaviors can be learned and nurtured through training. In addition, organizations and leaders can utilize or implement contexts whenever leader behaviors are not functional in some situations (Dionne et al., 2005).

### ***Structure of the thesis***

This thesis consists of seven chapters. Chapter 1 presents the introduction, establishing the research question. Chapter 2 offers a detailed review of previous literature and identifies the research gaps. Chapter 3 (Study 1) identifies the innovation-oriented leadership behavior items based on the combination of in-depth interview and literature review and provides the factor structure of these behaviors. Chapter 4 demonstrates the theories and rationales for the hypotheses. Chapters 5 and 6 describe the research method, results, and discussion for Study 2 and Study 3, respectively. Study 2 (Chapter 5) provides a construct validation of innovation-oriented leadership and examines its influence on three stages of innovation together with the impact of three contextual factors. Study 3 (Chapter 6) replicates the results of Study 2 in a different work setting to test the effectiveness of innovation-oriented leadership on two objective measures of innovation. The last chapter, Chapter 7, concludes the thesis and provides theoretical and managerial implications, limitations of the present study, and future research directions.

## **CHAPTER 2. LITERATURE REVIEW**

### ***Definition of innovation***

Early studies of leadership on innovation focused mainly on the generation of novel ideas (i.e., creativity). However, increasing attention has been devoted to the whole innovation process (e.g., Holman et al., in press; Mumford & Gustafson, 1988; Pieterse, Van Knippenberg, Schippers, & Stam, 2010). Consensus has been achieved among scholars (i.e., Amabile, Schatzel, Moneta, & Kramer, 1996; Davila, Epstein, & Shelton, 2006; West, 2002) that innovation and creativity should be differentiated from each other. In an organizational context, creativity is defined as the production of novel and useful ideas concerning products, services, processes, and procedures (Amabile, 1988). Nevertheless, an innovation is a new idea, which may also be a recombination of old ideas. It is a scheme that challenges the present order, a formula, or a unique approach that is perceived as new by the individuals involved (Rogers, 1995; Zaltman, Duncan, & Holbek, 1973). More importantly, innovation primarily involves the implementation of ideas throughout an organization (Amabile, 1988; Oldham & Cummings, 1996). Various processes and products may be regarded as innovations (West, 2002). For instance, administrative changes of implementing new policies and technological changes such as new products or new production processes are innovations. A definition of innovation from an organizational perspective was given by Luecke and Katz (2003), who wrote: “Innovation...is generally understood as the successful introduction of a new thing or method...Innovation is the embodiment, combination, or synthesis of knowledge in original, relevant, valued new products, processes, or services” (p. 2). In the same vein,

Amabile et al. (1996) contended that “All innovation begins with creative ideas...We define innovation as the successful implementation of creative ideas within an organization. In this view, creativity by individuals and teams is a starting point for innovation; the first is necessary but not sufficient condition for the second” (pp. 1154-1155). For innovation to occur something more than the generation of a creative idea or insight is required; the insight must be put into action to make a genuine difference, resulting in, for example, new or altered business processes within the organization or changes in the products and services provided.

Apart from the idea generation and implementation of innovation, based on the definition provided by West and Farr (1989) and West (1989), Janssen (2000) defined innovation as an “intentional creation, introduction and application of new ideas within a work role, group or organization, in order to benefit role performance, the group, or the organization” (p. 288). This definition implies that innovation consists of creation, introduction, and application of ideas. The above definitions all suggest that innovation is a process with phases or stages.

### ***Models of innovation***

In the literature, several innovation models exist that describe the innovation processes. First, a simplified two-part approach of innovation was suggested by Zaltman and colleagues (1973), including invention and implementation. Following a two-stage conceptualization, Damanpour (1991) defined the initiation stage as “consisting of all activities pertaining to problem perception, information gathering, attitude formation and

evaluation, and resource attainment leading to the decision to adopt” (p. 562), and the implementation stage as consisting “of all events and actions pertaining to modifications in both an innovation and an organization, initial utilization, and continued use of the innovation when it becomes a routine feature of the organization” (p. 562).

A three-stage model development by Rogers (1983) describes the process of innovation over time as a linear sequence of three basic stages, beginning with the invention of an idea, continuing through its development, and culminating in its diffusion to and adoption by users. The invention of an idea comes from the recognition of a need or problems, which is the same as generating an idea in the two-stage model. In the development stage, ideas are further developed, produced, and tested with a concrete device or program, which is the second component of the first stage of the two-stage model. The final stage, namely, adoption/diffusion, consists of five sub-stages: awareness, persuasion, evaluation, trial, and implementation. As commented by Van de Ven (1993), the three-stage model of Rogers is a classic model in the marketing field, which weighs heavily on the diffusion and adoption stage.

Another three-stage model was outlined by Kanter (1988) and Scott and Bruce (1994) drawing on the two-stage model of idea generation and implementation, containing idea generation, coalition building, and implementation. Janssen (2000) further developed these three stages and described them as idea generation, idea promotion, and idea realization. Idea generation and implementation tasks are the same as in the two-stage model while idea promotion involves social activities to find backers or sponsors surrounding the idea or to build a coalition of supporters who can provide the necessary power to mobilize the idea (Galbraith, 1982; Kanter, 1983, 1988).



The fourth model is Basadur's four-stage creative processes (Basadur, 2004). Although the model was termed "creativity processes" in that study, the present study considers it as an "innovation process" because implementation was included in that model, which is typically a component of innovation. The innovation process approach builds on the Osborn–Parnes school of creative problem solving and uniquely recognizes organizational innovation as a continuous circular process, beginning with a *problem-finding activity* (sensing and anticipating opportunities for change) and continuing through *problem conceptualization*, *problem solving*, and *solution implementation* (Basadur, Graen, & Green, 1982; Basadur, Graen & Wakabayashi, 1990). Different from the linear sequences of other models, each stage of Basadur's model synchronizes divergent and convergent thinking, separated by the ability to defer judgment. This approach begins with the search for a deliberate problem in everyday life and ends with an action to implement new solutions within the four-stage model.

In addition to the four models described above, other models break down the innovation processes into more detailed stages based on the two-stage model. For instance, Cooper and Zmud (1990) proposed a six-stage model for information technology innovation, including initiation, adoption, adaptation, acceptance, routinization, and infusion. With a similar focus on technology-based innovative projects, Roberts and Fusfeld (1981) posited that implementation involves six stages: pre-project, project possibilities, project initiation, project execution, project outcome evaluation, and project transfer. These fine-grained approaches offer a detailed examination of the innovation process, which is useful for tracking and managing innovative projects in a firm. Nevertheless, this level of specification is beyond the scope of the current

conceptual framework.

The review of the innovation models showed that idea generation and idea implementation were mentioned in almost all the models and endorsed by many researchers (e.g., Amabile et al., 1996; Axtell et al., 2000; Damanpour, 1991; Glynn, 1996; Mumford & Gustafson, 1988; Van de Ven, 1986; West, 2002). Nevertheless, most ideas need to be promoted because they often do not match what is already used in the organization and resistance to change may occur (De Jong & Den Hartog, 2010; Kanter, 1988). Frost and Egri (1991) also argued that ideas for product innovations may remain dormant for future development and implementation if no one is dedicated to promoting and championing them. Therefore, the three-stage model encompassing the processes of (1) idea generation, (2) idea promotion, and (3) idea implementation will be used in this study.

### ***Existing leaderships and the innovation process***

Research on the determinants of innovation has identified a wide set of factors, ranging from factors at the individual level such as personality, technical knowledge, and motives, to factors at the group level such as task structure, communication types, and task autonomy, and to the organizational level such as strategy, organizational structure, culture and climate, and available resources. Damanpour (1991) and Mumford et al. (2002) meta-analytically summarized and comprehensively discussed these issues. Although each of the above-identified factors is undoubtedly relevant, the new challenges faced by organizations and the style of leadership of their top managers have accordingly become an increasingly important determinant of organizational creativity (Dess &

Picken, 2000).

Leadership in the extant literature is generally recognized as an important determinant of innovation. Conceptually, the top managers of an organization can affect employee creativity or innovation in several different ways. First, they define and shape the work contexts within which employees interact to define goals, problems, and solutions (Amabile, 1998; Redmond, Mumford, & Teach., 1993). By creating and sustaining an organizational climate and culture that nurtures creative efforts and facilitates diffusion of learning, organizational leaders can significantly boost organizational creativity (Yukl, 2002). Finally, leaders can develop and maintain a system that values and rewards creative performance through compensation and other human resource-related policies.

Specifically, how relevant leadership theories were linked to innovation will be discussed in the following chapters and their empirical findings will be summarized. Transformational leadership, the most prevailing leadership style in the past decades, has been intensively studied in terms of its relationship to innovation. Bass (1985) portrayed transformational leaders as those who are radical in ideology, proactive and creative in their thinking, and constantly seek new solutions to old problems. Jung et al., (2003) proposed several reasons to support that transformational leadership will enhance employee creativity and innovation. First, by providing intellectual stimulation (Bass & Avolio, 1997), transformational leaders encourage followers to think “out of the box” and adopt generative and exploratory thinking processes (Sosik, Avolio, & Kahai, 1997). Followers are stimulated to destroy old ways of doing things and to make way for new methods. Followers are also encouraged by their transformational leaders to challenge

and question their own values, traditions, and beliefs (Hater & Bass, 1988). Second, transformational leaders go beyond exchanging contractual agreements for desired performance by actively engaging the personal value systems of their followers (Bass, 1985; Gardner & Avolio, 1998; Shamir, House, & Arthur, 1993). The leaders stimulate and increase followers' motivation to perform their jobs by linking the identities of followers to the collective identity of their organization. Transformational leaders, through articulating an important vision and mission for the organization, increase their followers' understanding of the importance and values associated with desired outcomes, raise their performance expectations, and increase their willingness to transcend their self-interests for the sake of the collective entity (Bennis & Nanus, 1985; Conger & Kanungo, 1998; House, Spangler, & Woycke, 1991).

Following such theoretical underpinnings, the findings of some studies generally lend support to the prediction of the enhancing effect of transformational leadership on the innovation of followers. For example, in a study involving 32 Taiwanese companies from the electronics and telecommunications industry, Jung et al. (2003) found that the results support a direct and positive link between transformational leadership and organizational innovation. Using a sample of 290 employees and their supervisors from 46 Korean R&D companies, Shin and Zhou (2003) found that transformational leadership is positively related to the creativity of followers. Given a sample of 159 undergraduate students, Sosik, Kahai, and Avolio (1998) also found that transformational leadership increased the creativity of followers in a computer-mediated brainstorming exercise. Similarly, Janssen (2002) found that transformational leadership has a stronger positive relationship with the innovative behavior of followers than transactional leadership. In a

recent study, Gumusluoglu and Ilsev (2009) tested the effects of transformational leadership on both creativity at the individual level and innovation at the organizational level using a sample of 163 R&D personnel and managers from 43 micro- and small-sized Turkish software development companies. The results showed that at both levels, transformational leadership and creativity/innovation were positively related. In addition to positive findings on creativity, Michaelis, Stegmaier, and Sonntag (2010) found that transformational leadership enhances the innovation implementation behavior of the followers.

However, some scholars argued that some dimensions of transformational leadership such as *idealized influence* try to shift the attention and efforts of followers to the collective goal rather than to his/her self-development. Hence, under such influences, followers are restricted by the shared norm and do what is expected of them (Mumford et al., 2002). Basu and Green (1997) contended that the transformation process involves leaders articulating certain positions and soliciting subordinate support even at a cost to the latter. By encouraging followers to be “team players” and inspiring them with his/her plans for the future, transformational leaders significantly influence the social identity process. This process assimilates followers cognitively and behaviorally in accordance with collective-typical attitudes and behaviors, which seem to undermine the uniqueness of the individuals (Tse & Chiu, forthcoming). Individuals in a group are less likely to perform innovatively without individuality and diversity (e.g., Janssen & Huang, 2008; Jehn, Northcraft, & Neale, 1999; Williams & O’Reilly, 1998). In a similar vein, Mumford et al. (2002) also claimed in their meta-analytic study that the visioning characteristic (i.e., *inspirational motivation*) of charismatic and transformational leaders may not necessarily

stimulate creativity.

Empirical findings also reflected the contradictory views stated above, and the positive findings are weakened by some inconsistent findings reported in the literature. Jaussi and Dionne (2003) reported that transformational leadership was not related to the individual creative performance of the participating students and was negatively related to group creative performance. In a study involving 62 first-line supervisors and the corresponding 251 randomly selected followers in a large printing company, Basu and Green (1997) found a strong negative relationship between transformational leadership and the innovative behaviors of followers, a result contrary to their expectation. In contrast to the findings of Sosik et al. (1998), in a laboratory experiment, Kahai et al. (2003) reported that transactional leadership was associated with greater solution originality than transformational leadership, indicating that transactional leadership resulted in higher creativity than transformational leadership. A recent field study of Pieterse et al. (2010) revealed that the main effect of transformational leadership on the innovative behaviors of followers was not significant, indicating that transformational leadership cannot directly engender innovative behaviors.

Apart from transformational leadership, other leaderships, although less examined, were also found to be related to innovation. For example, Jaussi and Dionne (2003) conducted a study on the impact of unconventional leader behaviors on the creativity of followers. They defined unconventional leader behavior to be behavior that is perceived as novel and surprising by followers. Based on the social learning theory, unconventional leader behaviors (i.e., standing on furniture, hanging idea on clothesline) positively influences creativity through the mechanism that when followers see a leader's behavior

demonstrated, they learn through emulation and, in turn, perform creatively. Jaussi and Dionne (2003) indicated that after transformational leadership and individual intrinsic motivation for creativity are controlled, unconventional leader behaviors significantly interact with follower perceptions of the leader as a role model for creativity and explain follower creativity. However, unconventional leader behaviors on their own were not related to the creative performance of employees.

Empowering leadership (Ahearne, Mathieu, & Rapp, 2005; Arnold, Arad, Rhoades, & Drasgow, 2000), emphasizing employee self-influence rather than top-down control allows all members to manage by themselves through job design. According to Ahearne et al. (2005), empowering leadership involves highlighting the significance and meaningfulness of the work, fostering and encouraging participation in decision making, expressing confidence in the competence of an employee and prospects for high performance, and removing bureaucratic constraints. Inherent in the empowering leadership behaviors is delegation, enabling the employee to make decisions without direct supervision or intervention (Bass, 1985; Jung et al., 2003). Examples of shared empowering leadership in a team of knowledge workers may include peer encouragement and support of self-goal-setting, self-evaluation, self-reward, and self-development. Empowering leadership is expected to influence idea invention positively by providing autonomy and enhancing self-motivation, which is considered an important determinant of creativity because intrinsically motivated individuals are more likely to perform beyond expectations. To date, only one empirical study has been conducted on the link between empowering leadership and creativity. Zhang and Bartol (2010) found that empowering leadership was positively associated with creativity through psychological

empowerment and intrinsic motivation. However, some scholars argued that autonomy is not necessarily a universal good (e.g., Trevelyan, 2001) because excessive autonomy also allows individuals to pursue their own unique insights (Amabile et al., 1996; Enson, Cottam, & Band, 2001) that may overshadow the team goal.

Some scholars proposed innovative leadership or innovation-oriented leadership (e.g., Anthony, 1998; Deschamps, 2008). Anthony (1998) defined an innovative leader as a person who promotes and focuses maximum effective creativity in followers to achieve remarkable breakthroughs in the organization. Innovative leaders are depicted as fast and action-oriented, immersed in progressive change, future-obsessed, masters of motivation and inspiration, passionate super-salespeople and evangelists, rule breakers, mountain climbers, opportunists, builders, and high-gain risk-takers. Innovative leaders share core values including integrity, tenacity, curiosity, courage, and humility. Deschamps (2008) also wrote in his book: “We need to ascertain that innovation leaders do, indeed, show a combination of characteristic behavioral traits that are seldom found, at least to the same extent, in other more traditional management leaders.” (p. 6) These leaderships emphasize the leader’s characteristics, and the underlying assumption is that the leader himself/herself is the locus of innovation rather than the employees.

Basadur (2004) demonstrated a series of leader behaviors corresponding to various stages of the creative process. The creative process begins with problem finding, and continues through problem conceptualization, problem solving, and solution implementation (Basadur et al., 1982; Basadur, Graen, & Wakabayashi, 1990). He proposed that in the problem-finding stage, the leader should transfer ownership of the problem, to delegate challenges to his/her followers rather than giving them solutions. In



the problem-defining stage, the leader must act as a role model to demonstrate continually his/her own commitment to meeting his/her own challenges. In the problem-solving stage, the leader should model and train followers in problem finding, defining, and solving. Finally, in the stage of solution implementation, the leader should set up structures that encourage others to buy in. Although Basadur proposed a number of leadership behaviors that match the creative process, no further quantitative or qualitative studies were conducted to compare and validate these behaviors.

Some scholars argued that championship is an important driver of the success of product innovation (e.g., Howell & Higgins, 1990; Schön, 1963). Champions are individuals who “actively and enthusiastically promote innovations through the crucial organizational stages” (Howell, Shea, & Higgins, 2005, p. 642). Howell et al. (2005) developed championship behaviors consisting of three factors, namely, expressing enthusiasm and confidence about the success of the innovation, persisting under adversity, and getting the right people involved. Although the literature emphasized the importance of champions in determining the success of technological innovation, the impact of champions is mainly on certain stages of innovation. Indeed, Howell and Boise (2004) found that champion emergence was only related to some idea-generation activities (i.e., champions provided enthusiastic support for new ideas more often than non-champions) but not to others (i.e., no differences were found between champions and non-champions in terms of getting involved with people in developing ideas and providing intellectual stimulation). They admitted that, “champions are usually described as being particularly active in the promotional stage of innovation” (Howell & Boise, 2004, p. 136). Therefore, championship plays a significant role mainly at the stage of promotion rather than at all

three stages of innovation. Moreover, Howell and Boise operationalized champion emergence as the presence or absence of a champion, and did not acknowledge the degrees of championship (Howell & Higgins, 1990; Howell et al., 2005). How effectively championship behaviors can influence the innovation process needs further research.

Lastly, the five power bases of influence-based leadership (Raven, 1992; Raven, Schwarzwald, & Koslowsky, 1998), namely, identification, expert knowledge/information, granting of degrees of freedom and autonomy, support for innovation, and openness in the decision-making process, were identified as the most relevant in affecting the innovative behaviors of followers (i.e., generation and testing of ideas and implementation of ideas) (Krause, 2004). Raven (1990) defined influence-based leadership as “a change in the belief, attitude, or behavior of a person (the target of influence) which results from the action, or presence of another person (the influence agent)” (p. 495). In other words, leadership was described through the forms of influence and power a leader shows to a follower. The leader draws on different underlying power bases to exert influence on the follower (Krause & Klöhn, 2002). Krause tested the effects of the five power bases on the generation and testing of ideas and implementation. However, the results showed that only granting freedom and autonomy as well as openness to decision making have the most positive effect on the innovative behaviors of followers. Although Krause (2004) separately examined the effects of power bases on idea generation and implementation, determining whether the five power bases selected from the power base inventory is conclusive is a significant limitation.

Deschamps (2005) raised the question, “Is there a specific and distinctive form of leadership for innovation?” (p.31) Several scholars have also argued for a closer look at

leadership behaviors that might fundamentally address the nature of creative work (e.g., Mumford et al., 2002; Tierney, 2008). They pointed out some inadequacies of current leaderships in explaining leaders' role in innovation process. Davenport (2001) noted that the old leadership model was formed to deal with a very different set of circumstances, and therefore, a new leadership model is required for the new era. A specific innovation-oriented leadership should be differentiated from conventional leadership theories because leadership effectiveness is measured by innovation, which is different from other types of leadership effectiveness such as in-role performance, satisfaction of followers, work attitudes, and so on. Innovation in organizational contexts is often a choice (Tierney & Farmer, 2002). Given a choice, employees often opt for routine over novel performance because, compared to a routine job, innovation requires more skills and knowledge, and it exposes employees to more risks. Therefore, specific leadership is needed to facilitate employees in performing innovative jobs and, at the same time, to encourage followers to embrace risks whenever necessary and protect them from the risk of criticisms. Innovation, by definition, is also achieved through three main phases or stages. Different challenges occur throughout these stages of innovation, and followers look up to their leaders to guide them through these obstacles and eventually achieve their innovative goals. The back-end of innovation requires a different combination of leader qualities and behaviors compared with the front-end of innovation (Deschamps, 2008). Therefore, the processes are important and help in understanding how leadership behaviors facilitate and assist innovation among followers.

However, most previous leadership theories do not specifically discuss how managers should lead effectively at different stages of innovation. Table 1 provides a summary of

the theoretical bases and findings, and acknowledges the innovation process and the inadequacies of the leadership theories aforementioned. Except for creative leadership, other leadership theories were not developed based on a well-defined process of innovation. Even the study of influence-based leadership is not process-based because the study did not distinguish leadership behaviors at different stages of innovation. In her study, Krause (2004) used two stages of innovation as two components of dependent variable to examine separately whether the five power bases can enhance both components of innovation. In that study, combining idea generation and testing in one stage might be problematic. Idea generation requires autonomies and a relatively free environment to stimulate thinking, whereas idea testing requires that strict procedures and criterion be followed to examine whether it is suitable for further implementation. Furthermore, the study neglected another important stage of innovation - idea promotion. The creative leadership of Basadur (2004), which leads people through a process of finding and defining problems, solving them, and implementing the new solutions, meets the expectation, overlooked the idea promotion stage, which is considered critical in the innovation process. Some leadership styles (e.g., transformational leadership) also consist of dimensions that enhance and promote innovation, whereas other dimensions may prohibit innovation. Some leadership styles may be particularly effective at certain stages while less relevant to other stages (e.g., championship). Emphasizing one leadership style too much (e.g., empowering leadership) may not necessarily enhance innovation, and excessive emphasis might even hinder innovation. The following sections will first conceptually describe what innovation-oriented leadership is to address the inadequacies of extant leadership theories in explaining the innovation process. Subsequently, based on

existing leadership theories and in-depth interviews, Study 1 will be conducted to identify leadership behaviors specifically to each stage.

**Table 1. Summary of existing leaderships relevant to innovation**

Leaderships	Theoretical bases	Empirical findings on stages of innovation			Process-based or not	Inadequacies
		Stage 1	Stage 2	Stage 3		
Empowering leadership	Empowering leadership theory (e.g. Ahearne et al., 2005; Zhang & Bartol. 2010)	+ve	unknown	unknown	No	<ul style="list-style-type: none"> <li>• Positive for generating ideas but may hinder implementation</li> <li>• Excessive autonomy may allow individuals to pursue their unique goals</li> </ul>
Unconventional leader Behaviors	Social learning theory	Main effect: n.s. only +ve interaction effect (role modeling x unconventional leader behaviors)	unknown	unknown	No	<ul style="list-style-type: none"> <li>• Intimidation perceived by followers may manifest itself in lower incidence of innovation</li> <li>• Unethical charismatic leaders even demands accepting without questions</li> </ul>
Transformational leadership	Transformational leadership (e.g., Bass, 1985)	+ve, -ve & no relationship	unknown	+ve	No	<ul style="list-style-type: none"> <li>• Some dimensions would hinder innovation rather than facilitating (e.g. idealized influence, inspirational motivation)</li> </ul>
Innovative leadership	e.g. Deschamps (2008)		unknown		No	<ul style="list-style-type: none"> <li>• Assuming leader is the locus of innovation</li> </ul>
Creative leadership	e.g. Basadur (2004)		unknown		Yes	<ul style="list-style-type: none"> <li>• Overlook the stage of idea promotion</li> </ul>
Championship	e.g. Howell & Higgins (1990)	n.s.	+ve	unknown	No	<ul style="list-style-type: none"> <li>• Mainly focused on the stage of promotion</li> </ul>
Influence-based leadership	Power & Influence (e.g. French & Raven, 1959)	granting degrees of freedom & autonomy, support for innovation and openness in the decision-making process +ve	unknown	granting degrees of freedom & autonomy, openness in the decision-making process and expert knowledge & information +ve	No	<ul style="list-style-type: none"> <li>• Not specifically designed for innovation</li> <li>• Not matching leadership behaviors with different innovation stages</li> <li>• Concern of Methodology fit</li> <li>• Parsimonious and Comprehensive? – Unknown!</li> </ul>

## ***Innovation-oriented leadership***

### *Definition*

As Isaksen (1983) claimed, creative problem solving or innovation requires a facilitative type of leadership. Rather than the leaders being innovative themselves, the objective of innovation-oriented leadership is to facilitate innovators' performance by encouraging their effective engagement in idea generation, promotion, and implementation, and ultimately achieve innovative performance or products. Innovation-oriented leadership occurs at the individual level. According to Yammarino and Markham (1992), an individual level of analysis signifies that relationships between leaders and followers are defined according to each subordinate's perception of their leader's behaviors. Correspondingly, innovation-oriented leadership is defined as to each employee's perception of their leader's behaviors that influence the innovator to fulfill the innovation targets throughout the innovation process. On the part of the leaders, innovation-oriented leadership is executed by displaying facilitative leadership behaviors at the idea generation stage, promotion stage, and implementation stage.

### *Dimensions*

A three-stage innovation process model is adopted in this study as mentioned in the previous sections. The approach of the qualitative study (Study 1) is to use this three-stage innovation process as a guide to code and categorize innovation-facilitating leadership behaviors that may enhance innovation among followers. Therefore, at least three dimensions of the innovation-oriented leadership are to be expected.

The first dimension consists of leadership behaviors that facilitate the generation of creative

ideas among followers. Rather than doing everything by themselves, leaders must transfer the ownership of problems or challenges encountered to the followers, giving them more autonomy to do their fact-finding and to define the problem in their own way. As creative work relies heavily on intellectual skills, leaders, by taking actions that encourage intellectual engagement, may do much to enhance idea generation. Through asking challenging questions and in-depth group discussions, innovation-oriented leaders can encourage followers to engage in critical thinking and think “out of the box.” In addition, previous studies showed the importance of providing support on idea generation (e.g., Bain, Mann, & Pirola-Menlo, 2001; Krause, 2004; Oldham & Cummings, 1996). Innovation-oriented leaders may exhibit idea support by shielding new ideas from premature evaluation, advocating new ideas, and recognizing the production of new ideas.

The second dimension mainly consists of championship behaviors identified by Howell et al. (2005). Championship has been established in the literature to mobilize ideas. Therefore, like champions, innovation-oriented leaders have to engage in idea promotion to get ideas heard and supported. Two aspects of championship behaviors proposed by Howell et al. (2005), namely, expression of enthusiasm and confidence about the success of the innovation and persistence under adversity, are expected to mobilize the ideas effectively.

The last dimension is predicted to include leadership behaviors that assist followers in implementing ideas. Idea implementation cannot be completed without resources. Hence, innovation-oriented leaders need to provide work support allowing access to the resources needed by employees to pursue the innovation processes (Mumford et al., 2002). The support can be material (e.g., manpower) and non-material resources (e.g., time). Moreover, leaders must ensure coordination and communication because idea implementation usually involves other



counterparts. Evaluating the implementation results in review meetings and discussing the problems encountered with employees also help effectively execute the ideas.

### ***Contextual factors and the innovation process***

Although leadership is claimed to be a vital driving factor of innovation (Jung et al., 2003), previous studies also suggested a wide range of contextual factors that may exert an impact on innovation (Oldham & Cummings, 1996; Woodman, Sawyer, & Griffin, 1993). Beyond the research on contextual factors and innovation, no attempt has been made to distinguish the impact of these factors on stages of innovation further, despite innovation being a process consisting of several stages.

Generating novel and useful ideas rests heavily on information-seeking, sharing, and discussing within a team (Janis & Mann, 1977; Paulus & Yang, 2000). Engaging in these activities is essential in the pursuit of creative solutions because it encourages members to share and learn from one another (Argote, Gruenfeld, & Naquin, 1999). Organizational and collective learning is considered a prerequisite for the development of innovation (Argyris, 1993). Team learning behavior (TLB) developed by Edmondson (1999) was conceptualized as an ongoing learning process of reflection and action, including seeking feedback, sharing information, asking for help, discussing errors, and experimenting. Learning behavior is about obtaining and sharing knowledge and making use of it (Gibson & Vermeulen, 2003); thus, it is conceptually more relevant to the stage of idea generation. Although they did not directly investigate TLB and innovation, in a recent study, Holman et al. (in press) revealed that learning strategies, which play a key role in shaping the learning process (Pintrich, 2000), were related only to idea generation but not to idea promotion and implementation. Holman et al. (in press) pointed out that the effects of learning strategies may be strongest on idea generation and other social factors such as social support, and may play a more important role in facilitating the promotion

of an idea and getting it implemented. Empirical evidence also suggested that team learning results in improvements in detecting and identifying problems (Hirokawa, 1990) and producing creative solutions (Maier & Solem, 1962), both of which are related to idea generation. TLB, to conclude, is expected to have a positive impact on idea generation.

The promotion of ideas requires interactions with people within and outside the organization, because idea promotion includes suggesting ideas to others, persuading others to adopt new ideas, and gaining approval and support for ideas (Elkins & Keller, 2003). Approval and support from stakeholders, including top management, other departments or units, and customers, must be obtained to further implement the new idea. Some innovations are new products required by or offered to customers. Hence, customers play a vital role in deciding whether the idea can be implemented. Therefore, social networks of individuals and their work contacts with people are important in idea promotion. Based on the concept of external work contacts developed by De Jong and Den Hartog (2010) which refers to the frequency of employees' contact with individuals or groups outside the organization, work contacts also include the contact with individuals or groups within the organization. Work contacts, accordingly, are defined as the frequency of employees' contact with individuals or groups within or outside the organization. Although the effect of work contacts on idea promotion was not directly investigated, some empirical evidence supported the positive effect of external contact on innovation. For example, contact with professionals outside the organization was found to be related to the increased adoption of innovations in Kimberly and Evanisko (1981). De Jong and Den Hartog (2010) also showed that external work contacts are positively

associated with the innovative work behaviors of employees.

Taking initiative was claimed to be critical to idea implementation because idea implementation cannot be planned in such a way that no unexpected problems, barriers, and setbacks occur along the way. Previous studies have found that personal initiative was influential on implementation (e.g., Hakanen, Perhoniemi, & Toppinen-Tanner, 2008; Miron, Erez, & Naveh, 2004; Wall, Jackson, & Davids, 1992). However, collective effort is even more critical at this stage because implementation requires cooperation and coordination. Teams play a pivotal role in processes such as innovation (Gibson & Vermeulen, 2003). Derived from the literature on personal initiative (Frese, Kring, Soose, & Zemple, 1996; Frese, Fay, Hilburger, Leng, & Tag, 1997), Baer and Frese (2003) introduced a climate for initiative that was conceptualized as “formal and informal organizational practices and procedures guiding and supporting a proactive, self-starting, and persistent approach toward work” (p. 48). They claimed that management support for a general climate for initiative is important for people to show initiative. According to the argument, the mechanism through which climate has an influence on outcomes is still the employee taking initiatives toward work. Thereby, in this study, team initiative will follow the definition of personal initiative, that is, to be conceptualized as behaviors rather than climate. Collective efforts and behaviors result in a team taking a proactive, self-starting, and persistent approach toward work. More specifically, like personal initiative, team initiative is characterized by its consistency with the organization’s mission, long-term focus, goal direction, and action orientation as self-starting and proactive.

### ***Substitutes for leadership theory (SLT)***

SLT explicitly takes into account a range of situational factors related to the leadership process, and enables a better understanding of the effect these factors exert on the relationship between leadership and outcome variables, innovation in this context. SLT explains that some leader behaviors are effective in some situations but not effective, or even dysfunctional, in other situations, because certain subordinate, task, and organizational characteristics may replace or reduce the effects of leadership (Wang & Rode, 2010).

Kerr and Jermier (1978) developed the substitutes for leadership model, the main notion of which is that certain characteristics of the subordinates (e.g., ability, experiences, training, and knowledge), the task (e.g., those that provide performance feedback and intrinsic satisfaction), and the organization (e.g., closely knit, cohesive work groups, and active staff personnel) may substitute for the impact of a leader's behavior. Based on their work, Howell, Dorfman, and Kerr (1986) refined the model by including neutralizers and enhancers of the relationship between leader behavior and associated outcomes. Although earlier conceptual work on SLT (e.g., Kerr & Jermier, 1978; Howell et al., 1986) indicated that leadership might become "unnecessary and impossible", Dionne et al. (2005) pointed out that what SLT emphasized is that "leadership was not the only major source of influence on followers in organizations" (p. 177). The way "substitutes" influence the impact of leadership on followers can be neutralizing, substituting, and enhancing.

The differences between neutralizers, enhancers, and substitutes were discussed in detail by Howell et al. (1986) and Podsakoff, MacKenzie, and Fetter (1993). According to

them, a neutralizer must meet the following conditions: both the main effect of the leader behavior and the interaction term on criteria must be significant, and they must have different signs characterizing a negative moderating influence on the leadership–criterion relationship. However, an enhancer must meet the conditions of the significant leader behavior main effect and the significant interactional effect, and they must have the same signs representing a positive moderating influence on the leadership–criterion relationship. A substitute should meet the two criteria of a neutralizer: (1) a significant main behavior of the leader on the criterion and (2) a significant interactional effect that must have a different sign than the main effect of leader behavior. An additional condition must be met which distinguishes a substitute from a neutralizer, that is, the substitute must have a significant main effect on the criterion variable in the same direction as the leader behavior’s main effect. A substitute both reduces and replaces the effect of leader behavior on the criterion.

The substitutes for leadership model was originally focused on substitutes for task-oriented or relationship-oriented leader behavior. Nevertheless, Kerr and Jermier also believed that the “elaboration of the substitutes construct must necessarily include the specification of other leader behaviors and other characteristics which may act as substitutes for leader behaviors” (1978, p. 397). Thus, the present study will investigate innovation-oriented leadership behaviors across innovation processes and the impact of team and individual characteristics on various stages. Villa et al. (2003) criticized previous research on the “substitutes for leadership model.” They argued that much of the research on the effects of substitutes on relationships between leader behaviors and follower outcomes lacked a sound theoretical rationale. Similarly, Gronn (1999) also

articulated that virtually no insight was provided by previous studies regarding the mechanics of substitution and the process by which substitutes achieve their effects. Thus, the current study will draw from the literature on organizational learning, network theory, and action theory to identify the contextual factors at different stages.

### ***Conclusion***

Based on the review of literature in this chapter, although an extensive amount of studies has been done to examine the impact of leadership on innovation, these studies focused mainly on a certain stage of innovation. No research has been done to examine empirically which leadership behaviors are effective and associated with increased performance at each stage of innovation. The existing types of leadership are not designed to cater to the different requirements and tasks of each stage of innovation process. In other words, the existing types of leadership are inadequate to explain the whole innovation process. Besides, although previous research has revealed several contextual factors that favor the development and expression of innovation, none of them systematically examined which factors play a role at idea generation and which factors are effective at idea promotion and implementation. How these factors interact with innovation-oriented leadership to influence employee performance at each innovation stage also remains unknown.

Thus, in the next chapter, based on a combination of literature research and in-depth interviews, Study 1 will be conducted, eliciting leadership behaviors and matching these behaviors with each stage of innovation. The factor structure of innovation-oriented

leadership will be examined by exploratory factor analysis (EFA) using a sample of part-time MSc students. Based on the results of Study 1, the development of the hypotheses will be presented in Chapter 4, explaining why innovation-oriented leadership can enhance the performance of innovation from idea generation to implementation. Additionally, in what ways contextual factors influence the innovation-oriented leadership–performance linkage will be clarified using SLT. Consequently, with a sample consisting of respondents whose job intensively requires innovation, Study 2 will be conducted to test these hypotheses empirically. Finally, Study 3 will be conducted using a sample of front-line workers of the manufacturing industry, which is different from the sample of Study 2, to verify and confirm the findings of Study 2. Objective measures of innovative performance will also be introduced in Study 3 to examine the effectiveness of innovation-oriented leadership further.



## **CHAPTER 3. STUDY 1 QUALITATIVE STUDY - ELICITATION**

### ***Methods***

#### ***Sample and procedures***

Employees of a semiconductor company headquartered in Hong Kong were invited to participate in Study 1. The company's core function is new integrated circuit (IC) product development. Fifteen individual interviews were conducted to identify critical leadership behaviors that facilitate or inhibit innovation. The interviewees included seven R&D engineers, six production engineers, and two marketing engineers. R&D engineers, product engineers, and marketing engineers represent the three major jobs of the company. They were selected because these engineers are "technical innovators" who design and develop new products. These professionals have a combined background in engineering, marketing and sales. They mainly focus on one or two stages of innovation but also have chances to get involved in the entire innovation process. For example, though R&D engineers are responsible for new product design, they also need to contact with customers to introduce and promote the products. They can identify whether their leaders' behaviors are facilitative or inhibitive to innovation, across three stages. Among the 15 interviewees, 2 were females and the average age was 32.5 years. All 15 engineers obtained a bachelor's degree or above, and their average organization tenure was 3.8 years.

Critical incidence technique (Flanagan, 1954) was used to structure the interview questions. Instead of asking the interviewees their perceptions of what a leader should do, the interviewees were required to recall a successfully implemented innovation. They

were then asked to describe the behaviors of their leaders in this innovation. The engineers were also asked to think of a failed innovation and then describe the behaviors of their leaders. The interview questions were the following: (1) Please recall a task that you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively? (2) Referring to the task you performed innovatively, what is the process or how many stages did the task contain? (3) Can you describe the key factor(s) that made you innovative in the task? (4) Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned? (5) Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages? All interviews were conducted in Chinese, each lasting 30 minutes to 40 minutes. The 15 interviews were tape-recorded and then transcribed (see Appendix 1 & Appendix 2).

## ***Results***

Two experienced coders conducted content analysis of the data using an open-coding approach (Strauss & Corbin, 1998) to identify leadership behaviors found in the individual interview transcripts. Each individual independently coded leadership behaviors mentioned in the interviews. Compared to the leadership behaviors for idea generation and idea implementation, only a few behaviors for promotion were solicited from the interviews (e.g., gets experienced peers outside the team heard and understood the new ideas), and thus championship behaviors (Howell et al., 2005) were incorporated into the leadership behaviors. The coded behaviors and championship behaviors were

then sorted into three categories. Redundant items with the same meanings were dropped and so did the behaviors that could not be sorted into any of the categories. The sorted behaviors of two coders were then compared, and over 90% of the sorting was consistent. The two coders discussed the behaviors sorted to different categories and reached an agreement on sorting. Finally, 46 behaviors coded from the transcriptions and 11 behaviors from the championship behaviors were grouped into the construct (i.e., idea generation, idea promotion, and idea implementation) according to their conceptual similarities.

The classification consisted of three categories of innovation-oriented leadership behaviors, namely, leadership behaviors for idea generation, idea promotion, and idea implementation. Behaviors for idea generation refer to a set of behaviors that facilitate generation of novel and useful ideas among followers and comprise the first step of innovation. This category includes behaviors such as asking challenging questions to encourage critical thinking and giving followers support and autonomy. A sample behavior is “Shares personal experiences, comments, insights, or past cases.” Behaviors for idea promotion incorporate activities in expressing enthusiasm and confidence on innovation and persisting under adversity. The following is an example: “Points out reasons the innovation will succeed.” Behaviors for idea implementation involve behaviors that assist followers in implementing the ideas. Behaviors such as liaising with other departments and providing resources are included in this category. An example is “Strives for sufficient manpower to carry out the innovation.”

### ***Exploratory factor analysis***

The survey of 57 leadership behaviors was in both Chinese and English to ensure the accuracy of results. Innovation-oriented leadership behaviors were studied with the combination of qualitative interviews and a literature review, while the championship behavior scale was originally developed in English and then translated to Chinese by one experienced translator. One university faculty then back-translated the items independently. Following the procedures described by Brislin, Lonner, and Thorndike (1973) and Brislin (1980), the back-translated English version was then compared with the original items for equivalency and agreement. No discrepancies between the two were found. Behaviors coded from interviews were originally developed in Chinese; hence, these items were translated to English. Similarly, the translation and back-translation of these behaviors followed the procedures suggested by Brislin et al. (1973) and Brislin (1980).

The 57 leadership behaviors were administered to 200 part-time business-related MSc students working in a broad cross-section of organizations. One hundred and fifty usable questionnaires were returned. All of the 150 students were Chinese and could understand both Chinese and English. Among these students, 48.8% were male and the average age was 32 years. They had an average of 4.9 years of work experience. All of them had obtained a bachelor's degree and were pursuing their Masters degree.

Following the suggestion of Arnold et al. (2000), a two-pronged approach was taken in the analysis of the instrument. First, a set of analyses using the 57 individual items was performed. For each dimension of innovation-oriented leadership, a correlation matrix was obtained to examine the inter-item and item-total correlations. Inter-item and item-

total correlations were suggested to be at least .30 to .40 (Ferketich, 1991; Gliem & Gliem, 2003; Knapp & Brown, 1995). Accordingly, items with low inter-item and item-total correlations ( $< .40$ ) were deleted, resulting in 38 items for further testing in the second set of analyses.

The factor structure of the innovation-oriented leadership behaviors was assessed using EFA. The students used a 7-point (1, “not at all” to 7, “always”) scale to rate the frequency of leadership behaviors. The multidimensionality of leadership behaviors was evaluated using principal component extraction with varimax rotation. As predicted, three factors were extracted with eigenvalues greater than 1. Factor 1 contained 10 items relating to leadership behaviors facilitating idea generation among followers, which explained 20.69% of the variance. Factor 2 consisted of 11 items focusing on the leadership behaviors for idea promotion, which explained 20.45% of the variance. Nine items pertaining to the leadership behaviors assisting idea implementation comprised Factor 3, which explained 15.69% of the overall variance in the 38 items. The cumulative variance explained by the three factors was 56.83%. Items were retained in a factor if they had a loading at or above .65 on that factor and cross-loadings at or below .40 on the other two factors (Howell et al., 2005). The retained 30 items together with the loadings and cross-loadings are presented in Table 1. “Continues to be involved with the innovation until it is implemented” was dropped because conceptually it did not fit the dimension as suggested by EFA results even though it loaded highly and distinctively on the dimension. The internal consistency of the overall innovation-oriented leadership behavior scale was evaluated (Cronbach’s  $\alpha = .97$ ). Reliability estimates are .93, .96, and .92 for the idea generation, idea promotion, and idea implementation scales,

respectively.

**Table 2. Results of exploratory factor analysis of innovation-oriented leadership behavior scale**

	Component		
	1	2	3
<b><i>Retained Items</i></b>			
Shares personal experiences, comments, insights or past cases	<b>0.70</b>	0.20	0.13
Questions our ideas in a constructive way	<b>0.69</b>	0.28	0.26
Gives a modest spur to induce us to come forward with valuable contributions	<b>0.65</b>	0.22	0.26
Helps us free from bureaucracies, rules, regulations and policies	<b>0.65</b>	0.20	0.30
Creates an atmosphere of autonomy	<b>0.77</b>	0.20	0.13
Leads all team members to carry in depth discussions on the problem	<b>0.67</b>	0.27	0.19
Encourages diversified and divergent inputs	<b>0.69</b>	0.18	0.27
Helps conclude the suggestions and ideas	<b>0.78</b>	0.15	0.25
Ensures discussions focus on the problems and are not sidetracked	<b>0.66</b>	0.35	0.30
Gets experienced peers outside the team heard and understood the new ideas	0.30	<b>0.67</b>	0.38
Expresses strong conviction about the innovation	0.15	<b>0.75</b>	0.28
Expresses confidence in what the innovation can do	0.04	<b>0.76</b>	0.36
Points out reasons why the innovation will succeed	0.08	<b>0.67</b>	0.33
Shows optimism about the success of the innovation	0.07	<b>0.71</b>	0.28
Keeps pushing enthusiastically	0.19	<b>0.78</b>	0.13
Sticks with it	0.22	<b>0.77</b>	0.22
Shows tenacity in overcoming obstacles	0.35	<b>0.82</b>	0.22
Continues to be involved with the innovation until it is implemented	0.36	<b>0.79</b>	0.18
Knocks down barriers to the innovation	0.21	<b>0.78</b>	0.28
Persists in the face of adversity	0.38	<b>0.69</b>	0.23
Provides the right tools and equipments to do the task properly	0.20	0.35	<b>0.69</b>
Strives for sufficient manpower to carry out the innovation	0.18	0.26	<b>0.71</b>
Liaises with other parties/departments to make sure cooperation	0.26	0.39	<b>0.65</b>
Articulates our requirements and standards with other parties	0.23	0.33	<b>0.68</b>
Sets up regular meetings to review the implementation results	0.21	0.26	<b>0.65</b>
Invites experienced peers to attend and contribute to the innovation review meeting	0.28	0.26	<b>0.66</b>
Raises questions and gives feedbacks in the innovation review meeting	0.21	0.21	<b>0.78</b>
Establishes a shared understanding of desired results among the various parties	0.38	0.19	<b>0.69</b>
Checks and evaluates the performance of the innovation	0.37	0.22	<b>0.67</b>
Be actively involved in solving problems with us during implementation	0.38	0.27	<b>0.65</b>
Eigenvalues	7.96	7.77	6.53
Percent (%) of variance explained	20.69	20.45	15.69

## ***Discussion***

In this study, 15 engineers in an IC design firm in Hong Kong were interviewed. Based on these interviews and championship behaviors from the literature (Howell et al., 2005), leadership behaviors were sorted into three categories, which resulted in 57 items. EFA was conducted to examine the factor structure using a sample of part-time graduate students. Thirty behaviors were retained under three factors. The 29 behaviors will be further tested and validated with confirmatory factor analysis (CFA) in Studies 2 and 3. In addition, on the basis of these leadership behaviors, hypotheses will be developed to examine the role of innovation-oriented leadership behaviors at each stage of innovation, controlling for the effect of the most prevailing leadership, transformational leadership. Contextual factors alongside the role of the leader will be tested as well.



## CHAPTER 4. THEORY AND HYPOTHESES

### *Innovation-oriented leadership vs. transformational leadership*

Transformational leadership, defined as a style of leadership that transforms followers to rise above their self-interest by altering their morale, ideals, interests, and values, motivating them to perform better than initially expected (Bass, 1985; Yukl, 1999), is the most studied leadership linked to innovation, especially idea generation. As mentioned in the literature review, on one hand, through intellectual stimulation and individual consideration, transformational leaders encourage employees to think “out of the box” and generate novel ideas (e.g., Jung et al., 2003; Sosik et al., 1997). On the other hand, some scholars contended that by reinforcing the shared norms and encouraging followers to be “team players,” transformational leaders may restrict the creative thinking of employees and cause the employees to act merely according to what is expected of them (e.g., Basu & Green, 1997; Mumford et al., 2002). Based on these arguments and the mixed empirical findings on transformational leadership on innovation, Pieterse et al. (2010) contended that a straightforward main effect of transformational leadership on innovative behavior is quite unlikely. The positive relationship between transformational leadership and innovative behaviors depends on the circumstances of high psychological empowerment of employees. Indeed, the results of Pieterse et al. (2010) showed that transformational leadership was not related to the innovative behaviors of followers.

Besides, innovation is a continuing process that consists of stages. Transformational leadership behaviors are not adaptive to the changes of requirements of each stage. The impact of transformational leadership on idea generation remains inconclusive. Although transformational leadership was argued to be associated with

innovation implementation behaviors, the impact of transformational leadership on implementation behaviors was mainly executed by enhancing the commitment to change of followers, which is more proximal to the engagement of employees in implementation behaviors. Commitment to change was found to mediate fully the link between transformational leadership and innovation implementation behaviors (Michaelis et al., 2010). In addition, how transformational leadership can effectively enhance the idea promotion performance of employees remains unknown.

On the contrary, innovation-oriented leadership, defined as leadership behaviors that influence and get followers to fulfill the objectives of an innovation process through displaying facilitative behaviors at the idea generation stage, the promotion stage, and the implementation stage was designed to cater to the specific requirements and tasks of each innovation stage. Through different behaviors according to the various requirements of each stage, innovation-oriented leaders can directly influence and enhance the innovative performance of employees stage by stage. For example, innovation-oriented leaders can grant autonomy, protect employees from bureaucratic constraints, provide idea support, and encourage team discussions and divergent thinking to facilitate idea generation. Compared with transformational leadership, which usually exerts its influence on innovation through heightened intrinsic motivation and psychological empowerment (e.g., Gumusluoglu & Ilsev, 2009), commitment to change (e.g., Michaelis et al., 2010), and efficacy (e.g., Gong, Huang, & Farh, 2009), these behaviors are more proximal and direct to encourage innovation. Consequently, when comparing the effectiveness of innovation-oriented leadership as a whole with transformational leadership, the effectiveness of innovation-oriented leadership on employee innovation (including leaders' subjective ratings of innovative work behaviors, objectively measured quantity of innovations and quality of

innovations) is arguably more direct and stronger than that of transformational leadership. Therefore, the following are proposed:

*Hypothesis 1a. Employee perception of leader's innovation-oriented behavior is positively related to individual's innovative work behaviors and this positive effect is stronger than that of transformational leadership.*

*Hypothesis 1b. Employee perception of leader's innovation-oriented behavior is positively related to the quantity of innovations, and this positive effect is stronger than that of transformational leadership.*

*Hypothesis 1c. Employee perception of leader's innovation-oriented behavior is positively related to the quality of innovations, and this positive effect is stronger than that of transformational leadership.*

(Note: The quantity and quality of innovations will be discussed in Chapter 6 and Hypothesis 1b and 1c would be tested in Study 3.)

### ***Innovation-oriented leadership – the role of leaders in idea generation***

The major role of innovation-oriented leaders at the first stage of innovation is to encourage and elicit the generation of novel and useful ideas among employees. Encouraging intellectual engagement was claimed to be associated with creativity, and its positive impact on creativity was supported by several studies (e.g., Enson et al., 2001; McGourty, Tarshis, & Dominick, 1996; Tse & Chiu, forthcoming). Creative work is highly reliant on intellectual skills and knowledge. Thus, leaders, by taking actions that encourage intellectual engagement, may do much to enhance idea generation. These actions include, for example, asking challenging questions to activate creative thinking, leading in-depth team discussions, and inspiring employee

ideas by bringing forth their own initial thoughts, which provide opportunities for employees to exchange information and ideas and help stimulate innovation.

Granting autonomy to followers is the second common practice that leaders can employ to foster idea generation. Granting autonomy makes followers feel empowered and increases their intrinsic motivation. Empowerment and intrinsic motivation are widely believed to be proximal predictors of creativity (e.g., Deci, Connell, & Ryan, 1989; Zhang & Batol, 2010). In addition, in the work of Krause (2004) on influence-based leadership, the influence of autonomy on idea generation was directly examined and found to be positive for generating ideas. Innovative leaders also facilitate idea generation by removing bureaucracies, policies, regulations, and rules. Such bureaucratic constraints were considered as controls that proved to inhibit the generation of ideas (Madjar, Oldham, & Pratt, 2002). As long as goals are clarified, allowing employees autonomy can help them generate more novel ideas.

Various studies on creativity or innovation showed the importance of support (e.g., Bain, Mann, & Pirola-Menlo, 2001; Krause, 2004; Oldham & Cummings, 1996). Idea support is especially vital in initial idea generation (Mumford et al., 2002). Innovation-oriented leaders may exhibit idea support by protecting new ideas from premature evaluation and criticism. Criticism when ideas are still in the formative stage may result in employees withdrawing from generating ideas (Galluchi, Middleton, & Kline, 2000). Innovative leaders may provide feedback and ask questions in a constructive manner rather than a critical one. Innovation-oriented leaders can also support idea generation by ensuring that discussions focus on the problems and are not sidetracked. The leaders may also use their expertise and knowledge to summarize and conclude ideas, which would also support idea generation. To conclude, through encouraging intellectual engagement, granting

autonomy, and providing idea support, innovation-oriented leadership can result in improvement in idea generation. This leads to the following hypothesis:

*Hypothesis 2a. Employee perception of leader's behaviors for idea generation (IL1) is positively related to the individual's generation of novel and useful ideas.*

### ***Team learning behavior as a substitute***

Apart from the active role that innovation-oriented leaders played in idea generation, in the light of SLT, some individual, task, and organizational characteristics may also have a considerable impact on the first stage of innovation. A review of the literature showed that team learning was conceptually relevant to idea generation because engaging in team learning facilitates team members to acquire, share, refine, or combine task-relevant knowledge (Argote et al., 1999), a necessary condition to generate novel and useful ideas. Sarin and McDermott (2003) also claimed that creativity can be viewed as a consequence of the learning process.

TLB was developed and conceptualized as an ongoing learning process of reflection and action (Edmondson, 1999). The learning process pertains mainly to activities including asking questions, challenging assumptions, seeking different perspectives, evaluating alternatives, and reflecting on past actions (Edmondson, 1999, 2002; Gibson & Vermeulen, 2003). Edmondson (1999) argued that through these activities, teams can detect changes in the environment, understand the requirements of customers, improve members' collective understanding of a situation, or discover unexpected consequences of previous actions. Hirst et al. (2009) pointed out that TLB encourages learning by increasing the knowledge and information available to team members. TLB also creates a context in which it is easier to learn and reduce the

psychological risks associated with learning. Team members are, in turn, motivated to engage in learning under such context. The impact of learning behavior on idea generation is also through encouraging social learning processes (Rosenthal & Zimmerman, 1978). Team members may see that learning is valued and supported when they observe their peers engaging in learning activities. Hence, they will also be willing to get involved.

Most of the studies related to TLB found that learning was positively linked to higher team performance. For example, Edmondson (1999) found that TLB was positively associated with team performance. Consistently, Van Der Veegt and Bunderson (2005) also proposed that TLB mediated the relationship between expertise diversity and team performance, confirming the positive effect of team learning on team performance. Some empirical evidence showed that TLB was also related to creativity. Hirokawa (1990) found that team learning led to improvements in problem detection and identification. Maier and Solem (1962) confirmed that team learning resulted in the production of higher creative solutions. Team learning and the application of knowledge were also found to lead to more innovative output (Sarin & McDermott, 2003). The results of these studies suggested that team learning favors the development and generation of ideas and innovation.

TLB was hypothesized as a moderator of the relationship between individual dispositions (i.e., goal orientations) and creativity (Hirst et al., 2009). Hirst et al. (2009) were the only ones who investigated the moderating role of TLB, and they found that TLB helped “bring out” the positive relationship between the learning goal orientation and creativity. How would TLB play a role in the relationship between leadership and employee outcome? As noted above, TLB is expected to have a direct impact on idea generation. According to SLT, TLB may suppress the relationship

between leadership behavior for idea generation and the correspondent employee performance. Specifically, leadership may be less strongly related with the generation of ideas when the team is engaged in learning than when it is not. In a team with low TLB, which is characterized by low levels of information seeking and shared reflection, leadership behaviors encourage, stimulate, and facilitate employees to undertake information seeking and sharing as well as error discussing, and these actions will constitute an important role in enhancing idea generation. In contrast, the role of innovation-oriented leadership is of less importance in an environment where team members actively get involved in learning activities. Under such circumstances, innovation-oriented leadership may produce a weaker effect on idea generation because the TLB has already provided the necessary support. Based on the above discussion, TLB would reasonably have a positive impact on idea generation. In addition to that, based on the parallel behavioral and psychological mechanisms described between TLB and innovation-oriented leadership, TLB replaces part of the effectiveness of innovation-oriented leadership on idea generation. Accordingly, the following is proposed:

*Hypothesis 2b. Team learning behavior moderates the positive relationship between IL1 and idea generation in such a way that this relationship is less positive when TLB is high than when it is low.*

### ***Innovation-oriented leadership: the role of leaders in idea promotion***

The second stage in the innovation process is the promotion or mobilization of ideas generated in the first stage (Mumford et al., 2002). To mobilize the ideas, leaders actively and enthusiastically promote the ideas to gain support from the

stakeholders and to obtain resources (Howell & Shea, 2001). Idea promotion is critical in the innovation process because the creative idea can be implemented and turned into an innovation only when the idea gets accepted by stakeholders and when support and resources are secured. Championship (Howell & Higgins, 1990), as reviewed previously, describes a set of behaviors mainly focusing on the promotion of ideas.

Much of the extant research on championship behaviors assumes that champions informally emerge in an organization. In other words, the formal leader does not necessarily play the role of idea promotion. In the same vein, Mumford et al. (2002) claimed that product champions are people outside the creative group as long as they are highly networked and persuasive. Nevertheless, Ashford, Rothbard, Piderit, & Dutton (1998) and Daft (1978) contended that change-initiated behaviors (e.g., issue selling, innovation) are more likely to be accepted or favorably evaluated when they are conducted by people whose functional background or job position supports their behavior. Accordingly, formal leaders of the innovation team are fitted to be responsible for idea promotion. Their positions grant them the power and authority to acquire resources and to persuade the management level as well as outsiders (i.e., customers) to accept the innovation. Thus, innovation-oriented leaders need to engage actively in idea promotion activities instead of seeking out others to take the role of champions.

In the early work on championship, championship behaviors were conceptualized as selling the idea (e.g., Roberts & Fusfeld, 1988) and obtaining the support of stakeholders (e.g., Burgelman, 1983). Chakrabarti and Hauschild's (1989) model of the division of labor in innovation management expanded the previous works, and found that forming the goals, motivating others to get involved, and dealing with



opponents are part of championship. Howell and Higgins (1990) provided some support for Chakrabarti and Hauschild's (1989) model. They concluded that champions also communicate a clear vision of what the innovation could be or do, display enthusiasm about innovation, demonstrate commitment to it, and involve others in supporting it. Based on these studies, leaders who want to mobilize ideas must express enthusiasm and confidence about the success of the innovation and remain persistent under adversity (Howell et al., 2005). Although Howell et al. (2005) found that the involvement of the right people composes the third dimension of championship behaviors, placing problems in the hands of those who can solve them is more relevant to when ideas proceed to execution.

By expressing strong conviction and confidence about the innovation, innovation-oriented leaders can persuade stakeholders that the innovation is worth pursuing, and thus facilitate enlistment of support and overcome resistance of key stakeholders. In addition to the expression of strong conviction in the innovation, innovation-oriented leaders also persist under adversity given the negative attitudes of managers to creative work (Basadur et al., 1992) and resistance and the opposition from stakeholders. Hence, innovation-oriented leaders, through their persistence in the face of adversity, can overcome barriers and obstacles from stakeholders and guide projects through the approval hurdles. Accordingly, the following can be expected:

*Hypothesis 3a. Employee perception of leader's behaviors for idea promotion (IL2) has a positive impact on individual's performance of idea promotion.*

### ***Work contacts as a substitute***

The key to idea promotion is to get ideas heard by the stakeholders, acquire approvals from them, and garner support and resources for ultimate implementation of the ideas. Thus, a well-developed network of connections is crucial (Mumford et al., 2002). Interpersonal interaction refers to contact with diverse associates within or external to the firm (Perry-Smith & Shalley, 2003). Accordingly, these associates constitute a critical role at this stage of innovation. Perry-Smith and Shalley (2003) studied creativity from the perspective of the social network theory by focusing on the role of two social factors, interpersonal communication and interpersonal interaction. They discussed the mechanisms through which the social context influences creativity, including network ties (weak ties vs. strong ties) and network position (central vs. peripheral). The essence of the two mechanisms Perry-Smith and Shalley suggested is the frequency of interactions as well as the accessibility of diverse information and knowledge. Exposure to a range of projects, people, and ideas tends to increase the acquisition of external information and thus promote creativity (e.g., Basadur & Head, 2001; Farris, 1969; Pelz & Andrews, 1966, 1976).

Work contacts include both external contacts (De Jong & Den Hartog, 2010) and internal contacts to capture the interpersonal interactions of employees. The work contacts of employees are defined as the frequency of employees' contact with individuals or groups within or outside the organization. Contacts with people outside the team or even outside the organization provide opportunities for individuals to approach people with different backgrounds, areas of specialization, and work responsibilities, which are documented as typical diversity types relevant to creativity (Amabile et al., 1996; Andrews, 1979). Some examples of external work contacts can be customers (Kanter, 1988), professionals outside the organization (Kimberly &

Evanisko, 1981), and scientists (Kasperson, 1978). Internal work contacts include associates with peers outside the team and non-immediate supervisors or senior managers not directly in charge of the team. These people are critical in the decision of whether a new idea can be further implemented or not. De Jong and Den Hartog (2010) also pointed out that interaction with diverse associates and increased communication with others are helpful in the promotion of ideas. Individuals with frequent work contacts have a more diverse network with many weak ties, because these work contacts are usually characterized by little affect or social exchange. The access to diverse social circles provided by these weak ties facilitates several processes helpful for idea promotion, including getting ideas heard, gaining approval and support, and finding resources for implementation.

Some empirical evidence supported the positive effect of external contact on innovation. For example, contact with professionals outside the organization was found to be related to the increased adoption of innovations in Kimberly and Evanisko (1981). De Jong and Den Hartog (2010) also showed that external work contacts were positively associated with the innovative work behaviors of employees. When employees have various work contacts, indicating that they have more opportunities to get their ideas heard by stakeholders and thus help promote the ideas, the role of leaders in idea promotion will be weakened or replaced. This leads to the following hypothesis:

*Hypothesis 3b. Work contacts moderate the positive relationship between IL2 and the idea promotion in such a way that this relationship is less positive when individuals have more frequent work contacts than when they do not.*

## ***Innovation-oriented leadership – the role of leaders in idea implementation***

When creative ideas are accepted, innovation-oriented leaders should then focus on helping getting the ideas implemented. Mumford et al. (2002) emphasized that the various complex interactions involved in implementation place another set of demands on leaders. Implementation of ideas requires resources and relies highly on the involvement of others (Van de Ven, Angle, & Poole, 1989). Accordingly, innovation-oriented leaders need to manage resources and provide support to facilitate idea implementation (Nohari & Gullati, 1996). Moreover, coordination with other counterparts from multiple teams or departments and the timelines of the implementation must be well planned.

The support of leaders for innovation is critical for idea implementation (Michaelis et al., 2010; Sharma & Yetton, 2003). The support for idea implementation is different from that of idea generation. Instead of idea support, innovation-oriented leaders provide work support, which allows access to the resources needed by people to pursue the innovation processes (Mumford et al., 2002). Innovation-oriented leaders should ensure that sufficient resources are given to their followers. Implementation takes an extensive amount of time because in turning the ideas into finished products, the failures and barriers that are time-consuming to overcome might be encountered. Thus, without the support and resources ensured by the leaders, ideas would remain dormant and unimplemented. An empirical work by Ekvall and Ryhammer (1999) endorsed the important role that work support plays in implementation. They found that among a variety of organizational variables they analyzed, the availability of resources was the strongest impetus of innovative results.

Implementation usually involves others. Hence, collaboration between different

parts is important. Through liaising with other parties or departments to make sure cooperation and articulating requirements and standards to them, innovation-oriented leaders ensure that ideas can be successfully executed. Mumford, Hunter, Eubanks, Bedell, and Murphy (2007) mentioned that facilitation of requisite internal and external collaboration is critical under conditions when many interactions are occurring in multiple teams. Innovation-oriented leaders, by establishing a shared understanding among the various teams and achieving a level of commonality and continuity, can enhance collaboration and thus facilitate implementation actions (Greenberg, 1992). When multiple parties are interacting to produce innovation, establishing a shared understanding by leaders is important, as emphasized by Dunham and Freeman (2000) in their qualitative analysis of play directors. The study of Kidder (1981) on the development of a new computer, considered as an innovation process, also showed evidence that ensuring a shared understanding among teams and framing future actions is vital to execute ideas.

Lastly, unexpected problems, barriers, and setbacks might occur in innovation implementation. Therefore, regular reviews and evaluation of the implementation results can assist in the successful execution of ideas. Runco and Chand (1994) supported that implementation depends on evaluation. Through setting up regular meetings to review the implementation results, inviting experienced peers to contribute to and comment on the implementation, and asking questions and giving feedback in the innovation review meeting, innovation-oriented leaders can enhance the performance of idea implementation. Therefore, the following is expected:

*Hypothesis 4a. Employee perception of leader's behaviors for idea implementation (IL3) is positively related to individual's idea implementation performance.*

### ***Team initiative as a substitute***

During innovation implementation, employees may encounter unexpected problems, obstacles, and setbacks. These problems must be anticipated and dealt with proactively to assure the efficient functioning of ideas. The implementation of a new idea often implies taking the initiative to implement the idea (Amabile, 2000; Kanter, 1988; Mumford & Gustafson, 1988; Van de Ven, 1986). Taking an active and self-starting approach to work and engaging in proactive behaviors were discussed in the initiative literature, whereas most of the other studies were about personal initiative (e.g., Hakanen, Perhoniemi, & Toppinen-Tanner, 2008; Miron, Erez, & Naveh, 2004; Wall, Jackson, & Davids, 1992). Frese et al. (1996) defined personal initiative as “a behavior syndrome resulting in an individual’s taking an active and self-starting approach to work and going beyond what is formally required in a given job” (p. 38). Group and organization characteristics are believed to have a stronger impact on the implementation of ideas than the other two stages of innovation (Axtell et al., 2000) because intensive cooperation and coordination are required at this stage. Given that idea implementation requires collective effort, team initiative is even more critical at this stage.

Team initiative is defined as the collective efforts and behaviors that result in a team taking a proactive, self-starting, and persistent approach toward work. According to the action theory (Frese & Sabini, 1985; Frese & Zapf, 1994; Hacker, 1985), actions are guided by goals (Miller, Galanter, & Pribram, 1960), which are developed according to the work tasks. Through a redefinition process, team members transform externally given tasks into long-term focused goals (Frese et al., 1996). An action-oriented team quickly transforms these goals that pertain to the successful execution of ideas into actions to prevent problems and overcome obstacles that occur during

implementation which, in turn, enhances the performance of idea implementation.

Evidence from a variety of sources highlights the potential value of initiative on innovation. For instance, Miron et al. (2004) found that people must take the initiative of implementing their ideas to transform these into valuable products. Initiative moderates the effect of creativity on innovative performance. Hakanen et al.'s (2008) study also supported that personal initiative had a positive effect on perceptions of work-unit innovativeness. When initiative is manifested by the climate of an organization, Baer and Frese (2003) found that it was strongly related to innovativeness, and climate for initiative moderated the relationship between process innovation and performance.

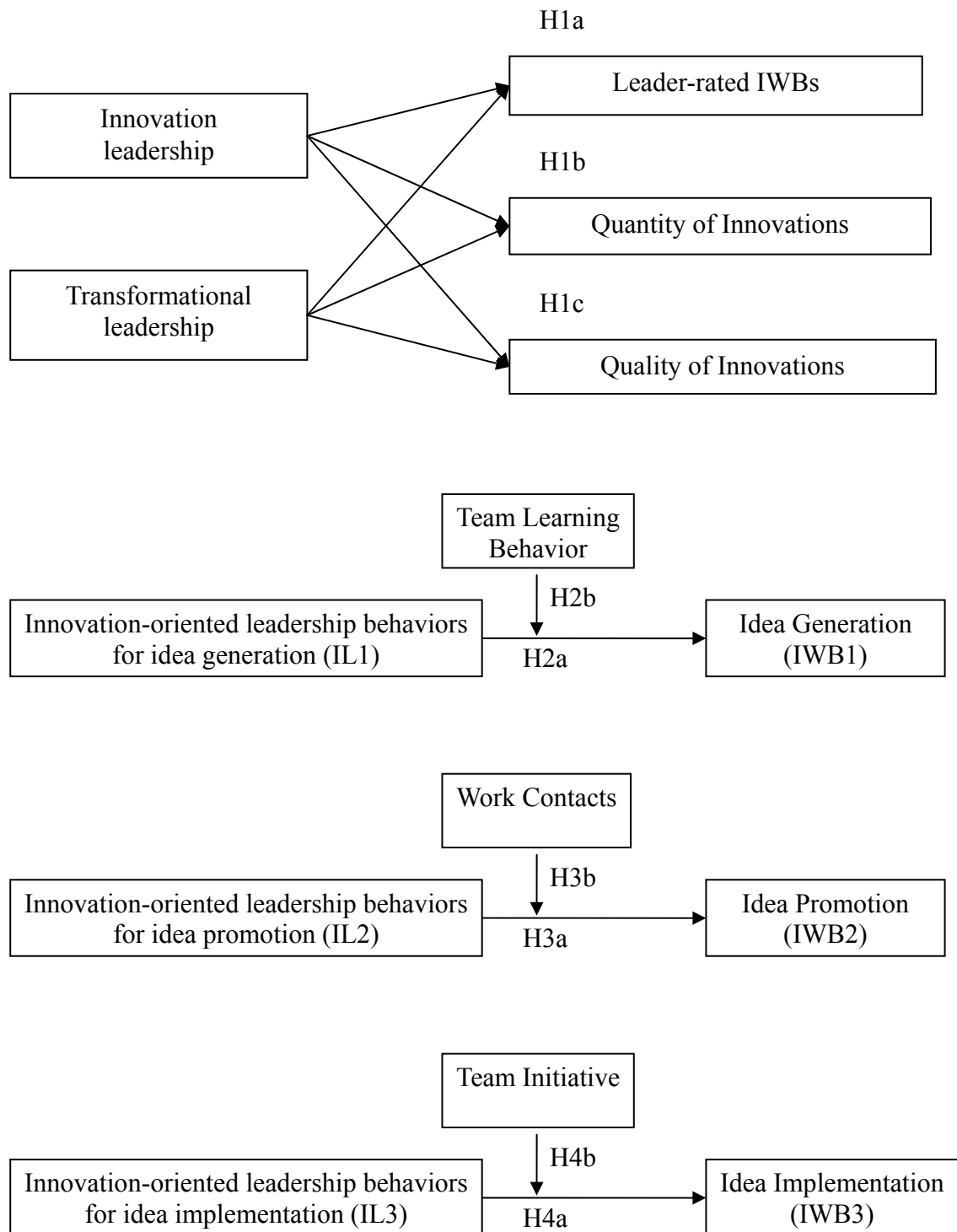
Michaelis et al. (2010) were the first to investigate directly the impact of individual perceptions of organizational climate for initiative on the implementation behaviors of employees and its moderating effect on the transformational leadership and implementation behavior linkage. The climate for initiative was conceptualized as the personal perceptions of initiative climate of the organization. Hence, this climate was measured at the individual level. Michaelis et al. (2010) argued that when employees perceive high levels of climate for initiative, employees respond more strongly and positively to transformational leader behaviors, which leads to the exhibition of more innovation implementation behaviors. Conversely, the current study argues that team initiative should replace part of the effectiveness of leadership on idea implementation. According to Kotter (1990), a fundamental function of leadership is “constructive or adaptive change” (p. 5). Based on this argument, Morrison and Phelps (1999) claimed that taking charge can be viewed as demonstrating a form of leadership that is not formal but informal. The informal influence is especially important in organizations characterized as less hierarchical

and more reliant on cross-functional teams. In the absence of team initiative, team members may not proactively take actions when things go wrong. Leaders would play a vital role in assuring resources and support, encouraging employees to reflect and discuss the problems during the implementation process, and regularly evaluating and reviewing the implementation results. On the contrary, when team initiative is high, employees will demonstrate informal leadership by taking actions to prevent problems and errors that lead to serious disruptions in implementation and dealing with these problems with high persistence. These actions that facilitate implementation are self-started even if nobody is around to help or give orders (Baer & Frese, 2003). Thus, being proactive and taking initiative by the team would substitute for the effectiveness of leadership. Moreover, team initiative should substitute for the positive impact of innovation-oriented leadership on innovation at the stage of idea implementation. Thus, the following is expected:

*Hypothesis 4b. Team initiative moderates the positive relationship between innovation IL3 and the idea implementation of employees in such a way this relationship is less positive when team initiative is high than when it is low.*



**Figure 1. Research Models**



## **CHAPTER 5. STUDY 2**

### ***Methods***

#### ***Sample and procedures***

The sample of Study 2 was collected from 40 teams of R&D departments from different organizations in China. The team size ranges from 3 to 7. Two sets of questionnaires were prepared. An “Employee Questionnaire” was prepared for employees to assess their immediate supervisor’s leadership behaviors, their team environment as well as their personal properties, whereas a “Supervisor Questionnaire” was prepared for the employees’ immediate supervisors to evaluate the innovative performance of each team member. All respondents voluntarily participated in the survey. I visited all of them in person to brief them about the purposes of the study and to explain the procedures for implementing the survey. In addition, the respondents were all assured of the confidentiality of their responses and personal information. Questionnaires were administered separately to the team members and their supervisors at various times and locations inside each company. The completed questionnaires were returned directly to the researcher on site. Each questionnaire was marked with a coded identification number in order to match each team member’s questionnaire and the supervisor’s ratings. Out of 200 questionnaires distributed to employees, 166 usable questionnaires were returned, resulting in a response rate of 83%. Forty-eight percent of the employees were male. The mean age of the sample was 26.2 years and 94.6% of them received associate degree or above. The average organization tenure of team members was 1.6 years. All supervisors participated in the survey and completed the “Supervisor Questionnaire”.

### ***Translation of questionnaire items***

All measures used in study 2 and study 3 were developed originally in English except for innovation-oriented leadership. Questionnaire translation and back-translation between English and Chinese were carried out independently by two experienced translators. The back-translated English version was then compared with the original English draft for equivalency and agreement and no discrepancies were found (Brislin et al., 1973; Brislin, 1980).

### ***Measures***

*Innovation-oriented leadership behaviors.* The 29 items of innovation-oriented leadership behaviors developed from Study 1 were used. Team members rated their leader's behaviors on a seven-point scale ranging from 1 (never) to 7 (always). Confirmatory factor analysis (CFA) was conducted to examine the three factors extracted according to the EFA results of Study 1 using AMOS 16.0. Five items were dropped (see Appendix 3) according to the CFA results hence 24 items of innovation-oriented leadership behavior scale were retained.

The chi-square statistic of the three-factor model in which each item onto was loaded onto its corresponding dimension was highly significant ( $\chi^2 = 404.07$ ,  $d.f. = 226$ ,  $p < .001$ ). The root-mean-square error of approximation (*RMSEA*) was .07. The *CFI*, *TLI* and *IFI* were .92, .91 and .92 respectively. Therefore, the three-factor model showed adequate fit (Bentler & Bonett, 1980). I also tested the higher-order model. The fit indices of higher-order model were the same as the three-factor model ( $\chi^2 = 404.07$ ,  $d.f. = 226$ ,  $CFI = .92$ ,  $TLI = .91$ ,  $IFI = .92$ ,  $RMSEA = .07$ ). Though the correlations between the three dimensions of innovation-oriented leadership were high (average  $r = .72$ ), the three dimensions are theoretically distinctive as they are

related to different stages of innovation. In addition, one-factor and three two-factor models were also estimated. Table 3 summarizes the fit indices of these models. Compared with the three-factor model, the one-factor model fit the data poorly ( $\chi^2 = 721.90$ ,  $d.f. = 251$ ,  $CFI = .80$ ,  $TLI = .78$ ,  $IFI = .80$ ,  $RMSEA = .11$ ), with a change in Chi-square ( $\Delta\chi^2 = 317.23$ ,  $\Delta d.f. = 25$ ,  $p < .001$ ). Besides, all the three two-factors models (1) items of innovation-oriented leadership behaviors for idea generation (IL1) and for idea promotion (IL2) loaded on the first factor and the innovation-oriented leadership behaviors for idea implementation (IL3) items loaded on the second factor ( $\chi^2 = 647.78$ ,  $d.f. = 250$ ,  $CFI = .83$ ,  $TLI = .81$ ,  $IFI = .83$ ,  $RMSEA = .10$ ) with a chi-square change ( $\Delta\chi^2 = 243.71$ ,  $\Delta d.f. = 24$ ,  $p < .001$ ); (2) items of IL1 and IL3 loaded on the first factor and items of IB2 loaded on the second factor ( $\chi^2 = 516.63$ ,  $d.f. = 250$ ,  $CFI = .88$ ,  $TLI = .87$ ,  $IFI = .88$ ,  $RMSEA = .08$ ) with a chi-square change ( $\Delta\chi^2 = 112.56$ ,  $\Delta d.f. = 24$ ,  $p < .001$ ); (3) items of IL2 and IL3 loaded on the first factor and items of IL1 on the second factor ( $\chi^2 = 649.75$ ,  $d.f. = 250$ ,  $CFI = .83$ ,  $TLI = .81$ ,  $IFI = .83$ ,  $RMSEA = .10$ ) with a chi-square change ( $\Delta\chi^2 = 245.68$ ,  $\Delta d.f. = 24$ ,  $p < .001$ ) yielded a worse fit than the three-factor model.

**Table 3. Summary of Model Fit Indices for Innovation-oriented leadership (Study 2)**

<b>Models</b>	$\chi^2$	<i>d.f.</i>	<i>CFI</i>	<i>TLI</i>	<i>IFI</i>	<i>RMSEA</i>
Innovation-oriented leadership three-factor model	404.07	226	.92	.91	.92	.07
Innovation-oriented leadership second-order model	404.07	226	.92	.91	.92	.07
Innovation-oriented leadership one-factor model	721.90	251	.80	.78	.80	.11
Innovation-oriented leadership two-factor model: generation + promotion & implementation	647.78	250	.83	.81	.83	.10
Innovation-oriented leadership two-factor model: generation + implementation & promotion	516.63	250	.88	.87	.88	.08
Innovation-oriented leadership two-factor model: implementation + promotion & generation	649.75	250	.83	.81	.83	.10

*Transformational leadership.* Transformational leadership behaviors were assessed using the eighteen-item scale developed by Podsakoff, Mackenzie, Moorman, & Fetter (1990). A seven-point Likert scale ranging from (1) “Strongly Disagree” to (7) “Strongly Agree” was utilized. An example is “(My leader) has a clear understanding of where we are going” and another example is “(My leader) has ideas that have challenged me to reexamine some of basic assumptions about my work”. The reliability (Cronbach’s alpha) of transformational leadership was .94. I conducted a confirmatory factor analysis for a higher-order model (Bollen, 1989; Marsh & Hocevar, 1985) in which the leadership factors contributed to an overall transformational leadership index. Results confirmed that the higher-order model fit the data better ( $\chi^2 = 246.67$ ,  $d.f. = 129$ ,  $CFI = .94$ ,  $TLI = .93$ ,  $IFI = .94$ ,  $RMSEA = .07$ ) than one-factor model where all items loaded on a single factor ( $\chi^2 = 558.93$ ,  $d.f. = 135$ ,  $CFI = .79$ ,  $TLI = .76$ ,  $IFI = .79$ ,  $RMSEA = .14$ ). Because the single higher-order construct adequately captured the variance in the leadership dimensions, and because prior research showed that the dimensions were highly correlated (e.g., Bycio, Hackett, & Allen, 1995; Shin & Zhou, 2003), I averaged the 18 items to create a single index tapping transformational leadership.

*Team learning behavior.* The five-item scale of team learning behavior was adapted from Edmondson’s (1999) work. Team learning behaviors were rated on a seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). A sample item is “This team frequently seeks new information that leads us to make important changes” and another example is “In this team, someone always makes sure that we stop to reflect on the team’s work processes”. To justify aggregating individual members’ response to team level,  $r_{wg}$  of each team was calculated (see Appendix 4) and the mean values

of  $r_{wg(j)}$  across teams was .94, suggesting it is sufficient to warrant aggregation (James, Demaree, and Wolf, 1984). In addition,  $ICC_1$  which represents the reliability of a single rating of the construct and  $ICC_2$  which indicates the reliability of the average team members' responses (Bliese, 2000) were computed.  $ICC_1$  and  $ICC_2$  of team learning behavior were .11 and .32 respectively. The values were comparable to the median or recommended ICC values of group-level constructs in the literature (see Schneider, White, & Paul, 1998). The fit indices suggested the adequate fit of the one-factor model ( $\chi^2 = 20.26$ ,  $d.f. = 5$ ,  $CFI = .98$ ,  $TLI = .97$ ,  $IFI = .99$ ,  $RMSEA = .06$ ). The Cronbach's alpha was .79.

*Work contacts.* Work contacts were measured with six items, four of which were adapted from the external work contacts scale development by De Jong and Den Hartog (2010) and two were from what interviewees described in Study 1. Using a five-point response scale ranging from 1 (never) to 5 (always), team members were asked to rate how frequently they contact with people within and outside the organization. An example of external work contacts is "I keep in touch with prospective customers of my firm". The two items from interviews are "I talk to senior peers from outside the team about my work" and "I talk to my non-immediate supervisors about my work". CFA results revealed that the one-factor model yielded reasonable fit ( $\chi^2 = 17.36$ ,  $d.f. = 9$ ,  $CFI = .94$ ,  $TLI = .91$ ,  $IFI = .95$ ,  $RMSEA = .07$ ). The Cronbach's alpha was .91.

*Team initiative.* The five-item of team initiative were adapted from Frese et al.'s (1997) individual initiative scale. In this study, the items were modified to be used on the team level to assess team initiative. Using a 7-point scale ranging from 1 (strongly

disagree) to 7 (strongly agree), team members were asked to rate the following sample items: “Whenever something goes wrong, our team search for a solution immediately” and “People in our team actively attack problems”.  $r_{wg(j)}$ ,  $ICC_1$  and  $ICC_2$  were .96, .19 and .49 respectively, exhibiting acceptable agreement. Confirmatory factor analysis indicated a satisfactory fit ( $\chi^2 = 10.38$ ,  $d.f. = 8$ ,  $CFI = .99$ ,  $TLI = .99$ ,  $IFI = .99$ ,  $RMSEA = .04$ ). The Cronbach’s alpha was .89.

*Leader-rated innovative work behaviors (IWB).* The employees’ innovative work behaviors were assessed based on the nine items scale developed by Janssen (2000, 2001). Drawing on Kanter’s (1988) work, innovation mainly consists of three stages. The supervisors were asked to rate how often their employees performed the three stages of innovative work behaviors in the workplace (1, “never,” to 7, “always”). Three items of the scale refer to idea generation (IWB1) and an example is “generating original solutions for problems”; three items to idea promotion (IWB2) and an example is “mobilizing support for innovative ideas”; and the last three items to idea realization or implementation (IWB3) and an example is “transforming innovative ideas into useful applications”. Although Janssen (2000) claimed that the innovative work behavior items could best be combined and used as a single additive scale, items of idea generation, promotion and implementation actually measures distinct stages of innovation. Confirmatory factor analyses, thus, were conducted to compare the three-factor model with one-factor model as well as three two-factor models. Table 4 summarizes the fit indices of these models. The three-factor model yielded a better fit ( $\chi^2 = 34.48$ ,  $d.f. = 24$ ,  $CFI = .99$ ,  $TLI = .98$ ,  $IFI = .99$ ,  $RMSEA = .05$ ) than the one-factor model ( $\chi^2 = 51.71$ ,  $d.f. = 27$ ,  $CFI = .97$ ,  $TLI = .96$ ,  $IFI = .97$ ,  $RMSEA = .08$ ), with a change in Chi-square ( $\Delta\chi^2 = 17.23$ ,  $\Delta d.f. = 3$ ,  $p < .001$ ). Besides,

a better fit was also noted compared with the three two-factors models (1) items of IWB1 and IWB2 loaded on one factor and the IWB3 items loaded on another factor ( $\chi^2 = 39.60$ ,  $d.f. = 26$ ,  $CFI = .98$ ,  $TLI = .97$ ,  $IFI = .98$ ,  $RMSEA = .06$ ) with a chi-square change ( $\Delta\chi^2 = 5.12$ ,  $\Delta d.f. = 2$ ,  $p < .1$ ); (2) items of IWB1 and IWB3 loaded on one factor and three items of IWB2 loaded on another factor ( $\chi^2 = 46.24$ ,  $d.f. = 26$ ,  $CFI = .97$ ,  $TLI = .96$ ,  $IFI = .97$ ,  $RMSEA = .07$ ) with a chi-square change ( $\Delta\chi^2 = 11.76$ ,  $\Delta d.f. = 2$ ,  $p < .01$ ); (3) items of IWB2 and IWB3 loaded on one factor and three items of IWB1 on another ( $\chi^2 = 46.24$ ,  $d.f. = 26$ ,  $CFI = .98$ ,  $TLI = .97$ ,  $IFI = .98$ ,  $RMSEA = .07$ ) with a chi-square change ( $\Delta\chi^2 = 10.78$ ,  $\Delta d.f. = 2$ ,  $p < .01$ ).

**Table 4. Summary of Model Fit Indices for Innovative Work Behavior (Study 2)**

<b>Models</b>	$\chi^2$	<i>d.f.</i>	<i>CFI</i>	<i>TLI</i>	<i>IFI</i>	<i>RMSEA</i>
Innovative work behavior three-factor model	34.48	24	.99	.98	.99	.05
Innovative work behavior one-factor model	51.71	27	.97	.96	.97	.07
Innovative work behavior two-factor model (1): IWB1 + IWB2 & IWB3	39.60	26	.98	.97	.98	.06
Innovative work behavior two-factor model (2): IWB1 + IWB3 & IWB2	46.24	26	.97	.96	.97	.07
Innovative work behavior two-factor model (3): IWB2 + IWB3 & IWB1	45.26	26	.98	.97	.98	.07

*Control variables.* As the number of team members varies across different teams, team size was controlled for. I also controlled for demographic properties including age, education and organization tenure.

#### ***Discriminant validity***

To assess the discriminant validity of innovation-oriented leadership and transformational leadership, the one-factor model where all leadership items loaded on a single factor was tested and the results showed that the one-factor model fit the



data poorly:  $\chi^2 = 2295.55$ ,  $d.f. = 777$ ,  $CFI = .67$ ,  $TLI = .66$ ,  $IFI = .68$ ,  $RMSEA = .11$ . The two-factor model where transformational leadership items loaded on one factor and innovation-oriented leadership items loaded on the other was examined and the results indicated a moderate fit:  $\chi^2 = 1421.47$ ,  $d.f. = 808$ ,  $CFI = .87$ ,  $TLI = .86$ ,  $IFI = .87$ ,  $RMSEA = .07$ ). Lastly, Lastly, the two-factor model where the six dimensions of transformational leadership items loaded on their factors and the innovation-oriented leadership for idea generation, promotion and implementation items loaded on three factors yielded a better fit:  $\chi^2 = 1191.13$ ,  $d.f. = 728$ ,  $CFI = .90$ ,  $TLI = .89$ ,  $IFI = .90$ ,  $RMSEA = .06$ , with a Chi-square change compared to the one-factor model ( $\Delta\chi^2 = 1104.42$ ,  $\Delta d.f. = 49$ ,  $p < .001$ ) and the first-order two-factor model ( $\Delta\chi^2 = 230.34$ ,  $\Delta d.f. = 80$ ,  $p < .001$ ). These results showed that the assessment of innovation-oriented leadership can be clearly distinguished from transformational leadership.

In addition, I conducted another confirmatory factor analysis to distinguish statistically the six key variables in this study's model, namely, innovation-oriented leadership behaviors, team learning behavior, team initiative, work contacts, transformational leadership as well as innovative work behaviors. To preserve adequate statistical power I formed parcels to serve as indicators of the latent variables (Bandalos & Finney, 2001). The one-factor model where all indicators were loaded on a single factor yielded poor fit:  $\chi^2 = 1751.61$ ,  $d.f. = 592$ ,  $CFI = .41$ ,  $TLI = .38$ ,  $IFI = .42$ ,  $RMSEA = .15$ . The six-factor model with the items assigned to the six corresponding variables yielded a better fit than the one-factor model:  $\chi^2 = 897.72$ ,  $d.f. = 576$ ,  $CFI = .90$ ,  $TLI = .90$ ,  $IFI = .91$ ,  $RMSEA = .06$ , with a Chi-square change ( $\Delta\chi^2 = 853.89$ ,  $\Delta d.f. = 16$ ,  $p < .001$ ).

Lastly, according to the suggestion by Podsakoff, MacKenzie, Lee, & Podsakoff (2003), I tested a model that indicators loaded on a latent method factor and their

theorized factors. The results ( $\chi^2 = 789.50$ ,  $d.f. = 541$ ,  $CFI = .92$ ,  $IFI = .93$ ,  $TLI = .91$ ,  $RMSEA = .05$ ) indicated that common method variance did not pose a serious threat to the validity of the results and conclusions.

## **Results**

The means, standard deviations, correlations and reliabilities for all measures used in study 2 are presented in Table 5. The data in the present study were multilevel in nature, with team-level moderators and individual-level predictors and outcomes. Hierarchical linear modeling (HLM; Bryk & Raudenbush, 1992; Hofmann, 1997; Hofmann, Griffin, & Gavin, 2000) was used to analyze the cross-level interactions hypothesized in this study. Table 6 displays the HLM results of the innovation-oriented leadership as a whole and transformational leadership on leader-rated innovation (IWB). Table 7 summarizes the results of innovation-oriented leadership behaviors at each stage of innovation on their corresponding employees' performances. The null models which contained no predictors were tested first. Then individual-level variables and team-level variables were introduced. The null model allowed us to examine the percentage of variance in outcome variables that resides between groups (Hofmann, 1997; Liao & Rupp, 2005).

### ***Employee innovation (Leader-rated innovative work behaviors)***

As shown in Table 6, the intercept of null model was 3.99. The analyses revealed that 47 percent of the variance in employees' leader-rated innovation resided between teams (to be explained by level 2 variables), suggesting a necessary precondition for testing cross-level interactions. To compare the effectiveness of the two leaderships on innovation among employees (Hypothesis 1a to 1c), I firstly tested the model of

transformational leadership and innovation-oriented leadership on individual's innovative work behaviors. In Study 3, objective measure of innovation can also be compared with these subjective ratings. The HLM results showed that the effect of innovation-oriented leadership on employee's overall innovative work behaviors was positive and significant ( $\gamma = .25, p < .01$ ). However, no significant relationship was found between transformational leadership and innovative work behaviors ( $\gamma = .05, n.s.$ ). The effect of innovation-oriented leadership on the innovation, therefore, is stronger than that of transformational leadership, lending support to Hypothesis 1a.

### ***Idea generation (IWB1)***

The intercept of null model was 4.11 and the analyses showed that level 2 variables accounted for 39 percent of the variance in employees' idea generation performance. As predicted in Hypothesis 2a, leadership behavior for idea generation was positively related to its corresponding innovative work behaviors (i.e., idea generation) ( $\gamma = .15, p < .05$ ). In addition, TLB was found to negatively moderate the leadership performance relationship ( $\gamma = -.28, p < .05$ ) and TLB itself had a significant and positive impact on idea generation in the same direction as the leader behavior's main effect ( $\gamma = .53, p < .05$ ). Therefore, all the three conditions to qualify a substitute discussed by Podsakoff et al. (1993) were met and this lent support to Hypothesis 2b. Figure 2.1 is a graphic representation of this interaction. Simple slope test (cf. Aiken & West, 1991) was conducted to analyze the interaction and its results suggested that in a low learning environment, the slope is positive and significant ( $\beta = .30, t = 2.23, p < .05$ ), while the slope under the condition of high TLB ( $\beta = .04, t = .36, n.s.$ ) is not significant.

### ***Idea promotion (IWB2)***

The intercept of the null model of idea promotion was 4.03. Forty-five percent the variance was explained by team level variables. As shown in Table 7, leadership behavior for idea promotion was found to be positively associated with innovative behaviors of idea promotion ( $\gamma = .53, p < .05$ ), lending support to Hypothesis 3a. Moreover, the findings showed that work contacts negatively moderated the leadership-idea promotion relationship ( $\gamma = -.10, p < .05$ ). The main effect of work contacts on idea promotion was also significant ( $\gamma = .46, p < .05$ ). The results indicated that work contacts substituting the effect of leadership behavior for idea promotion. Figure 2.2 depicts the interaction between leadership and work contacts on idea promotion. The results of simple slope test showed that in both cases of low and high work contacts, leadership behaviors for idea promotion had a positive impact on employees' performance of idea promotion (low  $\beta = .58, t = 2.17, p < .05$ ; high  $\beta = .36, t = 1.95, p < .1$ ). In addition, when employees have less work contacts, the positive relationship between leadership and promotion was stronger than under the condition of with frequent work contacts. Therefore, Hypothesis 3b was supported.

### ***Idea Implementation (IWB3)***

Examining the null model of idea implementation showed that the intercept was 3.81 and team level variable accounted for 50% of the variance in the outcome variable. Leadership behaviors for idea implementation was not associated with employees' idea implementation performance ( $\gamma = .11, p < .1$ ). Hypothesis 4a, accordingly, was not supported. Team initiative moderated the leadership-implementation relationship ( $\gamma = -.32, p < .05$ ) and it also had a significant main effect on implementation ( $\gamma = .55, p < .05$ ). Figure 2.3 is the depiction of the interaction. The

result of simple slope test revealed that under the condition of low team initiative ( $\beta = .28, t = 2.22, p < .05$ ), the positively relationship between leadership and idea implementation was stronger than under the condition of high team initiative ( $\beta = -.06, t = .44, n.s.$ ). Consequently, Hypothesis 4b was supported.

**Table 5: Mean Values, Standard Deviations, Correlations, and Reliability of the Measures (Study 2)**

Variables	M	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Education	3.50	0.63	---															
2. Organization Tenure	18.64	19.74	.08	---														
3. Age	26.20	2.73	.17*	.64**	---													
4. Transformational leadership (TL)	5.37	0.78	-.01	-.21**	-.23**	(.94)												
5. Innovation-oriented leadership (IL)	5.15	0.80	-.04	-.19*	-.20**	.72***	(.95)											
6. Leadership behaviors for idea generation (IL1)	5.17	0.84	.00	-.18*	-.15	.67***	.91***	(.90)										
7. Leadership behaviors for idea promotion (IL2)	5.06	0.99	-.08	-.16*	-.21**	.59***	.87***	.71***	(.91)									
8. Leadership behaviors for idea implementation (IL3)	5.14	0.89	-.01	-.17*	-.19*	.66***	.89***	.78***	.66***	(.86)								
9. Team learning behavior (TLB)	5.10	0.45	-.02	-.05	-.05	.55***	.51***	.52***	.41***	.48***	(.79)							
10. Team size	4.15	0.98	-.01	-.01	-.04	-.04	-.03	.01	-.03	-.05	-.10	---						
11. Team initiative (TI)	5.40	0.54	.02	-.07	-.13	.71***	.59***	.58***	.45***	.56***	.67***	-.08	(.89)					
12. Work contacts (WC)	2.99	0.75	-.01	.15	.17*	.04	.15	.17*	.11	.10	.21*	-.16*	.22**	(.91)				
13. Innovative work behavior – idea generation (IWB1)	4.14	0.92	.04	.13	.12	.18*	.21**	.26**	.15	.20*	.24**	.06	.11	.18*	(.76)			
14. Innovative work behavior – idea promotion (IWB2)	4.02	0.87	.01	.04	.02	.26**	.28**	.29***	.23**	.25**	.27***	-.06	.17*	.20*	.72***	(.79)		
15. Innovative work behavior – idea implementation (IWB3)	3.82	0.98	-.01	.09	.06	.21**	.24**	.26**	.18*	.22**	.33***	-.05	.23**	.21**	.72***	.74***	(.85)	
16. Leader-rated Innovation (IWB)	3.99	0.83	.02	.10	.07	.24**	.27**	.30***	.20**	.25**	.31***	-.02	.19*	.20*	.90***	.90***	.91***	(.91)

Note:  $N = 166$  (Level 1, Individuals);  $N = 40$  (Level 2, Teams)

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: Cronbach's alpha.

**Table 6. Hierarchical regression results on leader-rated innovative work behaviors (Study 2)**

	Leader-rated innovative work behaviors (IWB)
Variables	
<i>Null Model</i>	
Intercept	3.99 (.10) <sup>***</sup>
<i>Level 1</i>	
Intercept	3.98 (.10) <sup>***</sup>
Age	.05 (.03)
Education	-.01 (.08)
Org tenure	.00 (.00)
Transformational Leadership (TL)	.05 (.10)
Innovation-oriented Leadership (IL)	.25 (.09) <sup>**</sup>
<i>Level 2</i>	
Team Size	.04 (.10)

Note:  $N = 166$  (Level 1, Individuals);  $N = 40$  (Level 2, Teams).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: standard error.

**Table 7. Hierarchical regression results on IWB1, IWB2, & IWB3 (Study 2)**

	Model 1 Idea generation (IWB1)	Model 2 Idea promotion (IWB2)	Model 3 Idea implementation (IWB3)
<i>Variables</i>			
<i>Null Model</i>			
Intercept	4.12 (.11)***	4.03 (.11)***	3.81 (.12)***
<i>Level 1</i>			
Intercept	4.11 (.10)***	4.03 (.11)***	3.81 (.12)***
Age	.05 (.04)	.03 (.03)	.01 (.02)
Education	.06 (.10)	-.00 (.10)	-.02 (.10)
Org tenure	.00 (.01)	.00 (.00)	.01 (.00)
Transformational leadership (TL)	.04 (.12)	.12 (.11)	-.10 (.10)
IL for idea generation (IL1)	.16 (.08)*	.04 (.15)	.04 (.11)
IL for idea promotion (IL2)	.01 (.07)	.47 (.20)*	.06 (.08)
IL for idea implementation (IL3)	.06 (.12)	.10 (.16)	.11 (.07) <sup>+</sup>
Work contacts (WC)		.46 (.22)*	
<i>Level 2</i>			
Team Size	.15 (.11)	-.01 (.11)	.05 (.11)
Team learning behavior (TLB)	.53 (.26)*		
Team initiative (TI)			.55 (.22)*
<i>Interactions</i>			
IL1xTLB	-.29 (.14)*		
IL2xWC		-.10 (.04)*	
IL3xTI			-.32 (.16)*

Note:  $N = 166$  (Level 1, Individuals);  $N = 40$  (Level 2, Teams).

<sup>+</sup>  $p < .1$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: standard error.



Figure 2.1. Interaction between leadership for idea generation and team learning behavior on IWB1 (Study 2)

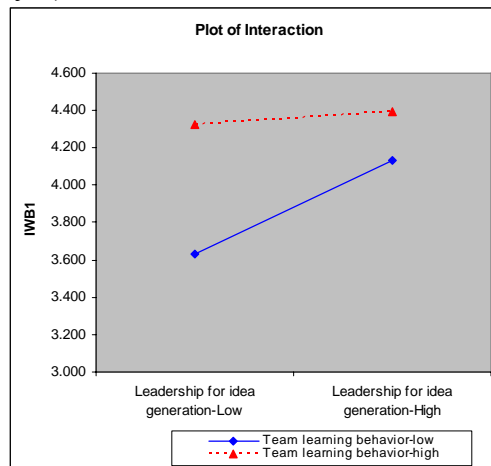


Figure 2.2. Interaction between leadership for idea promotion and work contacts on IWB2 (Study 2)

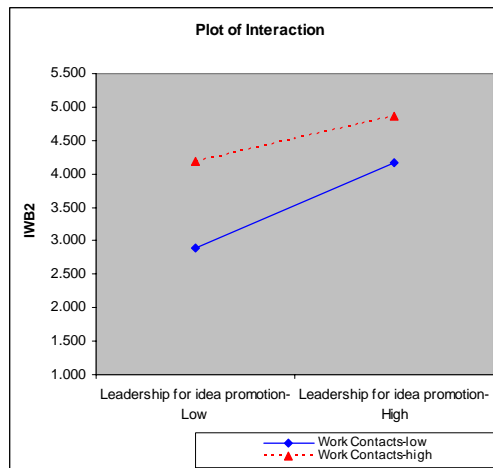
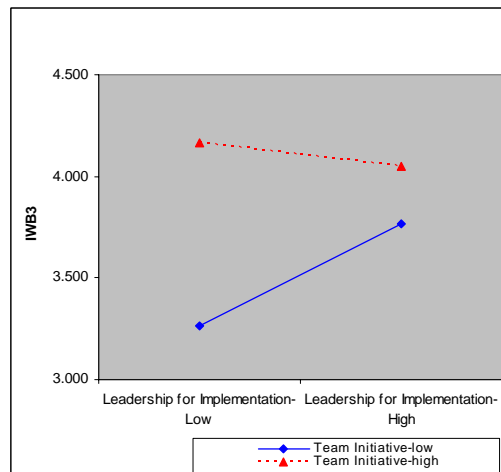


Figure 2.3. Interaction between leadership for idea implementation and team initiative on IWB3 (Study 2)



## ***Discussion***

In Study 2, using a sample of 40 teams collected from China, I firstly compared the effect of innovation-oriented leadership and transformational leadership, the most studied leadership in relation to innovation, on employees' overall innovative work behaviors. The results showed that innovation-oriented leadership was positively and significantly associated with employees' innovative work behaviors while the relationship between transformational leadership and innovative work behaviors was not significant (Hypothesis 1a). In addition to confirm the role of innovation-oriented leadership as a whole on innovation, the effectiveness of leadership behaviors at each stage, namely, idea generation, promotion and implementation was also examined, controlling for transformational leadership. Except for leadership behaviors for implementation, which was not associated with employees' idea implementation performance (Hypothesis 4a), leadership behaviors for other two stages had a significant and positive impact on their corresponding employee performance (Hypotheses 2a and 3a). Moreover, three proposed contextual variables, including team learning behavior, work contacts, and team initiative negatively moderated the leadership-innovation relationship of each stage (Hypotheses 2b, 3b, and 4b). At the same time, the three variables also had a significant impact on criterion variables, thereby qualifying them as substitutes. Leadership behaviors for idea generation was found most effective in enhancing employees' idea generation when team learning behavior was low. Similar results were found at other two stages. The positive relationship between leadership behaviors for idea promotion and its corresponding employee performance was stronger under the condition of employees with less work contacts than with frequent contacts. The positive influence leadership for idea

implementation on employees' idea implementation was also stronger when team initiative is low than it is high.

To confirm and further examine the effectiveness of innovation-oriented leadership on employees' innovation as well as the role three contextual factors play in the leadership-outcome relationship, Study 3 will be conducted. Study 3 will also provide insights on whether the effectiveness of leadership can be generalized to employees who engage in different jobs. Apart from the leaders' subjective ratings of innovation, two objective measures of innovation, both quantity and quality of innovation will be tested.

## CHAPTER 6. STUDY 3

### ***Methods***

#### ***Sample and Procedures***

The participants of study 3 were from a large beverage manufacturer in China. The beverage manufacturer has pursued the “Proposals for improvement” scheme since the beginning of 2010. The scheme encourages their employees to engage in innovative activities by offering rewards. Employees who are able to raise problems and suggest innovative ways to improve the existing processes or products will be awarded with cash vouchers. An innovation evaluation committee consisting of two experienced engineers and the top management of the organization assesses each proposal and facilitates the proposers to implement their ideas. According to the implemented effects, these proposals would be ranked into 5 categories (i.e. A to E) by the committee. In addition, the committee documents the quality and quantity of proposals as well as the proposers on the monthly basis. This measure of innovation is consistent with the innovation literature (e.g., Liao et al., 2010; Tierney, 1999) to assess “the quality and number of novel ideas about products and production practices, which are beneficial to the company’s productivity, profitability, product and operation quality.” (Liao et al., 2010, p. 1095)

Twenty-eight teams were invited to participate in the survey on a voluntary basis. The confidentiality of their responses and personal data were assured. Data were collected in two phases. At phase 1, frontline workers were invited to complete questions about their immediate supervisor’s leadership, their team environment and their personal attributes. Two months later, their supervisors assessed each team

member's innovative work behaviors. The questionnaires were in Chinese and the measures used were the same as that of Study 2. Out of 186 questionnaires distributed to the frontline workers, 137 usable questionnaires were returned, resulting in a response rate of 73.7%. The average age of the respondents was 34.6 years and 76.6% of them were male. The mean organization tenure for the sample members was 5.2 years and 65.7% of them completed high school or above. All the 28 supervisor questionnaires were completed, with a response rate of 100%.

### ***Measures***

*Innovation-oriented leadership.* The 24-item of leadership scale was employed according to the CFA results of Study 2. Confirmatory factor analysis was conducted to confirm the factor structure of the remained 24 items. The results showed a satisfactory fit:  $\chi^2 = 417.10$ ,  $d.f. = 226$ ,  $CFI = .91$ ,  $TLI = .90$ ,  $IFI = .91$ ,  $RMSEA = .08$ . The overall reliability of innovation-oriented leadership was calculated (Cronbach's alpha = .96). The five alternative models, including the higher-order model ( $\chi^2 = 417.10$ ,  $d.f. = 226$ ,  $CFI = .91$ ,  $TLI = .90$ ,  $IFI = .91$ ,  $RMSEA = .08$ ), the one-factor model ( $\chi^2 = 647.58$ ,  $d.f. = 251$ ,  $CFI = .82$ ,  $TLI = .81$ ,  $IFI = .83$ ,  $RMSEA = .11$ , with a Chi-square change:  $\Delta\chi^2 = 230.48$ ,  $\Delta d.f. = 25$ ,  $p < .001$ ), and three two-factor models (Model (1):  $\chi^2 = 591.95$ ,  $d.f. = 250$ ,  $CFI = .85$ ,  $TLI = .83$ ,  $IFI = .85$ ,  $RMSEA = .10$ , with a Chi-square change:  $\Delta\chi^2 = 174.85$ ,  $\Delta d.f. = 24$ ,  $p < .001$ ; Model (2)  $\chi^2 = 522.29$ ,  $d.f. = 24$ ,  $CFI = .88$ ,  $TLI = .87$ ,  $IFI = .88$ ,  $RMSEA = .09$ , with a Chi-square change:  $\Delta\chi^2 = 105.19$ ,  $\Delta d.f. = 24$ ,  $p < .001$ ; Model (3):  $\chi^2 = 622.92$ ,  $d.f. = 24$ ,  $CFI = .83$ ,  $TLI = .82$ ,  $IFI = .84$ ,  $RMSEA = .10$ , with a Chi-square change:  $\Delta\chi^2 = 205.82$ ,  $\Delta d.f. = 24$ ,  $p < .001$ ) were estimated as well and none of them is better than the three-factor model. Table 8 presents the fit indices of these models. Moreover, the Cronbach's alphas for

leadership behaviors for idea generation, promotion, and implementation were .90, .92, and .90 respectively.

**Table 8. Summary of Model Fit Indices for Innovation-oriented leadership (Study 3)**

<b>Models</b>	$\chi^2$	<i>d.f.</i>	<i>CFI</i>	<i>TLI</i>	<i>IFI</i>	<i>RMSEA</i>
Innovation-oriented leadership three-factor model	417.10	226	.91	.90	.91	.08
Innovation-oriented leadership one-factor model	647.58	251	.82	.81	.83	.11
Innovation-oriented leadership two-factor model (1): generation + promotion & implementation	591.95	250	.85	.83	.85	.10
Innovation-oriented leadership two-factor model (2): generation + implementation & promotion	522.29	250	.88	.87	.88	.09
Innovation-oriented leadership two-factor model (3): implementation + promotion & generation	622.92	250	.83	.82	.84	.10

*Quantity of innovations.* Each employee's quantity of innovations in the past 6 months was counted based on the records of the committee. All the documented proposals have been successfully implemented. When counting the quantity of innovations, the rank of them was not taken into consideration.

*Quality of innovations.* Quality of innovations was calculated based on the number of proposals during the past 6 months as well as the rank of each proposal. As the proposals were independently assessed by the committee members instead of employees' immediate supervisors, the quality of innovation reflects the implemented effectiveness of innovation proposed by each employee. The rank D and E proposals are minor problems observed and improvements made by employees, and the two categories of proposals will be rewarded with RMB 100 and 50 cash vouchers,

respectively. An example of a rank E proposal is installation of hooks for the wires in the warehouse. The rank A, B and C proposals are major problems observed or technical improvement and the implemented effects of these proposals usually result in large cost savings. The committee described that a rank A proposal as major technical improvements having a long-term impact on production and/or saving the costs over RMB 60000. A rank B proposal is characterized as technical improvements having a long-term impact on production and/or saving the costs over RMB 30000. A proposal solves major problems which influence the production and/or result in over RMB 5000 cost savings would be qualified as rank C. The rank A, B and C proposals will be awarded with RMB 800, 400, and 200 cash vouchers respectively. The total amount of the cash vouchers each employee received during the past 6 months were summed up and then divided by the number of proposals. The average cash reward per innovation reflects the quality of innovation proposed by each employee.

The same scales were employed to measure team learning behavior, team initiative, work contacts, transformational leadership and IWB as used in Study 2. All the measures had an adequate fit and the internal consistency was high (team learning behavior:  $\chi^2 = 7.73$ ,  $d.f. = 5$ ,  $CFI = .98$ ,  $TLI = .96$ ,  $IFI = .98$ ,  $RMSEA = .08$ , Cronbach's alpha = .85; team initiative:  $\chi^2 = 11.03$ ,  $d.f. = 8$ ,  $CFI = .99$ ,  $TLI = .99$ ,  $IFI = .99$ ,  $RMSEA = .05$ , Cronbach's alpha = .88; work contacts:  $\chi^2 = 18.37$ ,  $d.f. = 9$ ,  $CFI = .97$ ,  $TLI = .95$ ,  $IFI = .97$ ,  $RMSEA = .08$ , Cronbach's alpha = .86; transformational leadership:  $\chi^2 = 251.21$ ,  $d.f. = 129$ ,  $CFI = .93$ ,  $TLI = .92$ ,  $IFI = .93$ ,  $RMSEA = .08$ , Cronbach's alpha = .94). The three-factor model of IWB as well as its alternative models were examined and compared. Table 9 presents the fit indices of these models. As shown in the table, the three-factor model ( $\chi^2 = 37.32$ ,  $d.f. = 24$ ,  $CFI = .98$ ,  $TLI = .97$ ,  $IFI = .98$ ,  $RMSEA = .06$ ), fit much better than its alternative models (one-factor

model:  $\chi^2 = 86.42$ ,  $d.f. = 27$ ,  $CFI = .92$ ,  $TLI = .89$ ,  $IFI = .92$ ,  $RMSEA = .12$ , with a Chi-square change:  $\Delta\chi^2 = 49.10$ ,  $\Delta d.f. = 3$ ,  $p < .001$ ; two-factor model (1):  $\chi^2 = 85.43$ ,  $d.f. = 26$ ,  $CFI = .98$ ,  $TLI = .97$ ,  $IFI = .98$ ,  $RMSEA = .06$ , with a Chi-square change:  $\Delta\chi^2 = 48.11$ ,  $\Delta d.f. = 2$ ,  $p < .001$ ; Cronbach's alpha = .91; two-factor model (2):  $\chi^2 = 57.12$ ,  $d.f. = 26$ ,  $CFI = .96$ ,  $TLI = .94$ ,  $IFI = .96$ ,  $RMSEA = .09$ , with a Chi-square change:  $\Delta\chi^2 = 19.80$ ,  $\Delta d.f. = 2$ ,  $p < .001$ ; two-factor model (3):  $\chi^2 = 60.79$ ,  $d.f. = 26$ ,  $CFI = .95$ ,  $TLI = .93$ ,  $IFI = .95$ ,  $RMSEA = .10$ , with a Chi-square change:  $\Delta\chi^2 = 23.47$ ,  $\Delta d.f. = 2$ ,  $p < .001$ ). The Cronbach's alphas for IWB, IWB1, IWB2 and IWB3 were .91, .75, .84 and .84 respectively. For the two team-level variables, the intraclass correlation coefficients and within-group agreement justified the aggregation (team learning behavior:  $ICC_1 = .12$ ,  $ICC_2 = .40$ ,  $r_{wg(j)} = .93$ ; team initiative:  $ICC_1 = .12$ ,  $ICC_2 = .41$ ,  $r_{wg(j)} = .94$ ). Appendix 5 shows the  $r_{wg}$  value of each team.

**Table 9. Summary of Model Fit Indices for IWB (Study 3)**

<b>Models</b>	$\chi^2$	<i>d.f.</i>	<i>CFI</i>	<i>TLI</i>	<i>IFI</i>	<i>RMSEA</i>
Innovation work behavior three-factor model	37.32	24	.98	.97	.98	.06
Innovation work behavior one-factor model	86.42	27	.92	.89	.92	.12
Innovation work behavior two-factor model (1): IWB1 + IWB2 & IWB3	85.43	26	.92	.88	.92	.13
Innovation work behavior two-factor model (2): IWB1 + IWB3 & IWB2	57.12	26	.96	.94	.96	.09
Innovation work behavior two-factor model (3): IWB2 + IWB3 & IWB1	60.79	26	.95	.93	.95	.10

***Discriminant Validity.***

In order to examine whether innovation-oriented leadership can be differentiated from transformational leadership, I tested the one-factor model where all items loaded on one factor, the two-factor model where the two leadership items loaded on their



own factors and the four-factor model where items of transformational leadership loaded on one factor and three stages of innovation-oriented leadership behaviors loaded on their corresponding factors. The results indicated that the one-factor model fit the data poorly:  $\chi^2 = 2522.60$ ,  $d.f. = 777$ ,  $CFI = .59$ ,  $TLI = .59$ ,  $IFI = .56$ ,  $RMSEA = .13$ . The two-factor model yielded a moderate fit:  $\chi^2 = 1347.14$ ,  $d.f. = 808$ ,  $CFI = .87$ ,  $TLI = .86$ ,  $IFI = .87$ ,  $RMSEA = .07$ . The second-order two-factor model yielded a satisfactory fit:  $\chi^2 = 1181.89$ ,  $d.f. = 766$ ,  $CFI = .91$ ,  $TLI = .90$ ,  $IFI = .90$ ,  $RMSEA = .06$ , with a Chi-square change (compared to the one-factor model) ( $\Delta\chi^2 = 1340.71$ ,  $\Delta d.f. = 11$ ,  $p < .001$ ) and a Chi-square change (compared to the first-order two-factor model) ( $\Delta\chi^2 = 165.25$ ,  $\Delta d.f. = 42$ ,  $p < .001$ ).

## **Results**

The descriptive statistics for all measures used in Study 3 are presented in Table 10. As what have been done in Study 2, the null models were firstly tested. The variance in each outcome variable explained by team-level variables was obtained. Individual-level variables and team-level variables were introduced to the model then. The HLM results of innovation-oriented leadership and transformational leadership on three measures of innovation, namely, leader-rated innovation, quantity of innovations and quality of innovations are shown in Table 11. Table 12 presents the results of leadership on each stage of innovation.

***Employee innovation (leader-rated innovative work behaviors, Quantity of innovations, & Quality of innovations)***

As shown in Table 11, the intercept of each null model was 3.84, 2.58 and 54.11 respectively. The analyses revealed that 50 percent of the variance in leader-rated innovation was explained by team-level variables, 66 percent of the variance in quantity of innovations and 42 percent of the variance in quality of innovations resided between teams.

In support of Hypothesis 1a, innovation-oriented leadership was found strongly associated with leader-rated innovation ( $\gamma = .23, p < .05$ ). Transformational leadership, however, was not related to it ( $\gamma = -.06, n.s.$ ). Similar results were found on employees' quantity of innovations. Innovation-oriented leadership had a significant and enhancing impact on the quantity of innovations ( $\gamma = .32, p < .05$ ). The effect of transformational leadership on the quantity of innovations was not significant ( $\gamma = .06, n.s.$ ). Therefore, it lent support for Hypothesis 1b. Though the zero-order correlation (Table 10) of innovation-oriented leadership and quality of innovations was significant ( $r = .23, p < .01$ ), the HLM results showed that neither innovation-oriented leadership ( $\gamma = 3.92, n.s.$ ) nor transformational leadership ( $\gamma = 1.22, n.s.$ ) was significantly related to the quality of innovations. Accordingly, Hypothesis 1c was not supported.

***Idea generation (IWB1)***

The intercept of null model on idea generation was 4.07. The analyses results revealed that team-level variables explained 40 percent of the variance. As noted in Table 12, the relationship of leadership behaviors for idea generation and its

corresponding employee performance was not significant ( $\gamma = -.05, n.s.$ ), failing to support Hypothesis 2a. TLB was found to moderate the relationship of leadership and employees' idea generation ( $\gamma = -.23, p < .05$ ), whereas no main effect of TLB was found on idea generation ( $\gamma = .15, n.s.$ ). Figure 3.1 is a graphic representation of this interaction. Simple slope test was performed and the results suggested that in a high learning environment, the slope was not significant ( $\beta = -.19, t = -.66, n.s.$ ), neither the slope under the condition of low TLB ( $\beta = .07, t = .24, n.s.$ ). The results showed that only the interaction was significant hence Hypothesis 2b was not supported.

### ***Idea promotion (IWB2)***

The intercept of null model on idea promotion was 3.60 and team-level variables accounted for 46 percent of the variance in idea promotion. Leadership behaviors for idea promotion was found positively associated with its corresponding performance ( $\gamma = .54, p < .01$ ), lending support to Hypothesis 3a. Work contacts negatively moderated the leadership-performance relationship ( $\gamma = -.21, p < .01$ ) and itself also had a positive effect on idea promotion ( $\gamma = .98, p < .01$ ). Figure 3.2 depicts the interaction. As shown in the figure, the simple slope of high work contacts was positive and significant ( $\beta = .35, t = 3.27, p < .05$ ). Under the circumstance of low work contacts, the positive relationship between leadership behavior and idea promotion was even stronger ( $\beta = .74, t = 3.77, p < .01$ ). Hypothesis 3b, therefore, was confirmed.

### ***Idea implementation (IWB3)***

The intercept of null model on idea implementation was 3.87. Forty-three percent of the variance in idea implementation resided between teams. Hypothesis 4a which predicted the main effect of leadership on performance at the stage of implementation

was supported ( $\gamma = .21, p < .05$ ). Furthermore, in support of Hypothesis 4b, team initiative negatively moderated the leadership-performance relationship ( $\gamma = -.31, p < .05$ ) and it was also positively associated with idea implementation ( $\gamma = .33, p < .05$ ). This interaction is shown in Figure 3.3. Results of simple slope test revealed that when all team members taking initiative towards work, leadership was not related to employees' idea implementation performance ( $\beta = .03, t = .29, n.s$ ). In contrast, leadership was significantly associated with increased idea implementation when team initiative was low ( $\beta = .39, t = 3.62, p < .01$ ).

**Table 10. Mean Values, Standard Deviations, Correlations, and Reliability of the Measures (Study 3)**

Variables	M	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Education	1.90	0.87	---																	
2. Org Tenure	62.12	61.30	-.23**	---																
3. Age	34.56	8.96	.47***	-.46***	---															
4. TL	4.96	1.06	.00	.01	-.07	(.94)														
5. IL	4.31	1.19	.11	.07	-.06	.51***	(.96)													
6. IL1	4.28	1.15	.14	.02	-.13	.56***	.82***	(.90)												
7. IL2	4.50	1.30	.09	.03	-.04	.47***	.79***	.76***	(.92)											
8. IL3	4.25	1.19	.12	.04	-.08	.52***	.81***	.83***	.69***	(.90)										
9. Team learning behavior	4.01	0.57	.03	.00	.00	.60***	.50***	.47***	.43***	.43***	(.85)									
10. Team size	5.11	1.20	-.18*	-.14*	-.05	-.07	-.16	-.11	-.12	-.04	-.18*	---								
11. Team Initiative	4.97	0.57	.04	.06	-.06	.58***	.45***	.42***	.38***	.37***	.61***	-.25**	(.88)							
12. Work Contacts	2.09	0.93	.07	.04	.01	.19*	.26**	.28**	.25**	.29**	.27**	-.02	.22**	(.86)						
13. IWB1	4.04	0.90	.02	.05	.05	.11	.31***	.32***	.31***	.30***	.14	-.16	.12	.16	(.75)					
14. IWB2	3.57	1.08	-.15	.05	.16	.11	.22*	.16	.21*	.15	.08	-.05	.11	.20*	.56***	(.84)				
15. IWB3	3.83	1.11	.03	.01	-.05	.07	.41***	.32***	.36***	.30***	.10	-.12	.16	.20*	.72***	.75***	(.84)			
16. Innovative work behaviors (IWB)	3.81	0.92	-.04	.04	.06	.11	.35***	.30***	.34***	.28**	.12	-.12	.15	.14	.84***	.88***	.94***	(.91)		
17. Quantity of innovations	2.19	3.77	.01	.25**	.18*	.04	.38***	.17*	.14	.13	.20*	-.41***	.17*	.10	.15	.18*	.28**	.23**	---	
18. Quality of innovations	52.28	67.70	-.02	.16	.07	.10	.23**	.23**	.17*	.16	.12	-.22*	.09	.11	.24**	.22**	.33***	.30***	.47***	---

Note:  $N = 137$  (Level 1, Individuals);  $N = 28$  (Level 2, Teams).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: Cronbach's alpha.

**Table 11. Hierarchical regression results on leader-rated innovative work behaviors (IWB), Quantity of innovations and Quality of innovations (Study 3)**

	Leader-rated innovative work behaviors (IWB)	Quantity of innovations	Quality of innovations
<i>Variables</i>			
<i>Null Model</i>			
Intercept	3.84 (.13) <sup>***</sup>	2.58 (.63) <sup>***</sup>	54.11 (9.03) <sup>***</sup>
<i>Level 1</i>			
Intercept	3.85 (.13) <sup>***</sup>	2.58 (.65) <sup>**</sup>	2.74 (.67) <sup>**</sup>
Age	.01 (.01)	.01 (.03)	-.55 (.65)
Education	-.02 (.10)	.04 (.27)	-.32 (6.43)
Org tenure	.00 (.00)	.01 (.00)	.14 (.11)
Transformational leadership (TL)	-.06 (.05)	.06 (.09)	1.22 (6.96)
Innovation-oriented leadership (IL)	.23 (.10) <sup>*</sup>	.32 (.16) <sup>*</sup>	3.92 (5.09)
<i>Level 2</i>			
Team Size	-.12 (.12)	-1.72 (.79) <sup>*</sup>	-14.27 (9.02)

Note:  $N = 137$  (Level 1, Individuals);  $N = 28$  (Level 2, Teams).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: standard errors.

**Table 12. Hierarchical regression results on IWB1, IWB2 & IWB3 (Study 3)**

	Model 1 IWB1	Model 2 IWB2	Model 3 IWB3
<i>Variables</i>			
<i>Null Model</i>			
Intercept	4.07 (.12)***	3.60 (.16)***	3.87(.17)***
<i>Level 1</i>			
Intercept	4.07 (.12)***	3.60 (.16)***	3.87 (.16)***
Age	.01 (.01)	.02 (.01) <sup>+</sup>	-.00 (.01)
Education	-.05 (.09)	-.07 (.10)	-.09 (.10)
Org tenure	.00 (.00)	-.00 (.00)	-.00 (.00)
Transformational leadership (TL)	-.12 (.09)	-.07 (.06)	-.08 (.05)
IL for idea generation (IL1)	-.05 (.11)	.11 (.12)	-.01 (.11)
IL for idea promotion (IL2)	.11 (.08)	.54 (.15)**	.02 (.07)
IL for idea implementation (IL3)	.12 (.08)	.01 (.08)	.21 (.08)*
Work contacts (WC)		.98 (.28)***	
<i>Level 2</i>			
Team Size	-.12 (.16)	-.08 (.13)	-.09 (.19)
Team learning behavior (TLB)	.15 (.29)		
Team initiative (TI)			.33 (.16)*
<i>Interaction</i>			
IB1xTLB	-.23 (.11)*		
IB2xWC		-.21 (.05)***	
IB3xTI			-.31(.13)*

Note:  $N = 137$  (Level 1, Individuals);  $N = 28$  (Level 2, Teams).

<sup>+</sup>  $p < .1$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: standard errors.

Figure 3.1. The interaction between leadership for idea generation and team learning behavior on IWB1 (Study 3)

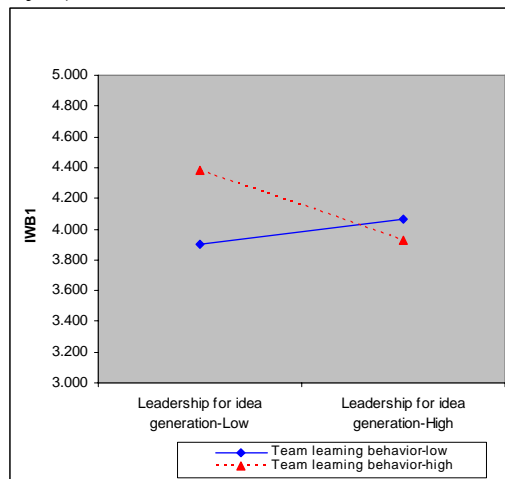


Figure 3.2. The interaction between leadership for idea promotion and work contacts on IWB2 (Study 3)

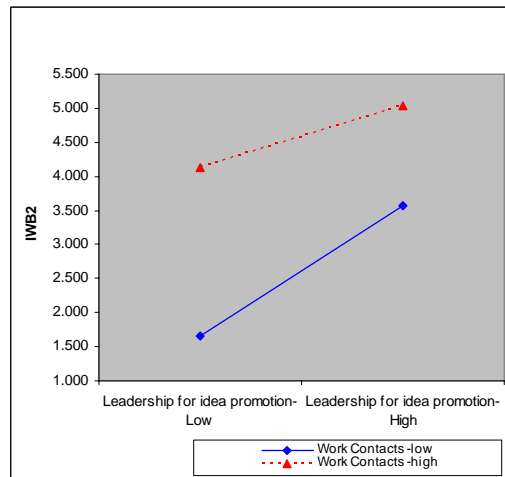
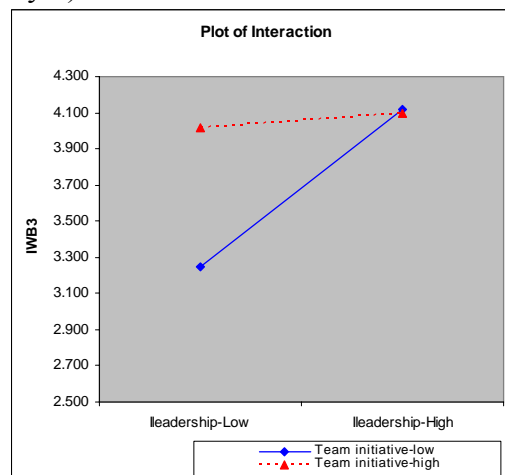


Figure 3.3. The interaction between leadership for idea implementation and team initiative on IWB3 (Study 3)





## ***DISCUSSION***

In Study 3, using a sample of a large beverage manufacturer in China with 28 teams, similar results as those in Study 2 were found. Consistent with the results of Study 2, the positive effect of innovation-oriented leadership on leader-rated innovation was confirmed while no relationship was found between transformational leadership and innovation. Furthermore, the results of Study 3 showed that innovation-oriented leadership can also enhance the quantity of innovations, one of the objective measures of innovation, whereas transformational leadership cannot effectively promote the quantity of innovation. Neither innovation-oriented leadership nor transformational leadership was found related to the quality of innovation. As a result, Hypothesis 1a and 1b received support but Hypothesis 1c did not.

When examining innovation-oriented leadership behaviors specific to each stage of innovation, the findings of Study 2 were mostly confirmed. At the stages of idea promotion and implementation, leadership behaviors were found to have a positive impact on the corresponding performances, supporting Hypotheses 3a and 4a. In support of Hypotheses 3b and 4b, work contacts and team initiative substituted the effect of leadership behaviors on idea promotion and implementation, respectively.

Despite these encouraging observations, leadership behaviors for idea generation and TLB were not related to the generation of ideas, indicating that Hypotheses 1a and 1b were not supported. Only the interaction of leadership and TLB was significantly associated with idea generation. Findings also showed that innovation-oriented leadership cannot boost the employees' quality of innovation, although the two were highly correlated according to the zero-order correlation. Transformational leadership also failed to enhance the quality of innovation, and their correlation was not significant.

In the next chapter, the theoretical implications, managerial implications, and strengths and limitations will be discussed, and future research directions will be proposed.

**Table 13. Summary of Hypotheses and Results of Study 2 and Study 3.**

<b>Hypotheses</b>	<b>Descriptions</b>	<b>Study 2</b>	<b>Study 3</b>
H1a	Employee perception of leader's innovation-oriented behaviors is positively related to individual's innovative work behaviors and this positive effect is stronger than that of transformational leadership.	S	S
H1b	Employee perception of leader's innovation-oriented behaviors is positively related to the quantity of innovations and this positive effect is stronger than that of transformational leadership.	N.A.	S
H1c	Employee perception of leader's innovation-oriented behaviors is positively related to the quality of innovations and this positive effect is stronger than that of transformational leadership.	N.A.	NS
H2a	Employee perception of leader's behaviors for idea generation (IL1) is positively related to the individual's generation of novel and useful ideas.	S	NS
H2b	Team learning behavior moderates the positive relationship between IL1 and idea generation in such a way that this relationship is less positive when TLB is high than when it is low.	S	NS
H3a	Employee perception of leader's behaviors for idea promotion (IL2) has a positive impact on individual's performance of idea promotion.	S	S
H3b	Work contacts moderate the positive relationship between IL2 and the idea promotion in such a way that this relationship is less positive when the individuals have more frequent work contacts than when they do not.	S	S
H4a	Employee perception of leader's behaviors for idea implementation (IL3) is positively related to individual's idea implementation performance.	S	S
H4b	Team initiative moderates the positive relationship between IL3 and the idea implementation of employees in such a way that this relationship is less positive when team initiative is high than when it is low.	NS	S

*Note: S: Supported  
 NS: Not Supported  
 NA: Not Applicable*

## **CHAPTER 7. OVERALL DISCUSSION**

Compared with merely generating novel ideas, innovation including idea generation, promotion, and implementation is the difficult part because the latter stages of innovation depend on enormous efforts to gain support, and large amounts of attention and energy to ensure the effective execution of the ideas (Nijstad & De Dreu, 2002; West, 2002). Ideas that cannot be implemented properly will turn out to be valueless. A number of studies have been performed to investigate how innovation can be enhanced by leadership while the majority of current leadership models employed to predict innovation focused mainly on idea generation, the first stage of innovation. Given the importance of latter stages of innovation, research on leadership and innovation should therefore take a broader scope or perspective to identify which leadership behaviors can enhance each stage of innovation. Accordingly, innovation-oriented leadership, developed specifically for each stage of innovation, was introduced, matching leader behaviors with the various targets and requirements of each stage. In addition, one also has to consider the role of contextual factors to understand the relationship between leadership and innovation fully (Michaelis et al., 2010). Drawing on substitutes for the leadership model (Kerr & Jermier, 1978), the role of three contextual variables, namely, TLB, work contacts, and team initiative on the linkages between leadership and employee innovation, were examined. Three studies were conducted to investigate these relationships systematically. In the next section, an overview of the results followed by a discussion of the theoretical and practical implications will be provided. Finally, the limitations of this study will be discussed, and the corresponding suggestions for future research will be presented.

## ***Overview of the Results***

In Study 1, a set of leadership behaviors was obtained through in-depth interviews and literature search. EFA was conducted based on these behaviors and three factors were extracted. The first factor consists of leadership behaviors such as “encourages diversified and divergent inputs” to stimulate idea generation. With respect to the second factor, leadership behaviors are characterized as facilitating promotion of ideas that are adapted from championship behaviors (Howell et al., 2005) and coded from interviews. An example behavior is “expresses strong conviction about the innovation.” The third factor is composed of leadership behaviors such as “strives for sufficient manpower to carry out the innovation,” which facilitates the implementation of ideas.

Study 2 was conducted with a sample of 166 employees residing in 40 teams from the R&D departments of several organizations in China to validate the leadership behaviors, and to investigate whether or not these behaviors are associated with increased innovative performance of employees. CFA confirmed the three-factor model and the discriminant validities were checked. A series of analyses were performed to test the effectiveness of innovation-oriented leadership. First, the effects of innovation-oriented leadership on the innovative behaviors of employees were compared with those of transformational leadership, which is considered as influential to creativity or innovation (e.g., Gong et al., 2009; Shin & Zhou, 2003). Results showed that innovation-oriented leadership was significantly and positively related to the innovative behaviors of employees assessed by their leaders, but transformational leadership was not. Therefore, the prediction that the effect of innovation-oriented leadership is stronger than that of transformational leadership was confirmed. Subsequently, the leader’s influence on each stage of innovation was examined.

Results showed that except for the marginal effect found at the idea implementation stage, innovation-oriented leadership plays a significant role at the stage of idea generation and promotion. As predicted, TLB also moderated the relationship between leadership and idea generation. Leadership for idea generation is less positively related to employees' idea generation when TLB is high than when it is low. Similar patterns were obtained when examining the effects of work contacts and team initiative on idea promotion and implementation. Innovation-oriented leadership is most effective under the condition of less work contacts and low climate for initiative.

The findings of Study 2 were verified by Study 3, with a sample of 137 line-workers residing in 28 teams from a manufacturing industry, which is distinctively different from the sample of Study 2. Additionally, two objectively measured innovations, quantity of innovations and quality of innovations, were examined, which answered the call of many studies for the inclusion of objective measures of innovation (e.g., Gong et al., 2009; Zhou, 2003). Findings confirmed the importance of innovation-oriented leadership in enhancing leader-rated innovative behaviors and employees' quantity of innovations. Compared with innovation-oriented leadership, the effect of transformational leadership on innovation was not significant. Although innovation-oriented leadership was found to be unrelated to the quality of employee innovations according to the HLM results, the correlation between the two was high.

Findings of Study 3 also confirmed the predictions of the role that leadership and contextual factors played at various stages of innovation, with the exception of idea generation. Neither innovation-oriented leadership nor TLB was found to be associated with the idea generation of employees; only the interaction effect of the two was significant. The non-significant main effect of leadership on idea generation may be attributed to the high correlations among the three dimensions of innovation-

oriented leadership behaviors. The non-significant main effect of TLB on idea generation might be due to the characteristic of the sample which consists of frontline workers in a manufacturing factory. The machine paced manufacturing job requires less TLB and in fact, the mean of TLB of Study 3 reflected that the teams were not engaging in learning activities as often as the teams in Study 2. When leadership behaviors for the other two stages were not controlled for, leadership behavior for idea generation was found to be significantly and positively related to the performance of idea generation. The theoretical and practical implications of these findings will be discussed in the following sections.

### ***Theoretical Implications***

The findings of this study have several implications on theories. The study enriches the innovation and leadership literature by building and testing a comprehensive and innovation stage-based framework, and linking leadership behaviors specific to each stage of innovation process and their corresponding substitutes with innovative outcomes. It echoes the call for new and more comprehensive models of leader influence by considering creative work in organizational settings (Mumford & Licuanan, 2004), and provides insights into what behaviors leaders use to facilitate innovation among their employees and how they use these behaviors.

The current research advances knowledge to each stage of the innovation process, especially the latter stages of innovation that received little research attention (De Jong & Den Hartog, 2007; Michaelis et al., 2010). Extant empirical studies of leadership and contextual factors focused largely on the stage of idea generation (e.g.,

Kahai et al., 2003; Wang & Rode, 2010). Prior to the present study, no integrative model has been built to investigate stage by stage what leadership behaviors and contextual factors may stimulate idea generation, what combination of the two encourages idea promotion, and what conditions favor the implementation of an idea. Identifying the effective leadership behaviors and contextual factors enhancing idea promotion and implementation fills the knowledge gap about the latter two stages. The results imply that idea promotion can be enhanced by promotion behaviors of the leaders. In addition, people having a well-developed connection with many work contacts both within and outside the organization can access interpersonal interactions and non-redundant information, which in turn facilitates idea promotion. Idea implementation can be improved under the joint effects of leadership behaviors, which secure resources and ensure sufficient communications to avoid conflict, resistance, and team initiative, taking a proactive approach to solve problems and setbacks. These leadership behaviors and contextual factors suggest that factors enhancing performance of idea promotion and implementation are not identical to those of idea generation.

The findings of Study 3 also provide implications to innovation literature by examining two objective measures of innovation. Compared with the leader subjectively evaluated innovation, the role of the leader in the objective measures of innovation is less influential. Rather than objective innovative outputs, innovative work behaviors are subjectively evaluated by leaders based on their perceptions of employee performance. The subjective ratings of innovation may be biased due to a variety of intentional and inadvertent factors such as demographic characteristics, supervisory liking, and halo effect (Landy & Farr, 1980). Indeed, supervisory liking was found positively associated with supervisors' assessments of subordinates' in-role



and extra-role performance (e.g., Allen & Rush, 1998). In addition, the halo effect, which refers to “the influence of a global evaluation on evaluations of individual attributes of a person” (Nisbett & Wilson, 1977), might influence the leader’s judgment of the innovative performance of an employee and be attributed to the positive relationship found between leader behaviors and subjective measures of innovation. More specifically, a leader may have a systematic bias in attributing the innovation of an employee, relying on global affect rather than carefully discriminating innovation and other performances. Conversely, objective measurements can avoid the possible biases. The positive findings of innovation-oriented leadership on the quantity of innovations provide evidence confirming the effectiveness of leadership in addition to enhancing innovative work behaviors. Furthermore, the results showed that leadership was not significantly associated with the quality of innovations as opposed to the quantity of innovations and innovative work behaviors, indicating that quality of innovations may be beyond the control of leaders and employees. As the quality of innovations reflects implementation effectiveness, whether a good idea can turn out to be a good ultimate product or be successfully executed also relies on the efforts of the organization. This finding further suggests the importance of the latter two stages of innovation. How creative ideas are promoted and implemented, a crucial part of the innovation process, needs further research (Mumford, 2003). Neglecting idea promotion and implementation may lead to unsuccessful innovations.

The present research contributes to the leadership literature in the context of innovation by introducing innovation-oriented leadership. Innovation-oriented leadership is the only leadership that captures the diverse requirements and tasks of idea generation, promotion, and implementation, and directly influences these

outcomes through displaying facilitative behaviors. Innovation-oriented leadership also clarifies the influencing process of leader behaviors on innovation because it deals with requirements stage by stage. However, most current leadership models treat innovation as an outcome, and therefore, cannot explicitly explain the process of leadership influences on innovation. This might be one of the reasons that the findings of prior studies on leadership and innovation are not consistent (Pieterse et al., 2010). In fact, when comparing the effect of innovation-oriented leadership on follower innovation with transformational leadership, the most studied and prevalent leadership in relation to innovation, innovation-oriented leadership was found positively related to innovation among followers while transformational leadership was not associated with enhanced innovation. This finding shows that innovation-oriented leadership, which caters to the distinct requirements of each innovation stage, is above and beyond the effect of transformational leadership on innovation.

Finally, there are three important theoretical implications to the substitutes for leadership model associated with the findings of Study 2 and Study 3. First, the present study reinforces the call of some scholars (e.g., Kerr & Jermier, 1978; Podsakoff et al., 1996) to extend the substitutes for leadership model by examining a wider range of leadership behaviors and a broader range of characteristics that can substitute for, neutralize, and enhance leadership effectiveness. The substitutes for leadership model of transformational leadership have been examined on outcomes like collective efficacy (Cole et al., 2009), satisfaction, commitment, trust, and organizational citizenship behaviors (Podsakoff et al., 1996). Very few studies adopted such an integrative approach to examine the influences of leadership and contextual factors as well as their interactive effects contributing to innovation. The present study thereby contributes to the SLT literature by adding to the research on

the situational approach to leadership in the case of innovation. Investigating a new leadership, namely, innovation-oriented leadership instead of transformational leadership, with a new set of contextual factors on each stage of innovation also contributes to the SLT model. The results imply that SLT can be effective to explain how the impact of leadership on the performance of idea generation, promotion, and implementation would be influenced by contextual factors. One also has to consider the role of contextual factors (Michaelis et al., 2010). Given the difficulties in detecting the interaction effects in leadership research (Villa et al., 2003), the current findings affirm that contextual factors, in general, and TLB, work contexts, and team initiative, in particular, are important to understand fully the relationship between leadership and innovation.

The second contribution to SLT is that the present study addresses the concerns and criticisms raised by Dionne et al. (2005) and Villa et al. (2003) that much of the prior research on the effects of substitutes on relationships between leader behaviors and follower outcomes lacked a sound theoretical rationale. Dionne et al. (2005) agreed that “without strong hypothesized relationships developed from sound theory, testing every possible interaction by regressing every criterion on all leader behaviors and moderators does not move the substitutes field forward in the direction originally outlined by Kerr and Jermier” (p. 172). Besides, previous studies did not provide insight into the mechanics of substitution and the process by which substitutes achieve their effects (Gronn, 1999). This research explores and specifies the mechanics by which contextual variables achieve the effect of substituting, neutralizing, or enhancing by incorporating organizational learning, social network theory, and action theory, the fundamental bases of initiative literature. The generation of novel ideas relies heavily on intensive information and knowledge (Rietzschel et al., 2006). A

learning environment for employees, enabling them to seek feedback, ask for help, share information, and make errors or mistakes would somewhat reduce the effect of leadership on idea generation, because it would also help stimulate idea generation as leadership does. Idea promotion relies largely on a well-developed network of connections to gain support and acceptance. Contacts with individuals or groups within and outside the organization allow individuals to approach different people and develop their connections, which help in enlisting support and getting approval of ideas. It accordingly reduces the role of the leader in idea promotion. Idea implementation involves changing the status quo, which implies resistance, conflict, and a requirement for sustained effort (West, 2002). Unexpected problems, barriers, and setbacks occur during the implementation of ideas. The formal and informal practices of teams, which guide and encourage sustained efforts and collective self-initiative to prevent problems and solve problems proactively, would substitute for part of leadership effectiveness.

Third, the findings of the present study indicate that the substitutes for leadership model can be rather dynamic as opposed to relatively static. Instead of finding that the same contextual variable may enhance some relationships and neutralize others, as Cole et al. (2009) did, the findings of this study showed that the contextual variable changes from one stage to another. Although the requirements and tasks differ at each stage of innovation, they are all about innovation and are thus related. The effects of variables (including substituting, neutralizing, and enhancing) on the leadership-outcome relationship are adaptive to different constraints and situations.

## ***Managerial Implications***

The findings also offer important implications for team leaders and organizations. A set of leader behaviors specifically targeting each stage of innovation was obtained in Study 1, and the results of succeeding studies validated the effectiveness of these behaviors in enhancing innovation. Instead of treating all stages of innovation in the same way, team leaders should display different behaviors to facilitate the innovative performance of employees at various stages of innovation. For example, leaders should encourage diversities and grant autonomies to stimulate innovative ideas while their focuses of idea implementation should turn to assure collaborations and provide work supports. In addition, the findings of Study 2 and Study 3 also suggest that some contextual variables (i.e., TLB) may replace part of the effectiveness of leadership in innovation. These findings are not contradictory to the importance of leadership. As Kerr and Jermier (1978) noted, leadership substitutes cannot be so strong as to totally overwhelm the leader. Moreover, some scholars (e.g. Dionne et al., 2005) claimed that “leaders may utilize or create substitutes to fill in for a weakness they perceive in their own behavioral repertoire” (p.186). The creation of substitutes is an act of leadership (Dionne et al., 2005; Howell & Costley, 2001). Richards and Engle’s (1986) definition of leadership also indicated that creating the environment within which things can be accomplished is part of the role of a leader. When a leader is unavailable or lacking in some behavioral competency, he/she can rely on the creation or utilization of leadership substitutes. At the stage of idea implementation, for example, leaders can utilize the formal and informal practices and procedures guiding and supporting a proactive, self-starting, and persistent approach toward work. Team members in such a climate are expected to anticipate problems that might occur and to prepare solutions for the failures during implementation, which sequentially ensure

smooth implementation of ideas. Similarly, team leaders can influence idea generation and promotion by encouraging team learning and helping employees build their networks.

As opposed to leadership traits emphasized in some leadership theories, the findings provide a constellation of behaviors that can be nurtured and learned. Organizations can deliver their team leaders trainings according to the effective behaviors found in the present study. Despite leaders' efforts on the creation of substitutes for leadership, organizations can do more to foster the environment. For instance, organizations can encourage team learning and sharing through setting up brown bag meetings that offer opportunities for employees to acquire, share, and combine knowledge, to ask questions, to experiment with new ideas, and to discuss errors. Organizations can also provide opportunities for employees to attend conferences, trade fairs, and/or expositions to talk to professionals, customers, and people in the same industry to help the employees establish their "weak ties" (Perry-Smith & Shalley, 2003). Organizations are also in a better position than leaders to reinforce the formal and informal practices to support a self-initiated and proactive attitude toward work, fostering the collective initiative.

### ***Limitations and Directions for Future Research***

The current research has some limitations. First, all data in Study 2 were collected within the same time period. The design does not sufficiently allow causal conclusions in the relationship among leadership, substitutes, and outcomes. However, in Study 3, the leader-rated innovation was collected one month after the completion of employee questionnaires, which remedied the limitation of Study 2. Besides, given

that innovation is viewed as a process composed of three stages, the cross-sectional design cannot capture the dynamics of idea generation, promotion, and finally implementation. Moreover, the two-source data sets with leadership and substitutes were obtained from one source (i.e., employees) while outcomes were collected from a second source (i.e., leaders) and were used to test the SLT models. Thus, some scholars (e.g., Dionne et al., 2005) may question that the significant substitute effects come from a common-source bias. However, confirmatory factor analyses showed that leadership behaviors and three substitutes were statistically discriminant across Study 2 and Study 3. In addition, aggregated data of TLB and team initiative at team level are less of a problem compared with those at the individual level. The two-way interactions found would also be difficult to ascribe to common method bias (Evans, 1985). Nevertheless, future research would benefit from collecting leadership, substitutes, and outcome data from three separate sources. A longitudinal design or study of the measured data at different time phases of the innovation process would also be recommended for future research in this area to establish the directionality in the relationship of the variables, and to understand when the studied variables lead to the optimal level of innovative performance (e.g., Farh, Lee, & Farh, 2010). Collecting data at different time phases can also help alleviate the common-source bias concern.

Second, the generalizability of the findings may be a concern. Innovation-oriented leadership behaviors were obtained and investigated in a Chinese context. Thus, whether these behaviors are effective in other cultures should be studied; for example, low power distance and high individualism should be replicated. Although the results of innovation-oriented leadership on various stages of innovation were quite consistent in Study 2 and Study 3, sampling from different types of industries and

from knowledge workers versus less-educated workers, the generalizability of these findings to other cultural contexts is still limited. Moreover, any differential effect when considering the cultural relevance of substitutes for leadership remains unknown. To be specific, future research could examine, for example, the collectivistic versus individualistic cultural rating on the significance of the substitution effect of team initiative. Does climate for group initiative have different effects in collectivistic cultures as opposed to individualistic cultures? Therefore, future studies may benefit from replicating the present models in other cultures.

Third, innovation-oriented leadership was confirmed to be effective in enhancing individual innovative performance throughout the three stages. Despite this confirmation, the findings of the present study are limited to individual-level outcomes and little is known about its impact on team performance. As Mumford and Licuanan (2004) pointed out, the effects of leadership and other variables must be examined in multiple-level studies. One avenue for future research is to examine the role that innovation-oriented leadership behaviors play in team performance. In fact, novel ideas are more likely to be generated and implemented in a team. How leaders manage an effective team to innovate is worthy of further studies. Lastly, although this study objectively measured the ultimate output of innovation with both quantity and quality of their innovations, future studies are recommended to employ objective assessment to measure each stage of innovative outcomes (i.e., idea generation, idea promotion, and idea implementation) to avoid potential biases.



## **OVERALL CONCLUSION**

This dissertation adopted an integrative approach, which takes both leadership and contingencies into consideration, to clarify how stages of the innovation process can be affected by innovation-oriented leaders and contexts. Twenty-four innovation-oriented leadership behaviors were identified which facilitate innovation among followers based on fifteen in-depth interviews and literature search. The three dimensions of innovation-oriented leadership behaviors matched with each stage of innovation, from idea generation to implementation, considering the distinct requirements and activities in each stage. The impact of contextual factors at each stage of innovation was also demonstrated. This research went further by clarifying the role contextual factors play in the positive relationship between leadership and outcomes. Taken together, these findings contribute to the scholarly understanding of what leadership behaviors determine enhanced performance of idea generation, promotion and implementation, the role of contextual factors plays, and the conditions under which those leadership behaviors are most effective in promoting each stage of innovation process. Innovation-oriented leaders can display facilitative behaviors to encourage innovation among followers, but when some behavioral competency is unavailable or lacking, leaders can also rely on establishing or utilizing contexts. Additionally, practitioners have been provided with some practical recommendations with which they can facilitate the innovation process and, ultimately, enhance innovative outputs.

## **APPENDICES**

### **APPENDIX 1: Interview Questions**

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?
2. Referring to the task you performed innovatively, what is the process or how many stages did the task contain?
3. Can you describe the key factor(s) that have made you innovative in the task?
4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?
5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

## APPENDIX 2 Interview Transcriptions

### Interviewee 1

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

其實你說真的 creative, 我又不覺得真的很 creative 的。其實我們工作中所做的大部分是 problem solving. 譬如, 很多時候, 遇到一個問題, 是去想怎樣解決。那這個算不算很 creative, 就是說是不是你想要的東西? 我們的工作上是看遇到什麼問題, 而有針對性的去解決。比如, 像我們做 design 的, 先會看下 design 本身有些什麼 limitation, 打個比喻, 如果我現在 system 上面遇到的是一個 speed 的問題, 那我們就要去看究竟是哪個地方 limit 住它使它無法快速運轉呢? 去看可以在哪裡做一個 improvement. 如果是本身只要增加很少的東西, 就已經可以 meet 到我的 requirement 的話, 可能只需要增加一些很細微的東西, 但如果不是的話, 可能整個 design 一定要改才能做到 (加速 system)。那我們就要針對性的去想, 究竟在哪個位置使得 (system) 不可以這麼快。然後找到解決方法, 改變整個 system。

比如我們現在遇到的一些問題是我們的 RAM 真的是有 Limitation 的話, 現在的 RAM 的 architecture 是不可以達到我們的客人要求達到的速度, 我們就會去檢查我們的 RAM 上面其實真的, 其實寫 RAM 和讀 RAM 是最花時間的, 而其他 system 上面的問題可能就不是那麼占我們的時間, 所以我們的整個 design 就會針對 RAM, 從 architecture 的角度來說, 怎樣 assess 這個 RAM。可能以前, 我們每 Access 一個 pixel 的時候, 要等 (此項 access) 結束, 才能開始第二個 pixel, 那現在有些比較新的方法去做就是把 data 擺在 RAM 那裡不用等它寫完, 就可以寫第二個啦, 當然就要做很多功夫, 來 hold 住 data, 類似一個...的方法去做, 使得整個 design 不會被 RAM 的速度 limit 住。那整個 system 就會快很多。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

Idea generation (brain storming) 有些什麼 Solution

Implementation:

Evaluation: 究竟做出來的是否和我們想像的一樣, 是否 meet 到我們的 requirement.

其實三個 stage 都是好像一個協助性, 我們有問題, 他們協助。

Idea generation: 我們講了一些自己的意見, 他們會給我們一些 idea, 又或者會提出一些問題: 如果遇到...的 case 的時候, 你會怎麼做呢?

Implementation: 我們遇到一些問題可能停滯住, 那就要像他們彙報, 看會不會在另外的地方做容易一些? 那他們就會給一些 idea, 或者 analog 會幫到我多些, 那就可以, 因為他 (supervisor) 提出了一個方面, 那就可以問下 analog 的同事, 你們是不是這樣做都可以呢。那這樣做就會容易些。

Evaluation: 除了很基本的試比如 speed 能不能達到要求, 另外也要檢查 performance 如何。比如, 有沒有 Reliability, 長時間運行會不會死機, 尤其是有問題時, 又會請 Peer 過來一起研究究竟什麼導致問題的出現, 雖然去做的實行的是我們, 但是他們不斷有 involvement. 一路都會有些 idea, support 給我們。

3. Can you describe the key factor(s) that have made you innovative in the task?

怎樣創新? 做的過程其實不是我一個人做的, 其實基本都是由一個 team 一起做因為一個 product, 改一點點地方, 影響未必是自己一個人, 可能影響的是一整個 team 的人去想怎樣能夠幫你達到 (你想改進的地方)。首先我們遇到的這個 speed 的問題是—不可

以不改，因為不改就達不到 **specification**，所以一定要找到方法令到自己可以做到這項任務，可能有很多的方法，可能是由一個 **RAM** 分成 2 個 **individual** 的 **RAM**，但如果這樣做就會變得 **complicate**，所以在一路做的過程當中，通常都是一大班 **engineer** 坐在一起，先 **brain storming**，討論一下有些什麼方法可以解決以上的那個問題，哪個方法會比較可行一些，從長遠來說，會 **effective** 一些。**Brain storming** 之後，大家會達到一個共識，是比較好的方案，那我們就會想如果要這樣做的話，需要有些怎麼樣的配合？或者有些什麼問題我將會遇到而要去解決。要想到這樣的方案就起碼要開幾次會，大家每次會都會 **bring up** 一些問題，然後回去要再想辦法解決。我們好像沒有一個很 **standard** 的 **procedure**，只是每次去開會的時候，討論有些什麼問題，然後再想辦法去 **solve** 這些問題。那如果遇到一些問題，我覺得在我這裡會很難做的話，我就會問其他同事看他們，可能有些問題，在其他同事那裡做的話，會很容易解決，就不會總是在我一個人這裡想來想去，可能最後想的很複雜都未必能做到一個最好的效果。所以最後無論如何都是整個 **team** 的人，大家一起去衡量方法可行或不可行以及這個方法是否是最好。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

其實 **supervisor** 的作用是真是一個 **Leader** 這樣 **lead** 住我們，(我們)有時想到一些東西，可能是很 **general** 的去想，但是可能有些問題沒能看到，因為有時我們看問題，看到的就是這麼多，但有時看問題要看到很大，你才能知道原來這樣會出現問題。因為 **supervisor** 經驗多些，所以他們在...上會看得清晰些。或者他們想的未必只限於 **design**，他們還會考慮到 **cost**，他們可能會給的意見多些，告訴我們有什麼需要注意，他們會給我們多一些這方面的資料。

除了在我們 **design** 的時候，要考慮些什麼問題，當我們要 **debug** 的時候，就是當...真的 **有問題** 的時候，有很多時候不是能夠 **simulate** 出來的，一 **sim**，明明是模仿到所有考慮到的有機會令到它出現問題的地方，但都未必 **sim** 的到出來，所以有時真的要靠猜，因為我們真的遇到過一些問題是我們無論怎樣去 **sim** 都 **sim** 不到問題出來，只有在誇大到不可能發生的情況下，才能 **sim** 出來，但 (**supervisor**) 可以在這些方面，可能他們曾經遇到過很多這樣的問題，又或者他們很清楚有很多問題不是只看 **simulation**，我們剛剛入行的人，很多時候會靠猜，而他們除了看 **simulation results** 之外，他們會大約知道究竟在哪一 **part** 可能出現問題，他會給我們一些解決方案讓我們去試，然後再從這些地方去想究竟問題是什麼。其實 (**supervisor's role**) 主要都是這些。

**Sharing**，真的是在做一個 **project** 的時候，比如我做 **digital**，另外有些同事做 **analog**，他們會解釋他們真正的運作是怎麼樣的。因為其實我可以不知道他們在做什麼，但如果我不知道他們怎樣去 **control** 的話，就是我做了我自己的任務就算啦，我不知道我怎樣做會影響到其它的部分，這樣做會出錯的機會就會很大，所以他們有時比如，**sim** 完了一些東西，都會做一個 **Sharing**。那我們都會出一個...，**share** 一下大家有些什麼改動，有些什麼是比較 **critical** 的，我們會寫一些 **guideline** 出來，告訴大家我自己這個 **blog** 有些什麼 **requirement**，來減少我們到時合併起來會出現的問題。剛才我說的是一個 **project** 的 **sharing**，那我們公司本身有一個 **department sharing**，就會講下我們在這個月裡面的不同的 **project** 在做些什麼。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

有些 **technical** 的問題未必是很容易能 **solve**。又或者要犧牲一些東西，例如我可以做到 **Speed** 快，但是要令到 **area** 變大，**area** 變大就是說 **cost** 會變大，那究竟我們這個

product 是不是可以 afford 的起 cost 變大，那就需要和公司 marketing 部門要再商量究竟是否 Justify 這樣做呢？如果我不想 area 不大，那可能我要多一層，但多一層又會使得 cost 增加，是否能夠 cover 這項 cost，究竟值不值得這樣做啊？這些問題就會在，除了 design 上有 limitation 之外，其實 cost 都會影響我們可不可以這樣做。

因素其實有很多，比如我剛才說的 cost 啊，schedule，因為每做一個改動的時候，可能要做一個很大的改動，當我們要做一個很大的改動的時候，我們預先預備的東西或者 layout 要做的功夫會多很多，那如果有這樣的改動，影響的不是影響一個禮拜的時間，可能是一兩個月，如果延遲一兩個月，交貨給客人的時間就會相對也延遲，所以未必可以這樣做。很多時候，（我）會被這些事 limit 住。那我的 Supervisor 通常不會阻礙我們，不讓我們這樣，不讓我們那樣，因為通常，比如我們開會，除了我們自己的 team 之外，我們通常都會請一些 peer 參與，這些 peer 就算不是負責這個 project，因為他們有多些經驗和始終，越多人（參與）想，就想到的問題和（問題）有機會出現的地方就多些，同時解決方法也會多些。所以通常我們開會就會請他們一起，所以最後我們決定用一個辦法的時候，通常我們的 supervisor 都會在裡面，他們亦都會知道發生什麼事並且會給我們意見這樣做可行不可行。所以我覺得外在的問題主要都是時間上的問題和 costing 上面的問題多些。

可以說 schedule，不允許用一個更好的方法做，那只能退而求其次，用一個不是那麼好的方法來 meet 到 schedule。

通常都會給足夠的自由度。他們只會說我要你做到什麼效果，不會說我要你怎麼做怎麼做，然後得到這樣的效果。你們給我一些方案，然後一起去解決。

## Interviewee 2

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

設計新的電腦或新的產品。如果是舊的產品通常就會用人家的設計。剛剛做的一個是輕觸式螢幕的設計。以前那些只能認到一點的，現在這個可以認到幾個點。通常都是因為 circus 不是說有的用，或者... 所以要重新想過它的架構，我覺得這個都算是一個比較創新的。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

Idea, Implementation, 但過程中都要和人溝通，儘量獲取多些的 feedback, 再完成 implementation. 我上司總是說 knowledge management, 我想是個 socialization。我覺得是第二個 Stage。

主要是 Socialization，因為設計其實是要我們設計工程師去想的，當然，我不是否定上司在這裡的工作，比如如果我的 supervisor 都是工程師，來 Lead 我們的 project, 那他的 involvement 就會多些。(可不可以說一下在 socialization 這個 stage 他具體作了些什麼?) 他通常都會 review 我們的 circus, 給我們意見。

因為做工程師都會要開 review meeting 的，在 Meeting 裡我們要 invite 一些 senior staff 和其它的 peers。所以這個是公司的規則，我覺得是公司的規則，而... (其實都不是說上司創造的?) 是的，不過可能是他定了這個 culture。

3. Can you describe the key factor(s) that have made you innovative in the task?

Knowledge，本身對電腦有所認識才能在(原有)基礎上想到一些新的東西。與同事之間的討論：大家一起討論，討論中可能會有些新的(想法)出來，別人說起一些東西，自己會有一些其它的 insights 幫自己去思考。另外就是公司本身有些以前有的設計可以用來參考一下。這些都是，我覺得這三個都是挺重要的(因素)。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

基本上我的上司都是 director 級的，所以他們未必會很仔細去看我們的設計，通常他們會安排一些 resources 這些來幫助(我們)，或者 assign 一些什麼 job 給我們做，但具體的設計還是要靠設計工程師。我覺得是他(supervisor)究竟 assign 什麼 Job 給什麼同事去做。上司怎麼樣 motivate, 在 idea generation 之前，怎樣鼓勵，不是在 process 本身的，在 generate 新的 idea 之前，就會有個環境。以前我在大學做 research 的時候，他(supervisor) 每個星期都會有個 meeting, 大家 report 一下 status, 如果他見到有好的 idea, 會讚賞。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

其實就不能說是失敗的，但是是我們設計了一樣東西，但是最後市場沒有 Needs，所以左右我們做的東西都沒有能夠 apply 到。(那上司做了什麼而令到做了這樣一個市場不需要的呢?) 因為市場的需要不是容易就可以 predict 的，所以在定 goals 的時候未必，就是未必 predict 的很准。這個是 intermedium, 但最終我們的上司都會要我們達到他的要求。可能做第一次不能成功，但第二次都要做到出來。如果(review 完了之後)有問題回到我們這裡，那大家又會一起 debug, 他(supervisor) 都會 involve 的(和我們一起 debug)。主要都是經驗，比如他可以 share 他的經驗。我自己本身都有下屬，有時真的

是想到另外一條路，自己都未必那麼清楚，但直覺上覺得是 work 的，但最後的結果可能不是最好的。

### Interviewee 3

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

我覺得最近都做了一件比較有創意的事。我們公司有不同的 project, 我就跟著其中一個 project. 本身我們一直有做 LCD driver 的。但我這個 project 的就有些不同的。我的 project 就是一個比較新的範疇, 對我們公司來說, 就是搞 touch panel 的 controller, 就是觸控式螢幕。現在的手機很流行這些的。公司最近都會開發這類的 product。我就是其中一個 design engineer, working on 這 project 的。其實我們公司都已經開發了大概 2 年左右的了, 由最初開始做實驗, 到現在有些 sample. 那我們最初做出的 sample, 未為十分滿意的。有時手指按上去的時候, 出來的所謂的 coordination, 就是浮標都不是很穩定的, 會有些振動。當中, 當然涉及一些 algorithm 的 design 可能未必夠好, 那我就在最近, 想了一個新的方法出來, 就可以使得由 panel 輸入 data 之後, 計算出來浮標的會準確很多, 穩定很多。(這是一種計法?) 對, 是一種 algorithm。詳細來說, 大概以前, 會用 average, 幾點相加, 找一個中間點, 而現在就會用看起來好像很複雜的方法, 其實好像 excel 裡面會用到的 crafting 這樣的。例如有一些 data, 要 fit 些東西進去, 我們就用來類似的方法。那為什麼都學過而之前不用呢? 因為其實做 IC 很多東西都不能貿然地用進去, 它可用的資源相對不是那麼多的, 一用某一樣東西的時候, 就要想一下會占了多少 area, 不是很多 advance 的都能用到的。有時看書的時候, 會覺得這個 algorithm 很好, 可不可以放進去呢? 其實不行的。那為什麼我忽然間想用這個 (algorithm) 呢? 我又覺得可行的呢? 我覺得要想一個新的東西出來都要看每個人自己的 background. 我以前讀書的時候, 經常讀類似這類東西的。我就稍微詳細些知道它的運作原理, 直到怎樣可以簡化, 其他人可能看到一大堆 formula, 又 matrix, 又乘又除, 不可能了, IC 不可能做到, 這麼複雜。那我就嘗試有些簡單的方法, 簡化了其中某些 parameter, 將他的 formula 再重組一次, 發現當 fix 了某些 parameter 之後, 就是一個很簡單的 solution. 在 IC 上是可行做到的。所以直到這個問題之後, 我就開始嘗試去做一些試驗, 例如在 engineering 的 software 上模擬一下, 然後用 FBGA 就是可以即時模擬到 IC 的運算。試了之後效果都不錯。所以我們就決定將這個 (algorithm) 用到下一個 version 從 IC 的角度。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

第一步一定是 learning, 就是先學好所需要的 knowledge, 找好所有的藥, 然後你要怎麼樣 analyze 你的問題, 不同的問題有不同的解決方案, 例如我所說的, 做 IC 有很多 constrains, 不可以隨便加很多 fantastic 的 equation 進去, 要 analyze 先知道目標, 鎖定了目標之後, 就要真的去想, generate idea 出來。Generate 之後都要 implement 這個 idea. Implement 之後我覺得還要加上 testing, 就是真的去驗證這個產品是否真的值得去做, 由公司的角度來說。(就是 implementation 之後是 testing or evaluation?) 沒錯。

3. Can you describe the key factor(s) that have made you innovative in the task?

例如剛才提及過的, 有時有些東西大家覺得沒可能的, 我剛才所說的總這個那麼複雜的 (algorithm) 用在 IC 上面大家都覺得沒可能。如果要創新, 很重要的就是要 see beyond the boundary, 要想一些別人覺得無法做到的東西, 想一下其實會不會其他的可能呢? 其次就是, 再說回來, 當然要有 knowledge, 要知道有這樣的東西。比如一個不是讀這個專業的人, 讀化學的, 根本就不知道不熟悉這樣的方法, 也不知道 IC 的運作, 那當然不可能會想到。起碼我覺得所謂的創新 on 某一樣東西, 確實需要有一個 basic background, 而且要很豐富的, 關於這個範疇的 knowledge。例如家裏有個藥箱, 有很多的格, 裏面有不同的藥, 某一個人想在某一 area 創新確實是先需要有足夠的 knowledge.

思維的方法, 是否會轉彎, 就好像剛才所說的, 大家都認為沒有可能的, 就要多方面



地嘗試，肯去做試驗，肯去面對可能做很多次都做不出的，有堅持，堅持都很重要的。如果，沒有什麼耐性的，試幾次好像行不同的，例如我們的問題這樣，其實已經出了 IC 了，已經有 sample 了，都沒有人特別要求我做這個的，還有就是要有要求，堅持，對自己要有要求，對做出來的產品有要求。其實大家為什麼要創造那麼多新的東西出來，其實是對生活素質有要求，覺得其他人的 product 的素質有要求，有要求才會有創新。我覺得是要有堅持和有要求。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

當然我們之前都想過很多方法的，我們之前那些都 inspire by 他，可能是他以前教過我的，只不過 particular 這個（知識，案例）我可能以前讀書的時候讀過，再特別想出來的。工作上呢，我們上司就會給我們很多空間。因為我做 design 始終是需要很多空間去思考的。那可能我上司見到我有些頭緒了，他見到我想到些東西，都會幫我和其他部門說：我們 design 這邊想到了些新的東西，可不可以將期限延遲一點啊？因為有新的想法之後都要去試，都要做 verification. 做 IC 推出一個產品要盡量沒有 bug, 如果有 bug 就很慘了，因為退回來就要再花幾個禮拜的時間，可能要重新做一粒晶片，又或者要耗費很多錢，做多幾個 mask, 所以我上司方面，就會為我們爭取多點時間，給我們再多點時間 testing, 試清楚這個新的產品，當然我做好之後，他都要 evaluate 我的方法，看下是不是真的 work，或者有什麼問題都會給一些意見。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

早期，剛才說過，已經出過一次 engineering sample, 出第一次 engineering sample 的時候都挺麻煩的，我們都買面臨同樣的問題，我們很想令到出來的效果可以穩定一些，但想來想去都沒能想到，其實在這個 Stage, 中間想過一個方法，除了我剛才說的那個，... 進去，都想過一個辦法，那個辦法都嘗試過創新的，另外一種技巧，叫 pr。。，例如有幾個點，嘗試去看趨勢，看下下一點是什麼。嘗試用這種技術去做我剛才說的這個東西，哪知 finally 出現是不是很行得通的。擺著就好像很穩定，但是一動，它的動的方向就不 liner。就是忽然快，忽然又慢，如果按得重的話，有時又會出現震動。最初那次研究出來就不是很成功的。

#### Interviewee 4

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

其實主要做都是跟公司的 project 做，不會無端端有件事做。通常就是客戶的要求，接著就根據客戶的要求，想下如何解決這個方法。所以就類似 problem solving 這類型會多一點。

Project 都是做 IC design，主要是做一個 drive 一個 panel，這個 panel 是屬於 micro-displacement 的 panel，同其他 team 的 project 會比較不用一點。主要都要 integrate 多一點的本身公司沒有 technology 進入，同時，它的 data flow 也不同於我們公司平時做開的 data flow。

(你可不可以講下在這個創新中，是怎麼做的?)

通常都會有一個問題先，有了問題之後，就看下同事間有沒有 solution，或者有沒有 suggestion，或者同事都會在網上 search 點可行性，或者有機會做 reference (的材料)。接著 base on 這些 reference 或者意見，自己決定選哪一個好，或者在哪裡做一點改善，怎麼可以正好的應用於這個 project 裡面

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

都有 stage 的，首先，就會有一個 problem 先，不會無端端有一件事。然後有了一個 problem，然後你就會有一個 work flow 如何去 solve 你的 problem。那麼 solve 中其中一個可能性就是你找到一個 reference 幫你手，那如果找不到的話，那要如何 modify 現在現成的 reference 或者 resources，就會沿住一個 process 那樣去做。如果你自己 develop 一個 work flow 去解決這個 problem 而要 build up 一點 modify 或者創新的東西加進去，就主要是這個 step。

那在做的時候，可能會有一點 integration，或者有一點 problem 是解決不到，那就需要一點，如果我個人認為可能是需要一些 skill 來解決它，或者當中你自己要 buildup 某一些 skill 去解決。

(那如果這樣斬開，你覺得是幾個 stages?)

。。。

(就是你之間講的每一點都是一個 stage?)

是。

(一般來講，別人會說，有兩個 stages，一個是 idea generation，就是想一個 idea 去解決這個問題，另一個是 implementation，就是你想好這個解決方法之後如何去 implement 而最終去解決這個問題。你覺得，你之前講了這麼多，你可不可以擺入這裡面，或者加多一兩個 stages?)

那譬如 idea，你首先，我個人認為在我的範疇裡，第一個是 confirm 那個 problem 先，或者要求 request。那麼有了 problem 和 request，我就會查找 resources，就是你所說的 implement。那麼 implement 有幾個方法，其中一個就是找 reference，如果找到 reference 就如何對 reference 做 modification。那麼在做 project 當中，可能會有一些 peers 的的 discussion。或者有點 simple 的 implementation，就可能 down to 幾個 level 做，不一開始就做最 detail 的那個，可能做一點 modeling 之類的工作，那麼然後看一個 results，看一下能不能解決先。那麼如果解決的了，才會 down to 接著下去的 step 做。

(那麼在 implementation 之後你覺得有無其他的 stage，例如 evaluation...)

其實就每一個部分，譬如在一路做 implementation 當中，每一個小 step，你都會有一個 pre-results，你都可以看做是一個 evaluation。因為如果你一開始就做到最 low 的 level，那麼你可能就已經開始有問題。其實會在每個 stage level 坡度提升根據慢慢 down 下去，有一個 solve 的...如果有一個不行，就要上返一級。

(就是說你認為包含了 implementation 裡面，每一個都有一個小小的 evaluation?)

是。就是一個 high level to low level 的 implementation。

（那麼上司在每一個 stage 做了些什麼？）

一開始，problem 開始有的時候，他/她會 assign 一個 schedule 給你。那麼這個 schedule 可能 link up 一些要求的 resources 或者 requirement，接著同你談。那麼看下這個 deadline 同需要的時間是否 accept 到。

之後要做 implementation 的，我們可能會初步的找一些 reference 同她談，談完之後，或者會做一個 modification，看下有無特別的問題先。也會做一先簡單的 high level 的 modeling，然後做一些簡單的 evaluation 看一看這個 result。如果沒問題會 down to low level 做。

那麼如果可能之間有一點 conflict，上司會看下時間、人手，之間怎麼穿插。

通常就是，你有問題，找他/她解決。

（會不會主動來幫助？）

因為有時，上司未必知道你有問題，通常我會主動問。

3. Can you describe the key factor(s) that have made you innovative in the task?

重要因素？重要因素就是要“交功課”，就是有一個 requirement，你要想到如何去解決。

（那你自己方面呢？類似自己要有 knowledge 或者其他...）

那因為有一個 problem，就要 build up 自己的 knowledge 來解決這個問題。

（還有沒有其他？好像同事幫助，上司怎麼做...）

這個就好像之前講的，譬如這個是你在做的過程中收集一點意見，就現在自己有一個 problem，或者自己 build up 一點在別人的意見之上的，你如何在那個 project 上面

（改良）...因為未必是在這個 project 上可以完全用到，那麼要加以改良。

（那麼有沒有其他人可以歸入一個 role，一些比較重要的 role，來幫助...）

通常很小，我覺得，如果是我做過的。因為我做的其他 team 未必會牽涉在內，通常是自己...反而是自己做完之後，有些什麼意見，再（同人）discuss 會多一點。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

通常 supervisor，你要他/她出現時就出現，要他/她不出現就不出現。就是說你有 problem 有要 discussion 的時，才會...，就是俗語講“別阻住我做野”。

（那之前第一個問題時的例子，在那個創新中，你的 supervisor 做了什麼？有或者不在這間公司...）

可能譬如，有一點 confi，或者 resources，你做 project 時可能需要一點 resources，那 supervisor 的作用就是幫你找到一點 resources 幫你解決這個問題。可能是錢，可能是人與人之間。或者有一點 parallel 的問題，就是可能你有其他 project，或者被其他的事 drive 住做到不（其他）事，supervisor 會幫你解決這類型的問題。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

我想可能未必是 under 我這裡，可能是 under 其他 department，那些就可能會有。

譬如我見到一些 designer 就會有一些 idea，那麼通常會 supervisor 就會覺得自己的 idea 好過 designer。那麼這裡就會有一個 conflict 存在。那麼就會 concern 這個 time 或者是 resources，那就變成，會令那個 designer 未必會做到他/她原本想做的那件事。

（有沒些具體的因素影響到最後做出來的結果...）

那就是因為 supervisor 覺得自己的 idea 好過那個，就會一定要求自己的下屬做自己這個。

（就是說已經在最開始的 ideal generation 的 stage 就...）

“Bend 佐”他（下屬）那個。

（那麼後面就其實已經，就全部都是照著上司的來做？）

是的，你可以這樣講。就是如果你覺得有點什麼不好，他（上司）都不會 balance 要去這麼做。

（那有無這樣的上司，會每日放工前，都會要知你做了些什麼，就是會 control 的很緊？）

我就沒接觸過這類型的（上司）。

（那你之前的 case 是不是？）

都不是，反而很少會這樣，因為有時的 job 都不是很快能出來，趕是不會，，反而 report 返這個 schedule。通常我自己的是比較主動點，有什麼問題會（主動）提。

（通常上司就不會很多干涉大家做事？）

我這個小點（機會這樣做）。因為你自己 handle 了，他又覺得你 handle 的到，那就不會有這樣的問題。

最大問題是，有些 designer，他們的 supervisor 對他們沒信心，那樣的話，問題存在會比較多點。

（你有沒遇到這樣的 case？）

我少點（這樣的機會），我就應該沒有。

（那你知道人家會這樣？）

有，別人（有時）就是這樣，就像我之前說 case 那樣。

（那就最終會做不到這個好的結果出來？）

會有失敗的結果，譬如跟一個 supervisor，但這個 supervisor 不是那麼好，出來的 results 會（不理想）。最終會浪費時間，可能會 feedback 回到原先那個（idea）。

（中間的 stages，你就沒有 observe 到 leader 會做了些什麼來影響最終結果？）

這個 stage 就是他（上司）不讓他（下屬）做他（下屬）的 idea。

（其他 case 就沒有遇到過？在中間（stage）來影響的？）

一開始就其實，你說 whole process 他（上司）就一路要求那麼去做。什麼是“中間”？

（就不同於你之前說的那個，一開始就是，上司一路要求照他自己的 idea 去做。譬如上司開始是，放手給下屬，buy 下屬的 idea，然後可能中間的 implementation，或者上司做了些什麼 behavior，或者沒做些什麼 behavior，而影響最終的結果是不好的？）

很少，很少會這樣。通常都是我們一開始拖頭的這個 idea，決定了之後的 performance，會比較緊要點。

## Interviewee 5

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

我想先講環境。比如要創新要有 Information 給我們去先示範一下。關於這個 Product 有什麼 features，或者市面上有什麼 features，現在面對著什麼樣的問題。有些這些 background 的 information，那樣才能想到一些創新的東西。就是說創新不是憑空想像出來的，都要 base on 一些 (Information)。之前我覺得最創新的就是，那個 situation 是有些問題我們已經面對了很久了，但是之前的 designer 就沒有嘗試去解決過。我接手之後，接著我就去尋找有什麼問題，然後知道問題在哪裡。(或者先講下是怎麼樣的創新)。那個創新就是在一個沒電的情況下都可以做到 detection。以前的 design 就覺得在沒有電的情況下都無法做到的，就沒有再嘗試去思考。但我接手的時候，base on 一些 background 就嘗試去解決這個問題。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

我覺得有三個：資料收集，接著是 brain storming, implementation. (其他呢?) 沒有了。  
資料收集：leader 要 provide 足夠的 resources.

Brain storming 這裡，剛才我都說過了，一個人未必可以想到的，要有一些很願意溝通的同事，或者 peers，他們就可以幫到 (我)。那 leader 的作用就是找一些相同的人，就是 invite 一些相同的人來做 brain storming。

Implementation 這裡就牽涉一些 resources，他會 handle 人手配方面。時間啊，人手啊。有時也會要跨部門來做。(跨部門的話他會怎麼做呢?) 跨部門的話，他會講我有一個 product, 有些這樣 requirement，那這個 requirement 要找 manufacturing 那邊幫忙的，因為那個 creator 的職位未必可以做到跨部門，這時就需要 supervisor 幫他們做了。

Implementation 就是這樣 (supervisor 就是這樣做)。

3. Can you describe the key factor(s) that have made you innovative in the task?

首先要知道究竟問題在哪裡。就是所做的一個創新是要解決一個問題。那我首先要知道問題在哪裡以及一些局限性的資料，就是一些 limitation, 那集齊了所有的這些資料我 base on 這些去想。中間的過程怎樣思考，是 base on 我以前做過一些不同的 product, 以及以前看過一些不同的 reference book 或者一些 news，加起來才能想到一些新的東西出來。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

我的 Supervisor 在 creativity 裡面其實是 provide 足夠的 information, information 都要很清晰地告訴我們，background 啊這些。even 他不清晰的話，他都要告訴我們，就是他自己不是很清楚，但是他要知道怎樣才清楚，他都要 provide 這樣的 information。以及 supervisor 的角色就是他會幫 (下屬) handle 一些會阻礙到 (下屬) 工作的障礙。比如其他 group 可能有些 request 要你幫忙，你的 supervisor 覺得你在忙這個工作，他就會幫你 handle，讓其他 group 就暫時不要找你幫忙。我想 supervisor 能幫忙就是這麼多。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

失敗的原因就是 background information 不足夠或者對於那個問題未必想得很透徹，比如我們做一個 job 是想 solve 一個問題的，出來的結果成效不好或者乾脆是失敗的。那

麼為什麼呢？可能中間過程有些問題，比如最開頭的, first day information 未必 valid, 就是開頭 assume 的未必 valid。接著就是，第三個，到了 implementation 的 stage, 因為最初 assume 的根本已經是錯的，到了 implementation 當然都會錯，那最後出來的東西當然就失敗了。

我現在 define supervisor 就沒有參與 creativity, 那如果他沒有參與過，如果他真的要負責任，就是 Information provide 的不足夠。我現在是 assume supervisor 沒有 involve. 但如果有，那就牽涉到 information 和 background. (就是他的?) 責任就是這樣。其實從我的角度來看，supervisor 在 creativity 方面未必會比他的手下強，supervisor 的角色不單是做事的能力高些，可能是 management 的方面高些，才會升他做 supervisor，所以我不覺得 creativity 是由他來做主導。阻礙就是太過分參與。(為什麼?) 如果他太過分參與又太過自我，就會阻礙，就是他堅持己見，那就會有問題。(那他有沒有很多 control，每天 check 你的工作?) 我幻想的話，如果是這樣，都會是阻礙。通常不會每天 check。我覺得是每個星期會問我們的進度，但不會是每天。

## Interviewee 6

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

我會 lead 一個 project 去做一個 design. 不是我的上司帶領大家做這個 project 而是我自己帶著大家去做。我們要 develop 一個 product 是 existing market 沒有做過的。當時我們做個晶片設計。我覺得這麼多的 generation, 它的 design 或者說 architecture 是沒有變過的。我不是從 design 的角度去看, 我是從 architecture 的角度看的, 因為之前的方法都是比較保守的, 我和 designer 討論之後, 改變了之前的做法, 做出來的這件產品 flexibility 會變高, 但是我們的價錢, 就是 use of silicon 變大, 對我們來說成本也變高了, 那做這粒晶片之後, 我就將它(flexibility)作為這粒晶片的 selling point 向客人介紹。特別強調這是個很重要的特性與其它公司相比, 或者與 existing 的 product 都不會有。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

最初是... 我回到剛才說的那個 case, 最初我為什麼會開始想這個 (創新), 主要是見到其他 product, 在另外一條 product line 裡面, 有一件產品做了出來, 它用的是一種 structure, 我們這邊從來不會用的。那我就去問其他人, designer, 為什麼我們從來都不走這條路呢? 感覺上就是我們從來都不從另一邊去想的, 那樣問他們。那麼剛剛我們 marketing 都在想 implement. 他們大家也是在討論的途中發現覺得我們要嘗試要轉一個 scheme 了。因為要轉 scheme, 我就看了很多的另外一條 production line 我們做的是一些很細化的手提電話的螢光幕, 我看到人家做到的是一塊很大的 32 吋, 42 吋那些大的螢光幕, 做了一些 design 的 scheme 在裡面。而我們這些小的螢光幕就從來沒有這樣做過的。我們主要的 concern 就是因為這個 (design 的 scheme) 價錢貴, 而我們的手機便宜, 人家電視賣的貴, 可以負擔得起, 做的起這樣的 (design 的 scheme)。然後, 我就問為什麼我們這裡, 然後我就開始問為什麼, 為什麼人家做的到, 我們做不到呢? 就是人家有錢? 然後我就再想, go into details 這樣去想, 這樣一個 blog 去做, design 難做到, 然後再想, 會不會是因為我們一直在用的方法去 implement 這個 scheme 的時候很難 implement, 所以然後我就想要去改我們的 architecture, 要改我們做的方法, 來使得它可以 meet 到另一邊做的 standard. 從這個之後, 我們就開始想一些新的東西。我都是有些東西 base on existing 正在做的東西, 再在我們自己的範疇裡面演變出來。

(那你能不能概括一下有幾個 stage 呢?)

最初是先有些 research, research on other products, on other competitors, or on similar products. 接著會由 brain storming 去尋找一些, 會有一些 self evaluate, 然後再去 improve 自己去 meet 到對方, 或者是超越對方的 technology 或者對方已經做到的東西。當想到方法, 然後再要 evaluate 它的 risk factor, potential problem 然後再進行 finetune. 其實很多時候可以天馬行空去想, 但 at the end, 當真的要 make a product 又或者要花錢去 lounge 的時候, 就不能天馬行空的去想了。同時要找一個 third part, 去看整個 process 有沒有問題。因為全部都是自己在想得時候, 會受到矇騙。最後就是真的做了出來, 再 evaluate effectiveness.

一開始 research 那邊, 其實有一半不是我自己做的, 一開始是 marketing team 幫我們先做的。他們是 point out 一些 difference, 或者 point out market 裡面有空間是我們沒有做過的, competitors 沒有嘗試過去接觸這個 area, 那我們就 focus 去做了。然後 implementation, 我那時會看很多人家在做的產品, 然後做很多的 cost comparison。我其實已經做了後面的我的 manager 會做的 evaluation, 我自己已經 self-evaluate 過很多次。寫了很多 simulation programme 不斷去 simulate 將來我真的做了出來, 我自己是 base on 一些資料啦, 我會 make sure 自己的 innovation 有很多 simulation background. Base on 這些 results, 再去找我們的 design 的 team 去設計, 因為其實 design 方面不是我的 profession, 我自己的 Profession 是在 circus level 在 architecture 方面。我會給 designers, 然後他們有 input 看怎麼做怎麼做。他們也都給我 options, 我可以從哪幾個(option)裡面

挑選。我就通常都會 List 這些 options 出來，然後再討論 pros& cons 然後再看我們究竟會採用哪個。然後 evaluation, 其實我自己的 task 是 up to 這個位置。

(你會怎麼樣做去帶領下屬?有什麼特別的 behaviors...?) 我會講得很清楚我的 goal, 我要 make sure 他們有個 clear picture 關於我想他們做的, 那他們才能在他們的範疇裡面找到 best solution for 我的這個 project. 我和 design team work 的時候, 即使我的 profession 不是那個 area, 但是我要 make sure 他們那邊知道我們的 situation, 才能 output 到最好的東西給我們。其實我在 architecture 的時候, 我已經開始 evaluate 這個 idea. 將一些資料 pass 給 design, design 那邊再 pass 資料回來的時候, 他們 design 出一些東西給我們了, 有一些資料給我了, 然後我又做一大堆 evaluation, 就是計算一大堆資料, 再證實是不是 efficiency 是否高, feedback 了很多次, (過程中) 大家不停的有些 finetune. 我會將很多我知道的東西告訴他們, 那些 idea, 讓他們去 generate 一些最好的 solution.

3. Can you describe the key factor(s) that have made you innovative in the task?
4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?  
其實我的上司沒有怎麼 involve. 我的上司真的放手, 讓我們下邊自己去 carry on 整個 design process. 但我們都會保持向他報告進度。他不會阻止我們繼續去做一些改動。當我們做好 design 的時候, 真的會將這個 design 變成一件實物, 這是需要花錢的, 因為是所謂的..., 我們 internal 會做幾個 take out, 將資料 send 出去給外面的一間廠去做實物出來, 這個需要比較大數目的錢。那時他 (supervisor) 就會開個會, 問很多問題, 我就要 Present 給他聽我們做了一些什麼改動, 有沒有什麼新的特別的 design 在裡面, 裡面有什麼 risk factor, 我都要向他解釋。他都會提出一些 challenge. 當時一開始他都有些 concern 的, based on 他的 concern, 我們都做了一些 amendments, 後來 (就接受了)。(就是他會給一些意見, 然後再按照他的意見做一些 finetune?) 對的。

(如果以你自己來說, 你都會帶著幾個 junior 一些的同事一起做事, 這都是一個 leader, 你自己在一個創新中, 你會怎樣鼓勵他們去創新?)

其實我都會給他們機會自己從頭到尾去做, instead of 給他們 guidelines, 因為我覺得如果我要把所有的 guidelines 這些給他們 (他們才能) 做的話, 就不需要一個讀過很多書的同事幫我做。我會 expect 他們大家的 education level 都差不多高, 我不會覺得經驗多的人就會優勝很多的, 有時他們會想到一些 (創新, 問題) 是我都想不到的。如果我給他們太多 instruction, 或者太多之前做事的方法, 他們就會 Lost 了他們自己的 creativity. (還有沒有其他呢?)

如果除了這件事之外呢, 我會請幾個人一起坐下來, starting from 遇到的問題, 很多時候要 solving 的時候, 是要一個 team 或者幾個比較會想多一點的人一起坐下來, 將不同的 possibility 想出來。我自己, 在做 creativity, 在想新的 idea 的時候, 我不會 ban 其他任何人的意見, 我會讓大家說, 他覺得有這樣的可能性, 有那樣的可能性, 然後我再 base on 這些可能性, 由不同的 route 那樣散出來, 就像一個 tree 一樣, 再散出去想。當然我們思考的方向都要是有些 technical grounding, 大家先散出去想多一點可能性再去找那一條才是真正正確的或者好的方向。這個就是我用的幫助大家尋找儘量多的可能性的方法。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?  
這個不是 exactly 我 lead 的 project, 是一個新的 interface, at the end 是沒有人用。是因為 market 不 appreciate 我們的這個產品。或者人們覺得要改變他們現有的做法就會是 redundancy. 我們把它包裝了, 告訴別人我們的好處是什麼, 但是別人覺得, 其實我們的產品是節省了一部分的 signal, 少用了一些 signal 做到同樣的 (效果), 但他們覺得: 如果多一些 signal 有相差多遠呢? 我又不覺得真的需要節省這一點東西, 但就減低了我們的 flexibility. 他們覺得 implement 這個 design 是好的, 但是減少了 flexibility,



以後只能用你們公司的 IC，不能用其他公司的 IC 了。我們變相想用這個 product 去壟斷，但是客人不喜歡，所以 at the end 這件 product 是賣不出了。

（那你的上司有沒有在此項創新當中做過什麼呢？）

其實我們不至於那麼 high risk 只 support 我們這個一件那麼特別的 interface, 當然我們同一時間兩個 interface 都做了。從我的上司的角度來說，做這件事的成本很低的，即使這個 interface 失敗了，對他來說都是 no big deal 的。所以他就放手，由我們自己去試，去把這個產品做出來。他都支持我們照做出來，我們都出了 Paper 來解釋這個 interface 有什麼好處，有什麼好處，當然，paper 上面寫的，天下無敵都無所謂的，但是真的做了出來，就沒有什麼人 appreciate. 其實我的上司沒有阻止我們這樣去做。他只會 make sure 我們在做的時候，這個不會是 only solution, 如果失敗的就不能轉彎了，公司就會虧很多錢，因為做了這件產品出來。

（那你做 Leader 時呢？你會怎樣鼓勵下屬呢？）

我現在正在做的 Project 由去年 10 月 run 到現在，那個 focus 是很好的，之前很 urgent，趕的很辛苦做出來。但現在就變得一個比較沉寂的時期，因為經濟差了，那個 product 的客就 hold 住了，不出錢，還沒有能出貨，但是同事們已經做好了基本的準備。那很多時候我都會給他們 positive 的訊息給我的同事們。他們都會花時間一起做，但是就會問，會不會浪費心機？做到最後這件產品也未必能賣出去？我是一個 leader 的時候，我自己如果沒有一個 positive 的 mindset，我就很難令到我的同事有個 positive 的 mindset 去工作。Make sure 在 project 的方面，大家都有共同的目標，一起想方法努力去贏回 business.

比如有個不是那麼順利的時候，我自己做事的方法都是，把整個 team 的人一起 call 過來，然後將我們的 situation 逐個逐個解釋，我覺得很多時，在一個 team 裡面，不是每個人都清楚 situation 的，他們自己會有很多 limitation, 而無法達到 goal。那我自己的方法就是 situation 由客人那裡到我們自己這裡的所有問題都講出來給他們聽，make sure 他們知道 situation 後，他們會 raise 很多問題問，比如，為什麼現在 turn out 會是這樣，我自己是希望將我自己所知的都先告訴他們，讓他們知道 full picture, 然後一起去面對這個 challenge.

## Interviewee 7

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

我的工作是 marketing, 我是負責 promote 一些產品給客戶的。我以前來的時候, 通常他們要 promote 一個新產品要給客戶看到這個產品是行的時候, 通常我們都要做一個 demo, 就是整個 hardware 一個個帶過去給客戶看的。我們的客戶就不會再香港的, 因為我們的客戶是廠, 在香港沒有廠的, 在臺灣, 日本, 新加坡, 大陸, 韓國才會有的。那就是我們要做一個 Demo 出來就一定要是 portable 才行的。以前就會有人做好了拿給他們 (Sales) 帶過去, 後來因為人事變動這些, 人手又少了, 這個工作也沒有人願意去做。那有新的產品出來之後又要怎麼樣給客戶介紹呢, 這個可行, 那個可行? 我們公司在香港都有幾個 lab 的, 那我們自己同事再香港的 lab 試, 試到成功了, 但是客戶在海外又不能整個 lab 搬過去, 那時都說不如做幾個 demo 啦, 但由於人手啊, 資源的問題, 就會拖很長, 或者未必有時間, 未必有錢, whatever 這樣去做, 所以後來就想, 其實我們就做電子零件的, 而不是做整個 end product 的, 做完零件之後就給廠, 那些長覺得好的, 才會用一塊玻璃, 就是開一個屏出來, 再去試。我們就只能自己, 有些新的 feature 想讓客戶看到的, 我就想不如拍一段片子給客戶看, send 給他們, 讓他們就算沒有一個活生生的 demo, 都可以看到一段片, 都可以見那些新 feature, 可以讓他們知道有這些東西。這個例子在生活就很普遍了, 拍片, 現在周圍都拍了, 但是在業界來說, 想必我們的 competitor, 或者自己都沒有做過的, 原來可以這樣做的。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

最開始就是遇到一些問題要解決, 可能是過往一直走的那條路行不通了, 開始越來越多障礙, 所以就要像一下有沒有另外的方法去走。就是沒有實物, 又沒人肯做, 又沒錢做, 現在, 拿個相機自己拍照, 又不用錢就可以解決了。接著後來, 就是有個新的方法出來之後, 嘗試去解決, 解決了之後會不會再有演變, 比如不單是做推廣的時候, 就算日常處理 technical, 對於有些應用的問題是否都能有用, 就是一些演變變成一個新的系列的方法。(那概括來說, 有幾個 stages 呢?) 問題, 想方法, 最後應用, 三個。我們沒有分得很重究竟誰是 leader, 因為在我的 team, marketing 只有我一個, 其他那些叫 product engineer, 我不是他們的 leader, 他們也不是我的 leader, 大家一起合作。驗證完產品然後再拿出去賣。多數都是, 概括來說, 客戶用我們的產品會遇到一些問題, 不會用啊, 或者明明我照著說明書上去做還是不行, 多數都是這些。通常我們收到這樣的 issue 之後, 都是一起坐下來, 分析, 分析完之後思考有什麼點子。我就覺得不是特別創新, 但是在處理這些問題上, 都會用很多不同的方法, 例如, 有沒有就案例, 例如有沒有參考, 不如另外一個客戶可以用, 只是這個客人用不來, 吸取別人的經驗, 又或者有些客戶根本就是問錯了, (我們) 就再教他們。零零碎碎很多問題, 沒有特別 innovative.

3. Can you describe the key factor(s) that have made you innovative in the task?
4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?  
上司就沒有, 反而是同事。我是做 marketing, marketing 對著的是 sales, sale 本身就堅持快點給我 Demo, 沒有 Demo 我沒有辦法向客戶 promote, 就很堅持一定要有一定要有。我就說有 demo, 但是要 portable 就沒有拿給你就真的沒有, 不如給你一個錄影。最初他們就很抗拒的, 因為他們要的東西拿不到, 他們就堅持這樣不行的不行的。但是後來真的帶了過去, 給了他們一個 USB 帶給客戶看, 在客戶面前 Show 給他們看過, 客戶覺得 ok, 那他們 (Sales) 才慢慢覺得其實這樣都 work 的。開始改變 concept, 不是一定要走之前一直走的那條路才行, 其實還有其他路可以走的。往後呢, 不單是 promote 產品, 有時我們的客人在海外, 他們用產品的時候, 有些不是很

會用，或者用得不是很好，都多了些會用照多一點照片，或者甚至不如拍一段錄影去證明或者驗證怎樣用，教他們怎麼用，開始多了一些用另外的途徑去除了不單是 demo，在其他時候都應用到。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

失敗是最後這件事（創新）就不了了之。還是說 Demo 這個例子。做一些 demo 版，之前那些就體積大，hand carry 或者拎的時候就比較難。那我們就想過可不可以做一個小點的，好一點的，多一點 function 的，因為現在有 USB，有...很多 interface，有很多新的電子產品的應用，以前那些就比較舊點的。曾經想過不如 Call 個 Meeting 想一下要做些什麼，加點什麼新進去的。到後來因為不同的工作 priority, 可能生意比較要緊，這些 demo 就低一點，也因為人手分不清楚，和錢的問題，沒有這個 budget，最後就不了了之了。現在乾脆就是沒有了，連 Demo 都不做了，不用說新的（Demo）了。

（那你的上司有沒有做些什麼呢？）

因為當中，開始就是發現不用著自己做那麼辛苦，不如出去買個 end product 回來都行。有些就是，existing product 買些，例如買個電話或者買個 Mp3 回來 show 就可以了，新的就像剛才說的拍一段錄影就可以了。新的就只有我們有的就拍一段錄影，舊的就出去買一個回來，都已經沒有這個需要了。

## Interviewee 8

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

其實我是一個 product engineer, 對我來說, 我一直做到是 evaluation 的 task。所以對創新來說, 就是要用原來的方去做到一些 repeatable 的工作。什麼意思呢? 我們公司就有一些 meter 的東西, task parameter, 但是有些 function 是不做不到的。Let's say, 對我來說, 是一個...的東西, 或者一個...的東西。那如果在現有的階段來說, 人手扭來扭到 resistance 來控制 current, 但是每次都是這樣扭, accuracy 就不夠。但是在電腦這裡, 我可以給它一個 voltage, 測量出 current 出來, whatever, 現在我做到的是, 加個 resistance, 將它 Set 不同的 voltage, 調校出 current。我現在做的, 簡單點來說就是快, 靚, 爭。(那這個是成功的?) 行的, work 的。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

最簡單都是四個, 我想我工作都是...

首先要 identify 想到現在要做到什麼? 然後要怎麼做啦? 在做的過程中, 會發現到什麼問題呢? 發現到問題之後, 要有什麼 action 去 clarify 使得整個 process move on? (大致上就是這樣。Implementation 算不算一個?) Final stage.

很難說, 首先當然我不會自己去找東西來做, innovation 首先要有一定的願望, 要求他給我一個要求可以去 meet, 可以去 commit。我要怎麼樣做就要去想, 思考完了之後, 再反復推敲, 我要用現有的 resources 去做, 不是 meter 就是。。。全部可以 program 的, 可以自己 control 的。那怎麼樣 control 呢? 這一步, 我的 supervisor 就會給我一些意見, 比如他說你不如換著試下其他東西, 另外 Source 不同的 voltage, 再看 current 這樣行不行得通啊? 這樣給我一個簡單的 requirement 之類。之後怎麼樣做, 就自己 implement, 做到有問題了, 當然是看書啊諸如此類。做完之後還要一個 verification 再檢查自己做得對不對。在不同的 range 有不同的。。。這一部分其實就 Experiment 的時間都很長的如果要所有的地方都正確。但是經過幾次 innovation 之後這樣就成功了。

3. Can you describe the key factor(s) that have made you innovative in the task?
4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

如果說我上司, 他就是讓我度(思考)這些任務而已。就是要我 achieve 這個 goal, 但是中間來說當然就會告訴我我有什麼資源可以用, 就是全部給你你就用, 用到的就用, 錢就暫時只有這麼多。就不會用任何的。。。, 他說了他的想法, 但是做法就要自己做。(就是他 identify 了一個問題, 然後給你, 之後就全部放手給你做?) 沒錯。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

我沒有什麼映射有些要做到一半做不到, 接著要 hold 住。沒有這樣的類型。

## Interviewee 9

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

之前要做一些 evaluation 的，我們做 IC 的，要做很多 evaluation 的。很多時候我們只是有一些數字，很多 data 啊，我們用了一種叫 automation 的方法去 capture 一些 data. 但是很多有些一些...的東西未必是 automation 可以做到的。但是之後我寫了一個 programme 可以直接 capture 到，以前是沒有做過的。（你是怎麼做的呢？）寫了個 programme, 知道怎麼樣用一樣東西。以前就沒人這樣用過，但是之後就有人跟著這樣用。（你覺得有什麼 contribution 呢？）很多 parameter 其實只是看數，是看不出什麼的，也要看 wayform...才能看到的。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

我覺得要先有這樣的 demand, 要有這樣的 demand 才能讓你去思考一個方法出來令到你很方便的做到這件事或者用到這個 idea 或者達到目的。中間的過程就是怎麼樣可以令你 achieve 到所想的這個 idea? 就要用些什麼工具啊，或者用什麼方法啊，去實踐這個 idea. 最後要試，試下看不可行。（就是最後作了產品出來，還是要試，就是 evaluate?）對啊，要用不同的 condition 去 reevaluate 之前想得是不是正確，試出來的答案是不是我們想要的那個（效果）。

第一個 Stage, 他是要 result, 他要 Define 個 result 出來, 我們就要想怎麼樣達到這個 result.

（第二個 stage 是要想辦法去解決，上司在這裡有沒有做過什麼呢？）都很少，decision making. 我就是說以前那個 programme, 不是說現在這個，現在這個當然會參與其中。以前那個就比較 decision Making。（那現在這個上司他會怎麼做呢？）他會每一個 step 都會 involve。（他是如何 involve?）他會看下你這樣做正確不正確，看下這樣做夠不夠 effective，他會看下一開始的方向是不是已經是錯的。他第一句就會問你：你究竟想要什麼？想做點什麼？想達到什麼？接著他就有些意見：你這樣做會不會好些啊？（每個 stage 他都會參與?）他一路都回 involve 的。（剛才你 define 了四個 stage, 有個這樣的 demand, 想辦法去解決，親身去做（implement），evaluate 結果，那有沒有什麼特別的 behaviors 在每個不同的 stages?）四個 Stage 他都會參與的。（參與的活動都是相同的？）我覺得第一，他不會幫我一步步去做，第二就是，evaluate 他就只會看 result. Result 他覺得不對的話，他就會提出。他就不像以前那個（上司），以前那個就什麼正確或錯誤他都不知道的。現在這個就知道對錯。（如果不對的時候，他是否會指出怎麼樣做？他自己已經很清楚了？）他是一個有很純熟的 technical 方面的知識（的人）。（他對每個 stage 都很熟悉？）對的。他對與每一個步驟都很熟悉。

（可不可以具體說每個 stage 他都是怎麼做的？）

例如有個客戶，無緣無故說 send 了一個 Requirement 給我們，那我們要想一下，我們的（現有的）能不能 meet 客戶的 requirement 呢？他（上司）就會列一些（初步的想法）出來，問我們，你們覺得這個可不可以達到客戶的 requirement. 那怎麼樣才可以達到 requirement 呢，要 meet 到哪些條件才能 meet 到客戶的 requirement 呢？那我們就會逐個條件去看，拆散了去看。究竟這個客戶的 end product 要些什麼的？逐個對完之後，發現原來是可行的，就會答覆客戶可以使用，如果不可行的話，我們就會想有沒有其他方法來補救這個缺陷讓客戶滿意。（Implementation Stage 呢？）中間我們就要不停的試，如果不可行的話，我們就會不停的試不同的 implementation. 來看下怎樣才能做得到。有不同的方法，例如，用不同 value 的 component, 或者用不同的 Driving 的 Waveform 這樣去試。（supervisor 都會一起做的？）他會給我們意見。如果任務很趕的話，他就會和我們一起做。要看 urgency 是多少。如果這件事不緊急的話，他就會給我們一個大方向，如果很緊急的話，他就會把事情 break down 讓我們每個人跟。（那 evaluation stage 除了你自己 evaluate, 他會不會幫忙呢？）只是看 results。如果不對的話，會給我們 suggestion.

那你有沒有試過帶著一些同事去做 project ?

通常這裡的 team 都是比較散, break 得比較小, 大家通常都是自己做的。(有沒有試過和同事一起做 project. 其實大家都差不多, 但是有時你會多一點 leader 的 Role 的, 有沒有這樣的例子?) 我都會看下最後需要的是什麼, 然後要 break down 一些工作, 然後做 Plan 每個人適合做什麼。如果是適合, 試 o 野試得很好的, 很細心的, 我就會安排這個人去試 o 野 (做測試)。都是要看大家的分工。每個人有不同的 (長處)。有些人就有很多意念, 有很多想法的; 有些人就是試 o 野 (做測試) 會試得很 detail, 很細心。每個人有不同的 (長處)。但 discuss 的時候就都回問有些什麼 contribution 啊這樣的。有些人就大家都是

(可不可以用一個例子來說, 你怎麼樣鼓勵下屬創新?)

其實剛才說過, 每次開會的時候都會問他們, 你們有什麼意見, 很少有人會只是坐在那裡聽。大家都會發表意見, 因為大家都是在工作。(分 Stages? 比如第一個 Stage 是看有什麼 demand) demand 其實通常都是從客戶那裡來的。客戶有這樣的 demand, 我們有很多 project 的, 幾個人做一個 project 或者是一個人做幾個 project, 我們就要看怎樣分工。例如我們每個星期都會開會的。每個星期都會開會比如與客戶開會或者與 peer 開會, 看下每個星期進度如何。與客戶開會就會看下客戶的 specification 有沒有改過, demand 有沒有改過。那客戶的 demand 隨時都會有改變, 到時要看下他們改變的 demand 會不會令到我要多做很多很複雜的東西。他們轉一點點, 其實我們要改動很大的。(那 implementation 和 evaluation 你分別會做什麼呢?) Evaluation 我們會一起討論究竟有什麼 combination, 有很多不同的 combination, 溫度不同啊, 電壓不同啊的 combination, 可以做到成千上萬的 combination, 我們要調訓究竟哪個 (combination) 實際情況會用到, 或者哪一個是比較 Critical, 我們要關注。在 evaluate 之前, 我們要選擇我們要怎麼 evaluate. (那你作為 leader, 你是怎麼樣做的? 幫助他們? 鼓勵他們?) 其實是一起想 combination 出來。Under 這幾個 combination 的時候, 我們究竟要怎麼樣試我們的 product。再到 evaluate, 那 result 究竟是不是我們想要的 result 呢? 我們要想好 combination 也要向好 result 大概是怎麼樣的。那 evaluate 的時候, 如果和 result 相差很遠的話, 就要再看到底哪裡錯了呢, 是中間錯了, 還是一開始就已經想錯了呢? 中間如果真是達到一個 (指標) 的時候, 我們都要想究竟是否真的是正確的呢? 我們想是這樣想, 但是究竟最後做出來是不是正確呢? 有什麼證據取 support 這個是正確的呢? 出來的結果

3. Can you describe the key factor(s) that have made you innovative in the task?
4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?  
有時有些 fail 的東西, 因為我們 IC 就經常會 fail 的, 以前就未必看得到, 現在就會看得到這些 fail. (他會幫你看?) 加了一些 fail 的 device 出來。(你的上司在這個過程中做了什麼?) 只是看下 results 而已。這個 task 是他 assign 給你去做的, (還是你自己發覺要做這樣的創新的?) 自己要 design 一個 plan 出來去格一個 IC 怎樣叫 pass, 怎樣又是不能 pass。他沒有 assign 的。Draft 完之後, 再和 designer 開會阿。
5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

如果客戶沒有這樣的 requirement 的話, 我們就不會試, 就是如果客戶 stop 了這個 project 的話, 我們就沒有辦法繼續做下去了。(如果中間出現問題的情況呢? 他有沒有做了些什麼而使得這樣的情況出現?) 他會 foresee 到一些問題, 他會預見到究竟這個客戶的 requirement 是不是 realistic。如果不是的話, 他就會想怎樣回復客戶。但

如果他是覺得可以 **achieve** 的話，我們都會盡力去試的。什麼叫做失敗呢，是無論怎麼試都試不出想要的結果，達不到客人的要求，或者和客人要求差一點，我們都視為失敗。比如，我們的 **life time** 要計算可用多少年，客戶要求的是三年，但我們的 **product** 如果用電池，只能用到 2 年半，我們都當是失敗，那就會再看下怎麼樣再節約點電來用。（**supervisor** 做了些什麼呢？）他會重複驗證出來的資料是否正確。比如我說 2 年半，他都要 **check** 一下是不是真的是我說的 2 年半。或者少計算了一樣，其實是 2 年，又或者計算多了一樣，其實是 4 年。他會加上其他因素去思考。（有沒有你是 **leader**，但最後的結果不是很成功，你做了什麼？）我們做的 **IC** 通常都是有點問題的。**Designer design** 的東西不會次次都 **perfect**。都會有一點點得缺憾，如果是 **IC fail** 而令到我們 **application** 上用的時候有問題的話，我覺得都沒有辦法去補救的。（其實不關 **leader** 的事？）**leader** 其實可以想一下怎樣去補救 **design**，補救先天性的問題，比如外置一些東西，來補救先天性的問題。或者與客商量 **life time** 不夠可不可以用大點的電池啊，或者 **cut** 某些電這些啊，會不會再好些。（除了他自己的 **knowledge** 不夠，有沒有 **management** 方面阻礙呢？）通常不是阻礙，是 **force** 我們去做。通常都是 **schedule** 逼住我們要做得很快很急。（**Schedule** 會不會都會阻礙呢？）每個人未必是一個人一個 **project**，一個人做幾個 **project**，這個 **project** 的 **schedule** 很趕，另外一個 **project** 的 **schedule** 都很趕，就有時都會撞期，撞期的話，就看怎麼樣去分配，哪個趕一點，哪個不是那麼趕。（自己分配，**leader** 會不會幫你們呢？他會不會幫你 **negotiate** 或者看你手上很多工作，安排一些給其他同事？）會的。如果他見到我們沒有時間，會照另外一個同事來做。（又有些什麼他沒有做到呢？）沒有。我們的 **Leader** 很有經驗。

## Interviewee 10

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

我想到的是，其實我負責的產品是一些 PMP，就是隨身可以看 video 或者聽歌的 product. 因為我們本身是一間做 hardware 的公司，我們做 software 的經驗不是很多。但是我們做這個 product 的時候，這個產品是我們公司第一次做硬體和軟體都要負責的。那我們在設計軟體的時候，比如 user interface，介面都用了很多心思去做設計，包括我們自己內部的測試，大家都試下究竟這個介面好不好用，這裡花了很多時間和 effort 在這個部分。我覺得整個 project 的流程來說是比較 Innovative 的，我很難說 isolate 成一件事說很 innovative.

(那你自己在這個 project 中做了些什麼?)

我想是我們由一開始想介面究竟怎麼用，由構思這裡開始，包括想一下我們日常之前一直用的產品，有些什麼不好的地方，或者我們覺得好的地方，首先有一個 idea 出來。類似做一個模型出來，一個初步 prototype 出來。然後我們負責給不同的同事，最簡單我們身邊的同事去試，然後給我們一些 feedback，比如這個好不好用啊，ok, 很喜歡這個 features 這樣。我的角色就是這樣。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

我想第一件事是有個問題大家需要解決。接個有問題需要解決時，第二個 Stage 就會有些 brain storming. 經過 brain storming 後，大家會開始有一些 conclusion, 或者一些 summary 或者 direction 有個 idea 就開始做一些 Implementation，用 prototype 啊去試。接著最後就是一些 feedback loop。大家去 evaluaton, 如果最後是 ok 的，就採用這個 idea, 如果不行，就再回到 brain storming 這裡。然後再一個 Loop。

第一個 stage，我想本身，leader 對這個問題有自己的見解或者有自己的分析。但是 Leader 就不可以 dictate 大家要 follow 他的思想。雖然他有自己的想法，有自己的分析，但是他不能要別人一定要跟（著他的想法去做）。可能最初的時候，他要做的是讓大家提出自己的意見，因為在這個時候，一個人的意見不一定是正確的，他一定要 encourage 不同的人去表達(自己的意見)，只有有不同的人和大家不同的人去大家瞭解大家的想法，可能有好的，不好的想法，然後大家再有個意見磨合才會有個化學作用。Leader 在這裡的角色是，最重要的就是，令到大家都勇於表達自己的意見。以及 make sure 大家表達意見的時候不會有 conflicts. 因為當大家不同意見的時候，有時越講就越面紅耳赤，相互間有爭吵，變成就不是針對問題本身，而是針對另外的東西了，那就會 sidetrack 了，那 leader 的 role 就是要讓大家 focus 在這個問題。從其他人的討論裡面，一個 leader 都可以加入自己的意見，或者在這個時候，他也吸收了其他人給他的意見，發現原來他自己的想法和一班人的想法有什麼一樣的地方或者由什麼不同的地方。經過這個過程之後，就可以 leader 本身的想法再加上其他人好或者不好的想法就會有完整些的計畫或者 summary 出來。(你的 leader 是不是 exactly 是這樣的?) 我覺得形式是這樣，就是我覺得他是這樣做的。(是你觀察到然後 describe 出來?) 可以這麼說。(剛才你說到會盡量 encourage 他的 subordinate 發表意見，他具體是怎麼做的呢?) 一開始大家可能真的完全沒有方向，所以我就說原先 leader 一定要有他自己的，首先要對件事有個看法。因為一般人進來（合作一個 project）的時候，對這件事的瞭解程度很不同。有些人可能很瞭解，有些人就完全不理解。Leader 要給一些 example, throw 一些 idea 出來讓大家慢慢瞭解清楚問題，或者可以在同一個 stand point 去看這個問題。這個是 leader 要做的。他首先將大家對問題的理解性 align 了之後，通過這一點，他就會 encourage 其他人去發表意見。因為一開始如果大家對問題的瞭解程度不同，或者大家沒有什麼方向的時候，大家都不會有什麼想法可以發表。所以一開始，leader 一定要給大家一些 idea 讓大家令到大家去思考。我覺得他是通過這個方法來鼓勵大家發表意見。(你覺得你的 leader 是這樣做的?) 是的。因為一開始問大家



有什麼意見，都不會有什麼意見的，他可能開始先說了一些，然後問你覺得這樣對不對，然後大家開始你一言，我一語，因為有一個人說了一個 idea 出來，大家就會有意見了。大家在講自己的意見的時候，另外的人又會對這些意見有個新的作用。

(implementation 這個 Stage 又做了些什麼呢?) 在這個 Stage 就是一些比較 operational 了，比如 make sure schedule 啊, quality of work 這些。(有沒有些具體點的事?) 有了一個大家做的方向的時候，leader 就會分工，因為我們通常都是一 team 人一起做事的。他就會分工，每個人 divide task 不同，他就會 break down schedule，比如某個 period 的 milestone 是什麼，下個禮拜，或者下次的 delivery 需要什麼? 因為我們的 task divide 了是 individual 做不同的 task，但是到了最後的時候，他會做 integration。那在最後 integration 的時候，他都要 make sure integrate 完成的東西是和原本我們訂立的 standard 做出來的是一樣的。(那最後那個 evaluation stage, leader 又做了些什麼呢?) 其實我們因為做 integration，我們逢是做這些 hardware, software，會有一些 standard, 就是預先有個 test procedure。我們就會 generate 一個 test 的 report, 當然不是第一次做完就馬上 Ok 全部都 pass 的。那麼 leader 就會，如果有什麼地方 failed 了，就會影響到 schedule, 他會再排過 schedule，make sure 最後我們做過的 test 與我們原先想的是一樣的。那 leader 就會我們 so called sign of the ..., 就是說這個 job ok, 就會 pass 給其他的同時，譬如我剛才所說的，給其他人去試這個產品，ok 不 ok, 有什麼 feedback 這樣。

你作為 leader?

其實我們公司的 team 的 structure 就比較 flat，就沒有什麼 hierarchy。所以我們的 group 就是有一個 leader, 下面有很多人在下面工作。我就沒有嘗試過 lead 住幾個人，但是我們就所有的人，每個人的 task 都是聯繫在一起的，因為我們最後是做一個 product 出來，只不過我們是 piece by piece 這樣去做，所以我們都要 make sure 同事和我做的工作最後是可以合在一起。所以我們大家要相互 monitor 大家做的事情。比如 keep up schedule, 因為有時要別人給我一樣東西我才能繼續完成自己這部分。所以就每一個人都有些要 monitor 別人在做的事，make sure 大家的 schedule 啊，deliver 的東西要合乎已經訂下的目標。有一點點像 overall 的 leader, 不過 overall 的 leader 要可能關注的是整個 project。而我要自己 individual 去關注我和 A、B 兩個人有關聯的，我就要 make sure 我可以用他們做好的部分繼續加工，如果不是，我就會很慘，做不到自己的部分了。而同樣他們也要關注另外一些人的進度。所以每一個人都有一點這樣的角色。(除了這間公司，有沒有你之前工作過的公司，可以舉例你作為 leader 怎樣去帶著下屬創新呢?) 其實我沒有試過。

3. Can you describe the key factor(s) that have made you innovative in the task?
4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

都會有的。因為這個就不是個人的創作，最初是一個集體的創作，上司的角色來說可能一開始就負責有個方向讓大家思考。因為我們一開始想的時候，大家都漫無目的的，他會給我們一些 idea, 比如平時用的電話的介面是怎麼樣的啊，或者是大家見過的某類型的產品用這種功能的，我們就會開始從這個方向去想。他就會開始收集多些 idea, 直到某個程度，他覺得大家的想法都比較 solid 了，開始有一個 direction 了，那大家再深入討論，接著就有個結論，然後大家就去做。上司的角色就是最初給大家一個方向。他不是引導大家只能討論某一樣 o 野，有些 guideline，可能最開始大家有 say, 三四個方向的，然後大家一路討論一路集中集中，開始大家 align 到，然後再組織我們怎樣循著這個方向繼續 develop。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

都試過有這樣的情況。比如產品裡面有些 features 我們覺得是很好的 idea, 是很好的設

計。但是最後我們試了之後，發現其他的同時，或者可能甚至於 end customer，試過他們看過一個 prototype 之後，他們就覺得完全相反的。他們會覺得這個設計不是很好，很難用或者沒有什麼用，所以最後我們都會應客戶的要求，所以最後這個設計都沒有放進產品裡。會有這樣的情況。

（那這樣的情況，你的上司做了些什麼呢？沒做？）

當客人覺得這個設計不 ok 的，就說明我們做的不能說服客戶去用。只不過我們通過客戶，他們的 feedback 就是這個設計（或產品）不好，那我們下次再設計的時候類似的東西的時候，就會 take 這個 into account。原來我們上次那樣設計，雖然我們自己這班人覺得好，但是這個世界其他人都覺得不好的。我們會考慮這一點，但是 leader 不能說服客人。（那做的中間，想 idea, implement 他做了什麼？）有時都會，有的情況就是比如 schedule 很 tight, 或者中途，客人要求改變了，那時是在 implementation 的一半的時候，可能有 5 樣東西我們要 implement 的，但是時間不夠，或者客人的要求改變了，不需要這麼多功能了，只要做完 1, 2, 3 就夠了，不需要 4, 5 了。（這些情況他 control 不了的，不是他做的，他做的事情阻礙你們）我就想不到。

## Interviewee 11

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

其實就是我剛剛進這裡（這家公司的時候）就 handle 了一個 project, 那那個 project 出了些問題，那些問題就要一些很特別的方法才可以讓它 work 返的。那那時要在很短的時間之內想到一些很特別的方法去做。（你是怎樣創新的呢？）其實很多問題都是要回到最 basic 的層面去看。就是有些東西是一定正確的，有些要 base on 一些 basic 的 theory, 然後再 build up, 去想一些方法，去解決這個問題。就不是憑空去想的，一定要有一些理論根據去做的。（可不可以講一下你是怎麼樣做的，具體一些）因為那時我們有個，比如，假設有個記憶體，我們自己做的，那那個記憶體沒有辦法在高速運作，原因就是那些雜訊太多，而那個運作的方法，那個 architecture, 是不能在這麼高雜訊的環境下運作的。那我們就要重新想一個 architecture, 而這個 architecture 就可以在這些雜訊這麼高的環境下都可以運作如常的。那那時（我剛剛進這家公司時），就是要想一個方法，有很多地方要改，不同的地方都要改，改完之後要遷就新的 architecture, 最後做出來結果都很好。（再具體些呢？）那時我們的記憶體裡面有個放大器，那個放大器裡面就用了一個 single ended 的方法，那這個 single ended 的方法就是很容易受到雜訊的影響的，那我們就像到用一個 differential 的方法去做 sensing。但是要改作 differential 的話，首先裡面有個放大器要改，要由 single ended 改成 differential, 然後記憶體裡面的 architecture 都要改成，因為如果要支持到 differential 的話，都需要一些參考的記憶體去做參考的。我們就改了整個記憶體裡面那個叫 ROM 的 architecture。然後就再改外面的放大器，重新全部再類比一次。那搞了很久，但最後出來的結果都不錯。裡面有很多地方我不知道到外面有沒有人做過，其實我們這個記憶體在我沒有進這家公司之前已經設計好了，這個 architecture, 那我是負責就是看下可以再怎麼 improve。去提高工作頻率，那出來的結果都不錯。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

Identify 到問題，這是第一。接著是要有個目標，然後是要想下有什麼辦法可以解決到這個問題，但又不曾遇到其它新的問題。接著就是大家都 agree 了，這個新的方法 okay 了，那就可以，也會想好方法，東西做了出來之後，判斷怎麼樣是成功的，就是要想好怎麼樣去 evaluate. 要 evaluate 怎麼樣謂之 okay 呢，在什麼情況之下，我才知道我的問題已經解決了呢？

（之前你說，你上司是給于 100% 的信任，接著...，可否將其做的事分 stage 描述？）目標就一定要有，比如你的目標是可以運行到多少快，工作頻率可以達到多少高啊，但是找問題就靠自己去找了。他未必是自己親手，落手落腳去找這些問題。然後你找到問題後，你就和他講，他覺得言之有理的，也都可行的，他就會說 go ahead, 就是說他放心交給你做，但你都要能解釋這原因，講到點有理據的，有說服力的（解釋），而他又不是完全不理會的，如果覺得問題的原因好大機會可能是你講的那個，（那就會支持你做下去）。

至於 detail 的 implementation, 他未必會幫到你，要自己想，接著自己試，都是自己來嘗試的。

（在嘗試或者 implementation, 是否都會有合作，上司在此中是否有幫到忙？）有的，甚至是再高層點的上司，會指出有些地方需要改，如果不改，會令你花在這上面的時間更多，也會向你解釋為什麼要這樣改。在合作上面，會 coordinate 其他同事，例如需要些什麼 resource。尤其是對於剛剛來到公司的同事，不太瞭解其他部門的運作，上司就會起到一個 coordinate 的作用。

（是否會在 discuss 中有 involve）

會的，他會 ordiante 每個人的 progress 是怎麼樣，會明確 bottleneck 在哪裡，哪些需要之前做，(如何定 plan?) 會的，他會 set 好 plan 給大家做，包括 deadline. (他會不會有 input?) 會的，絕對有幫助。

3. Can you describe the key factor(s) that have made you innovative in the task?

我覺得自己都挺會想到一些特別的方法去做一些事情而未必是別人都會這樣去做的。  
(有沒有其他因素?) 我都不是很清楚自己的創新程度與其他人的創新程度有什麼不同。但 in general, so far 我做的這些事情裡面都會有些新的東西，有自己的 idea, 而未必外面的人會做一樣的事情。沒有人會反對我嘗試新的事物。(有沒有一些自我的因素?) 就是要 stick to 這個 basic fundamental 的事，要知道得清楚一些，否則你做出來的事情就會 follow 不了。要瞭解最重要的事在哪裡，我自己就喜歡想新事物，不喜歡一成不變。喜歡做一些新事物這樣會有挑戰性。

(外在因素)

有的，譬如有時有新的 idea, 你都會問清楚身邊的人來給你一些意見。(身邊的人) 會覺得你的 idea 是 okay 的，也會給你很多意見。將你自己的 idea 可以鞏固，增強自己的信心。如果沒有人可以 discuss, 可能最終都會這樣做，但可能就不會和身邊的人一起，想到新的 idea, 激發多一點的新的東西。(互相會有 discussion?) 是的

(個人因素會阻止創新?)

可能不喜歡做這件事，或者不覺得這件事的挑戰性很高，可能就算有什麼創新，做出來也不會 interesting. (就是說) 看你是做什麼的。有時會給你一個很大的工作去做，但是(以個人的力量) 你很難做到，會吃力不討好就會卻步了。(團隊的影響阻礙創新?)

So far 沒有。但是(如果要有的話) 就是和不喜歡的人一起做事情，或者 (teammate) 會強迫你根據他的意思來做。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

他對我就是 100% 的信任。他抱的宗旨就是疑人不用，用人不疑。就是我就不會對你有懷疑，如果對你有懷疑的話就不會用。那他就是完全讓我做。(那他會不會幫你呢? 在你遇到問題的時候) 如果我遇到什麼特別的問題的時候，他會回答，但主要技術上的話都要靠自己。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

不是在這間公司，在這間公司有的。我之前都是做記憶體的，有一次做記憶體，因為我們不瞭解它的工作電壓不可乙太高，我們錯誤的給了它一個高的工作電壓令到它裡面漏電。有種 sensing 的方法用放大器做 detection, 不是太可靠，就是有雜訊會影響到，但當時大家都 agree 的，而我們看漏眼。(上司的作用?) 他都會先 accept, 這件(失敗的事) 大家是討論好才決定做的，有些事是大家都沒有想到的，因為這樣的事大家都不會知道。那他都會重新再做，但是在嘗試之前一定要解決之前的問題。(他有沒有做什麼阻礙的東西?) 如果你說要阻礙創新，那就要看你做的是什麼事情。如果做的是千篇一律的事那給你創新的機會就不會多，來來去去的事都不複雜，想發揮的機會也不多。譬如，來到這裡有很多不同的事情做，同時上司也不會理你用些什麼方法去做，所以在這種環境下就會令你想想天馬行空的東西都 okay, (這種) 環境會好些。我之前做過一間公司，都是寫 EMC program 的，不是說有多麼複雜，比較簡單，所以都不是說有很多創新的空間來做什麼(創新)。(就是說工作的本身會阻礙創新?) 是的。工作本身。或者說如果本身不是困難的。上司都不會太 low level 地去干

涉你做的事情。這些他未必會做的很足，所以要去瞭解（問題）的都是你自己。如果你做的事情是不困難的，那都不會有太多的空間去做（創新）。（可不可以說個例子？）都會有這樣的例子的。但是 so far 我遇見的上司都 okay, 其實他們都想你（我）做成這件事，不會想玩你（我），如果想做這件事而又不給資源，不給時間就等於他想你（我）做不到。就其實不會這樣自己和自己作對。所以聽你到想要點什麼，都會將你想要的東西給你。（可不可以分類？）總之，不會很 low level 地干涉你（我），喜歡天馬行空的都行，沒有問題就 okay 啦。某些上司可能一定會規定你做怎麼樣去做，這樣就會 limit 了你的空間。（在 implementation 的時候，上司會不會對錢和時間 control 的很緊？）都會，都會考慮的，時間和錢是最主要的。在有限的時間裡想到做法，不可能你說想怎麼做就怎麼去做。在限制下做。如果用無限的錢一定可以做的到。（是不是一開始上司就和你說明時間就這麼多錢這麼多？）是的，上司在一開始就和你說明時間就這麼多錢這麼多，用什麼（資源）來做，不可以用什麼（資源）來做。（這樣的話）設計的方向就已經不同了。比如說，只能用這麼多的 area 去做。

## Interviewee 12

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

你說很創新的話就不多的，但是你說比如做某個 task，用某種方法，可能本身整間公司不是用這樣的方法，但是你想一個方法，覺得這樣做好一點，類似這些囉。（這些當然是）是我們做 Product engineer 的，一些 programming 的東西我們會做很多，但是 programming 經常要對應某一 set 的 hardware，那我們做了一個 Mapping，就是做一些 software mapping，因為以前可能每一次 hardware 都要改過，現在就變成一塊板，用 software 去改。這個算是，在這家公司，我覺得算是創新幫到工作的。（再具體些呢？）應該這樣說，見到某樣東西，這個做法可以快點地。每個客戶，每個客戶的那套 hardware 都不同的，如果每個客戶遇到問題都要回來找我們（解決）的，那就是我們要做很多不同的 hardware 去應付他們，就很浪費時間，我們在現有的 platform 上面，應該是只是做一個 hardware，但是用一些 software，無論 hardware 變成怎麼樣，總之變成那個 Interface 之後，只要改一點點 programme，就可以很簡單的對不同的客戶，都可以 Solve 到他們的問題。（你扮演了什麼樣的角色呢？）我是做 develop 那個，因為要對應客戶的 hardware，再做到一個一套的話，很浪費時間。我發現太多我搞不定了，需要想些新的方法去節省時間。（是你想到的？）是，even 我現在的這個 team 還在用這個方法。應該是另外一個 team 還在用比較舊的方法，我見到就覺得比較浪費時間，那我就 base on 這些舊的方法去改，都改了差不多 1 個月。當然不是整個月都在做，就是每天用點時間去做。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

開頭當然是有個概念開始啦，有個概念之後，在程式上，開頭是慢慢試，當然不是一試就馬上（隨便）找點東西去試，當然找些我們認為已經沒有問題的東西去試，比如一些 golden sample 去試，開始試究竟行不行。當然開始試只是做一些簡單的 operation，慢慢試到可行了，再慢慢應用到我們自己 team 裡面不同的 product。當然試了之後會一路試會一路 debug，做到差不多上下的時候，真正有些新的東西回饋，然後應用新的 idea，一直都相安無事，當然做得當中，都可能發現之前做的都有些不方便的地方，然後繼續改。這個東西其實到現在都有一些 improvement 的。現在就另外一個同事負責了。他會想再怎麼樣可以再改進。（首先有個概念，然後慢慢試，試到差不多的時候，就應用到自己 team 裡的不同 product，然後在不停的試的過程當中會發現到之前的不足，跟著就再改，改完之後...）其實一路用的時候，就一路改，其實就像電腦 OS 一樣，就會跟進一些。

（分類呢？）

如果在想的時候，比如我有一個想法，我的上司就會幫去想一下這個想法不可行，或者應該朝著什麼方向做。大家會討論一段時間 應該怎麼樣開頭會好些呢？在概念這裡就做了這些。試的階段的話，基本上自己試的比較多。但是他會 suggest 不如用某個 product 這個去試，他會 forecast 到試了之後，會有些這樣的應用啊，讓我先試某樣 product。試的當中，他會偶爾來看下試的成果，看下開始的想法是否可行。（應用）到自己的 team 的不同的 product，其實已經會和我們的組裡不同的人去 work，告訴他們應該怎麼用，或者讓他們試下新的東西。原本他們可能都在用舊的方法，和他們說有寬裕時間就去這樣去試。慢慢他們就會用這個方法去做。到了後期，其實我會告訴他們會怎麼樣做，之後的 product 就不需要我告訴他們怎麼做。他們自己都會改了，改到適合他們自己用。就是原來我的東西，會根據他們自己的不同該法，finetune 到適合他們自己用。

3. Can you describe the key factor(s) that have made you innovative in the task?

事，那就會想一些創新應用到自己工作上面。

(team 的因素?)

如果整個 team 來說，如果絕大部分人都是對工作有熱忱的，那大家會，不同的同事之間，就會有溝通，如：你做了些什麼啊？究竟可不可以用到我這裡呢你做的這些？就會整 team 人都這樣的話，就會有推動力讓我繼續做好創新，因為整 team 人都是這樣的。如果絕大部分人都是收工就走的，那你做多少東西都沒用的，那你做出來的東西不會有人用，自己用，那自己的心態都會不一樣，因為做出來的東西都是這樣。如果做出來的東西大家都會受惠的，那就會有多些衝動去做這個東西（創新）。(就是 team 有這樣的氛圍?)如果這個 team 都比較齊心，有 team spirit 會容易點成功。

請再回想一件事，有什麼個人因素令到他/你不像花時間做創新？有什麼外在因素？應該這麼說，如果只是個人來說，責任其實是。如果個人有些責任心的，那想做好一件事，就會去做這樣的東西。我想是除了自己的責任還有其他人也支持你，這些（創新）就會去做。

(不想做呢?)當然不想的話就是整隊人就是自己顧自己的，有什麼事，其實同事之間，有一個比如如果生病了，或者需要做其他的東西了，如果有什麼問題發生，應該會其他的同事補上的。如果真的有些同事覺得我負責這個工作的，其他的工作不要來找我，那你(我)就沒有這樣的熱誠去繼續做了。根本其實是自己顧自己的，為什麼你(我)要做創新呢？我想是周圍的同事會影響到你(我)的工作態度。你(我)的工作態度會被其他人影響到。

(那其實已經說到 team 的因素了。)

其實一個 team, 或者做事做得好不好，其實和周圍的同事的做事方法，工作的態度，是很有關係的。每個人都有長處，有短處，做的好些的也好，做的不是那麼好的也好，只要有心去工作，合作起來是沒有問題的，最主要的是肯用心去做，不是得過且過的，對於這些 development 的工作最主要是看周圍整個 team 的人的態度其實。(同事創造一些環境給你?)是啊，這個環境影響很大，如果周圍都是些得過且過的人，你(我)做的多麼好都好，不會有人看到，也不會有人欣賞，自然心裡就會覺得不舒服，做事也會放慢下來。(上司看到呢?)如果只是上司看到，就要看他欣不欣賞你(我)做的東西。如果他 buy 你(我)做的東西的，又覺得真的有用的，他就會給你(我)一個環境去做，如果他肯給你(我)做的話，他就會給你(我)一個環境，好的環境去做。因為如果他不希望你做這個東西的話，一定會令到你(我)沒有時間做這個的。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

我做之前我會(和上司)說我過會怎麼樣做。然後他說“好啊，去”，然後就這樣去做了。他有什麼可以幫到？比如他見到我在做某個工作，就不會給我很多 work load, 留時間給我做好這個工作。(你上司的作用就是不會給你太多 work load?) Management, 就盡量一些不是緊急的工作，就不會塞過來給我做，可能讓其它的東西幫忙先做。(你 Lead 住幾個同事做呢?)通常是合作的關係是 Partnership 比較多。(再說你的上司)他都會給時間我，但是在某些事上，可能他想到某些做法會好點，他就會告訴我，問下這樣做好不好啊，給我點意見啊這些。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

基本上，我們其實一開始的時候就如果，由概念到試，其實已經想了很多問題了。想到差不多的候，就發現原來這樣做是不行的，我們就已經不會再去試了。如果到最後或者到了試的階段去試，才發現原來不行，好像不太有這樣的情況。(那在你們想的階段呢?)其實基本上，上司就不會去阻礙的。本身做這個工作的前提是有時間，如果

本身有太多事情在手要做，太忙的，基本上就沒有時間去做。當沒時間去做，可能要放下一段時間再做，其實是很難的。因為當工作積壓的越來越多的時候，根本不會再拿這個東西出來做。最重要是時間。（他分配給你們的時間）其實不是他分配的。是公司每段時間都不同，有時比較忙，有時不是那麼忙。某個時間太多工作要做，就沒時間做這個東西，要遲點做，但是過了這個時間，就已經不需要這個東西了，過了這個 window, 已經不再需要。（有沒有你們需要些 resources，而他沒有 provide 給你們？）基本上最主要的是時間，如果是要用錢買的東西，基本上我們都能買到。只要有的買，不是很貴，我們都可以 claim 到數，拿到錢去做，基本上沒有其他的了。once 上司覺得是值得做，而又 afford 的起的，就會去做。



### Interviewee 13

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

我自己這組人，當我們想到一個 idea 的時候，大家都會，不知道為什麼就會比較...的去想，想這個東西到底可行不可行。可能想到某些東西要知道才知道的不可行的，就會很落力去查找，在找的過程中，我們又會找到另一些因素使得這個東西可行或者不可行，或者怎麼樣會好一些啊，就是有耐心去找，找這個東西（創新）到底可不可行啊，之前有沒有做過啊。或者可能會找到一些類似的 example，去找一些類似的東西。

(有沒有耐心去找?)

肯不肯花時間去找，有沒有耐心肯去花時間，應該這麼說，這些我們會當成學術研究，因為本身公司真的要做到東西出來的，如果肯花時間做這些研究，其實研究完之後對做事會有幫助的。

(另外呢?)

其實我最主要覺得的是究竟熱不熱衷這份工作。如果是熱衷於這份工作，是想將一些工作做好，那就自自然然會做這個東西（創新），如果有些人是想著只是出糧的，就不會主動去做。有工作就做，到時間就走，有些人會這樣。當然在不同的公司，都會找得到這樣的，當然也有些人是真的想做好這件其實就在說在晶門科技，最創新的工作來說是我去年在公司有一個 product 是做 LED 的，之前沒有同事接觸過這個 product，全部都是要自己去看下外面的 market 怎麼樣，看下國內的事情怎麼樣，在 engineering 這裡也要看下別人的其他的 product 是怎麼樣。比較我們的產品和別人的產品的分別。好在當時老闆都參與，在當中給我們意見。當中會給我發揮的空間。而不是“你應該要怎麼樣怎麼樣”。困難之處就在於，這個 product 是比較新的，相對的就會有很多難度在當中，因為之前沒有做過，又沒有 reference 要慢慢摸索。但是也在當中學到了很多，就是對於一些突發而來的新事情，有應付能力，增加到應付能力。(那整個 product 是你設計出來的?) 我是負責有一點 marketing 的。最後因為人事的關係，調到了另外一個 team，就沒有再搞這個了。(在這個創新中你是怎麼做的?) 整個過程扮演的角色來說，我負責 product engineering 的方面，由得知整個產品的架構，它的 spe，我得知整個產品的 spe 之後，我就要去想它的應用層面，甚至去研發。因為這個產品是新的，要做很多測試的工序，和看這個產品究竟是否合格。整個產品中都要接觸很多國內的廠商，客戶我都要去 visit 他們，和他們談一下在應用層面上究竟我們要怎麼樣才能幫到你(他)們。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

在整個產品過程中，他不會在我們身邊去參與的。很多時候，他會讓我們自由發揮。但有很多重要的文件，重要的設計方面，應用上的設計方面，他都會再看看，從中會給些意見。他給意見，就要根據他要求的意見的方向去看下當中有什麼可以改善。

3. Can you describe the key factor(s) that have made you innovative in the task?

如果最完美，就是整個產品由頭到尾的跟下來，應該頭一個階段就是去認識，認識這個產品。之後認識之後，很這個產品去相處。就好像人一樣，從認識這個人之後，就要和他相處，熟悉這個產品。因為我的角色是產品工程師，要很熟悉這個產品。第二個階段就是一定要熟悉產品。第三個是要找出產品的優劣，它有什麼缺點，也都要很清楚。因為當賣這個產品的時候，一定會有許多問題出現，也都會有客戶有要求。所以就要很清楚它的優劣，告訴客人這個產品優點在哪裡，甚至有什麼問題，是不是我們的產品問題從而怎麼樣去改善。優劣之後，第四是去推廣這個產品。幫手去推廣，去客戶那裡 visit，做些 demo 啊這些。最後就是這個產品的收成。如果這個產品是成功的，客人要的，我們就開始有成果了。(最後一步是 implementation，implement 之前要 sell 給客人?) 是的

根據你所描述的創新，你認為在此創新中有幾個階段？// 你能把以上所說的你的上司所做的分類嗎？或者你所做的分類嗎？

第一認識產品，其實市場上有些類似的產品，那我就去認識這類型的應用。這個類型的應用我應該怎麼樣去做？做個類似做一個 **benchmarking** 這樣的工作。看外面已經有的產品或者類似的產品。看別人的應用層面是怎麼樣。從而我怎麼樣去瞭解這個範疇的產品將來可以做怎樣的工程，或者可以怎樣去做推廣。上司在當中也會建議我究竟整個產品，究竟是哪個類型的產品會有市場價值，才去做 **benchmarking**，而不是給我盲目的去做，比如我選了十個產品，就不是這十個產品都去做 **benchmarking**。他會和我坐下來一起討論，將來哪些值得或者我們的 **competitor** 會做的。第二就熟悉產品，熟悉產品就是去試這個產品去玩這個產品。上司在外面和客人開完會，就會帶回客人有什麼要求，有些什麼應用。我就會從而，就大概意思去看產品方面是否能 **fulfill** 到客人的意見，慢慢去熟悉。當中他都會提供一些很好的意見，告訴我外面的情況其實是這樣的，那我就會從而得到客人要求的情況是怎麼樣，將產品的所長發揮。第三和第三都差不多的。上司就會和客戶開會。究竟外面整個市場來說，這類型的產品有什麼用途，從而我在這個產品上，找到這個產品是不是 **fulfill** 到市場的要求，找到它的最強的（長處）**sell** 給客戶。除了上司會和客人開會，很多時，我都會和他一起去推廣產品，做下 **demo** 啊這些，當中都給我很多機會接觸客人。推廣產品都是，除了做 **demo** 啊，當時有計劃要擺在 **exhibition** 啊，有一連串的計畫，有 **exhibition** 啊這類，最後我就調離了這個 **team**，就沒能完成了，最後收成我都沒有辦法看到。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

就講我以前的公司，當時有個關於紫外光的產品。當時整個產品已經完成了，我也有份研發的。但奈何在這個資訊爆炸的年代，使用者可以在不同的地方得到這個資訊。我的產品是什麼呢？是用來量度紫外線的。但是在資訊爆炸的年代，周圍都可以得到不同的資訊。基本上就不需要一個特別的儀器來量度紫外線。我們打個電話去天文臺，或者在上網就可以查到。這個產品最後在市場上都不是很好賣，據我所知，到現在都是這樣。（那你上司做了些什麼導致了這樣的結果呢？）其實很坦白來說之前那家公司，和 **PolyU** 有一點淵源，我的上司就，我有點感覺始終他不是商人出身，而是教書出身，市場觸覺是比較完美，有很多應該要想的 **worst** 的 **case** 都沒有想。另外始終大學有參與，那成本也是無限量供應，絕對沒有想過成本，導致了整個產品的失敗，完全沒有一個 **well-planning** 的，整個 **project** 就是做一個產品出來但是它有沒有市場結果呢？

（你能把以上所說的你的上司所做的分類嗎？或者你做的分類嗎？**stages** 呢？）頭幾個 **stages** 和之前幾個講產品的 **stages** 都差不多。直到推廣這裡有個分叉。這個分叉來說在於對於怎麼樣推廣產品。可不可以與一些 **related** 的，或者可以一些應用到它的商家去接觸，例如我的產品是量度 **UV** 的東西，可以和一些表商研究一下可不可以將我們的產品放到表裡，當中我覺得他都有做的，但是奈何，都是成本的問題，開始沒有很清楚計算成本，就導致將來，整個生產出來就算有人買，基本上都是虧錢。（有沒有帶著幾個同事去做創新？）因為我的職位就都是 **junior**，基本就是一起去做。（那一起做的時候，你有沒有幫助同事一起創新？）那我說再前一間公司。都是做一些 **project engineering** 的工作，建立一個系統，當時都要分派一些工作。因為整個工序，整個架構不可能一個人做完，每個步驟，就挑選最適合做的同事，建議他們去做。在他們做的過程中，我盡量都不會 **monitor** 他們，由他們去做。到整個 **project** 中期的時候，我都會瞭解一下他們的進度，他們的困難之處，看一下有什麼可以幫到他們。最後到了工程完結之前的 10% 時間之前，比如還有 10 天我們的工程就要完結了，再看下當中會不會有什麼問題，大家再一起研究（解決）。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

我覺得第一步，創新要成功最重要的，就要有膽量。正所謂創新，就是沒有見過的東西，或者之前沒有人做過的，要看人有沒有膽量去嘗試。因為其實創新來說，有很多情況都會有失敗，但創新也有吸引之處就是如果創新成功，成果是很大的。最重要就要看人有沒有勇氣踏出第一步，和第二樣就是要 **well-planning**，就是不是說很有膽量就可以去做，也要整個過程 **well-planned**，認為這個值得去做，才能去做。同時在做的過程中也要會怎麼樣找不同的人來幫手，因為始終懂得找不同的人，能幫人解決很多不是自己專長的事情。當創新是成功的時候，也可以用成功得來的果子再找更多不同的人，去 **explore** 另外的創新。

（Team 呢？）**team** 的因素來說，最重要的就是無私。整個 **team** 不能夠只顧住自己的利益去做。如果整個 **team** 如果不同指責的同事，如果只是顧住自己的交功課，就不是那麼好了。因為大家坐同一條船，船有個洞，進了水都要一起去補救。一定要無私。因為做一個創新，和只是打份工我覺得是不同的。因為創新在乎要全力以赴進去，去沖，才能到成功。

（反面呢？）

如果一個人，人始終都會有懶惰的情況的。如果有個果擺在人面前，不用做任何努力就能得到。這個就很容易讓人選擇（懶惰）。另外要做創新也要很冷靜的，將眼見到的有限的成果拋諸腦後，而去想將來會不會有一些別人沒有發掘到的果。要付出很多努力去找的果。要抱著這樣的信念去做創新。

（一件事，個人令到你不想花時間？）

都是之前公司的情況，可能公司重整架構，事情就會很大影響，整件事都還沒有完成，要把人調去另外的位置，就會影響創新。

## Interviewee 14

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

我想很難說找到一個什麼創新，其實對我們來說，我們的工作流程已經定好了，主要是看我們做過程當中，怎麼樣能夠用比較 smart 的去做，比如一個產品本身用到的 algorithm 可以說很大，用短些的時間去做，或者用其他的方法得到同樣的效果。那你問有沒有呢？有的。本身我的工作主要是負責一些 mask preparation 的動作，通常我們 IC 方面叫要做一些 mask 的工作，那我們就 checking，就是 against 一些，比如我們出了些版圖給外面的廠家，他們要 report 一些 data 給我們 check 的時候用的。那我們可以怎麼做呢？我們會用一些 program，用 program 去確認核對我們給他們的資料，讓我們有最快的速度做到我們要的結果。我們可以讓我們的过程可以 smooth 些，或者可以更快地做到我們要做的東西。（那你自己在這個過程中，怎麼樣創新？你做了什麼？）運用本身公司現有的資源，用另外一個途徑去做到我們要做到的東西。比如本身我們要 check 那些東西，本身用肉眼去而用一些 program 的形式讓我們去 check 的時候，用比較 computer 的形式，而不需要次次都用到肉眼。因為肉眼去 check 的時候未必是最準確的，因為有時會看漏的地方，而用 program 去做，可以將我們的... level 提高很多。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?
3. Can you describe the key factor(s) that have made you innovative in the task?

通常我們 bring out 一些 idea 出來都是基於一些曾經失敗過的經歷。這些失敗不想它再出現，不想它再發生，我們就要想一些方案令到我們做這個工作過程不想它再重蹈覆轍。所以通常我們做的都是我們之前做過的結果，導致我們用一個新的思維去想去不再出現失敗。（內在的因素呢？）之前做的時候有漏，有過錯，過程的時候不是很嚴謹，有些東西 overlook，我們不想這樣的情況再發生，變得我們需要找一些做事的方法，去彌補我們之前為什麼會 overlook 的情況。那我們就會想一些方法去補救我們之前漏的地方。有些人做事比較實際些，有些東西，是無法控制到的，既然無法控制到一些認為出錯的地方，就會去 develop 一些 flow，一些 flow 的工作。如果各個都跟著這個 flow，就不會出錯，中間不會有之前漏的情況發生。之前漏了什麼，就補上一個 step，令到整個 process 來說就不會有問題。

（外在因素呢？）

主要是一些做 software 比較強的同事。對於 support 到，對於我們的意見，我們的 idea，可以實際的可以反映到。就如我剛才所說，一些 software 的東西，他可以真的做出來，比如 user friendly 些的，令到大家做事的時候，一來大家做的舒服些，一來就方便些，但大家做的時候每一個 step 都不會漏。（有沒有 team 的 safe environment？）意見說出來，大家都會思考究竟這個意見可不可行。不會 ban 掉它，都要視乎這個意見會不會影響之前的 flow，這個已經做過了，只不過是 duplicate 之前已經做過的。大家就會覺得只不過是 improve 之前做的，而不是加一些東西進去。大家就會看是否有這樣的因素存在。

（請再回想一件事，有什麼個人因素令到他/你不想花時間做創新？有什麼外在因素？）

除非真是在手的工作很多。不能分身去做。你說放棄就不會，可能暫時 hold 住。除非這個產品到最後真是沒有用的，或者作用不大的話，基本上我們都不會不用這個產品，只不過要看它本身，本質上有沒有需要去做。（內在因素？）例如本身真的不清楚這個工作，或者覺得這個工作有困難。遇到比較大的。。。的時候，可能就會退縮。或者覺得這個挑戰比較難，一般的挑戰沒有問題，但是對於一些自己覺得自己的能力

做不到挑戰，就會退縮。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

主要 leader 本身有這方面的 background，對於 program 上給我們一些意見。比如過程中會需要他給我們一些提示，可能因為他的 background 會讓我們知道要做到這個（效果）要用些什麼樣的方法去做，他會帶領我們去想到這樣的方法讓我們完成這個工作。（只是用到這樣的 background? 你作為 leader 呢?）之前有。之前我就 leader 一個 project，那這個 project 就主要不是設計這方面的，我們是用別人之前設計的東西，去 convert 到最後 physical 我們想要產品。Leader 住我的同事怎麼樣去創新，在這個過程中就未必有創新。我之前就 leader 過這一個而已。

想的時候，就是在構想的時候做法開頭當然要有一些討論的形式，就是和 leader 討論做這個工作，怎麼樣可以做到我們想做的東西可以成功，有一些什麼 requirement，需要些什麼 support，可以支援我們做到這個工作。需要一些 meeting 去溝通，或者大家一起坐下來想一下，brainstorming 一些 idea 出來。然後就要落實，去做一些試驗品出來，比如 trial 1，做一些嘗試究竟做不做的到預期的效果，當然要嘗試。當中當然會有問題，要想一下怎麼樣可以解決這些問題。Try& error, 最後就有個 work 的結果。然後之後相同的工作都可以這樣做。（最後結果可不可以說 implement?）當然有問題之後，都要坐下來再討論究竟為什麼這個問題發生了，error 是什麼事。然後就再想另外的方法或者另外的 approach，或者現在的做法怎麼樣可以 improve 令到結果正面，就是 idea 用過後，基本上每個問題出現的時候就不斷 input 一些 idea 進去，結果就是 work，做到我們預期的結果。

想這方面當然是我們（做）的啦，那他主要是 brainstorming 啊，或者討論啊，或者當中間遇到問題時，一個 advisor 的形式，他當中做的主要是給意見，或者給我們一些提示，引導我們在做的過程中發掘一些做法有沒有這樣的可能。（每個 stage 分開呢？）第一個 stage，可能大家都知道想做到一些怎樣的結果。到時第一個 stage 他就是給一些 idea，例如可以有些不同的方法去做，做到這個效果可能會有許多不同的方法去做。他就想一下跟 哪種方法是最有效的，那他就會 advise 我們，然後我們就用這樣的方法去做。當然這幾種方法我們也未必清楚應該怎樣去做，那他就會給些意見，我們循這這樣的意見，我們看下分幾種方法應該怎麼樣做，或者是我們再嘗試下 benchmark 一下哪樣會是比較 efficient 的方法。至於 implement 之後，就是試完之後，就決定，當然看下他有什麼的意見，覺得這樣做的情況下，他會覺得究竟這樣做是不是正確呢？他會覺得我們做出來的未必百分百準確。或者我們未必能比較得出究竟哪中方法好些，他就會讓我從其他方面去想怎麼樣再做再好一些。最後當然是落實一個方案，最後就這樣去做了。我們去 implement 的 approach，得出來的結果不滿意的，大家一起看下 result, review 一下，看下結果，在過程中哪裡出了錯，然後再不斷 improve，最後成功。（時間啊，resources 上呢？）資源就用公司本身 existing 的資源，extra 就，因為不需要 extra 的資源，所以就可能沒有。至於時間的話，他會給充分，足夠的時間，不會無了期地去做這個工作。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

失敗就一定有的。失敗的原因有時不是人為的因素，這個做法不可行，那就只能停了。可能是外在的因素。比如這個資源突然沒有了 support，沒有了這種 support 的話，我們再做下去，都不是一個那長遠的方法。因為如果我們用這個方法，但是沒有人 support，就變成做出來的結果，就沒有人去改良。比如一些 software 我們公司沒有

了，之後再也沒有了，變成我們再想（設計）也沒有用了。就變成失敗了。或者去想另外的方法去做。（沒有 software 關不關 leader 事呢？）無關的，主要是看大圍的需求。如果這個 software 的需求小，那與其擺這些 resources 在這裡就不如 relocate resources 去另外一個更有需求的地方。但這個未必是 leader 決定的，而是看大圍。（他有沒有做過什麼呢？或沒做什麼而導致失敗呢？）他曾經都和人說過為什麼會這樣，但是都說了這個問題都是大家的意思，不應該繼續去 support，他一個人堅持的話，那的確大家所持的意見是正確的，不是一個普遍行要用的產品，浪費一些 resources 去 support 就沒有意思了。（你作為 leader 呢？）沒有。（他會不會不給 resources 你啊這些？）Resources 他不會控制不分配給大家。問題是本身 resources 是不是 exist。（沒有辦法分類了？）是的。

## Interviewee 15

1. Please recall a task which you feel you have performed innovatively. What is that task and in what ways were this task performed innovatively?

08年頭的時候有些 Product 要求變高了，然後有些 spe 不同了。舊的方法就不能用了，然後就要轉新的方法。新的方法有很多不同的做法，每種做法都要選的，然後要想哪種做法好些。這些做法都很花時間，要想很多東西，要丟棄舊的，想寫新的。（那些方法是你想出來了，然後再選擇，還是已經存在的，然後你再選擇？）是我自己想出來的，沒有人做過的。是我自己想出來的，自己要 verify. 因為是新的產品，所以要想得很清楚，然後再擺到 product 裡。（具體些說你是怎麼做？）首先要看有些什麼要求，然後再看我有些什麼選擇，然後再在我職責的範圍裡想所有的可能性。然後再挑選其中的 combination 可以做出成果來的。很多方法來比較，要想清楚選一個好的出來。要想得很清楚，可能一開始是好的，後來再想清楚發現也有不好的地方，做了幾十次，可能才是好的。可能幾秒想出來的方法不是 Final 的。

2. Referring to the task you performed innovatively, what is the process or how many stages did the tasks contain?

第一個 Stage，就是看有些什麼可以選擇，可以做到什麼，有什麼選擇。所有的範圍都想清楚了，如果少想了一點，可能最後出來到結果不是最好的。只有想到所有的選擇，在所有的選擇裡，挑一個好的。挑一個好的說就簡單，但真的要比較這麼多種 combination，挑出來，然後 present，Present 給其他的同事，等他們 agree 了，okay 了，然後我就可以做出來了（最後是 implement？）然後做很多 simulation，做完之後 okay, even design 結束了，debug 結束，後面還有很長 stage 的 verification. 這 Part 要試了有問題才可以 verify. 再看中間每一 part 都看得很清楚。要檢查每一個部分都正確了，做完中間每一 part 都要檢查的很清楚，沒有 Potential 的 error. 因為 simulation 是個比較 ideal 的 case, 真的現實可能不是 ideal 的，要考慮這 part. 如果什麼地方不是 ideal 的話，會不會出事，中間每個 critical 的都要再檢查跟進。

（上司做了什麼？）

我上司就是坐在那裡聽。另外都是 Senior，就是之前做我做的 Design 的同事，這些同事真的有用。他們對於我做出來的產品都很熟悉，可不可行他們都很清楚，不需要我解釋太多。

（或者就說你的 senior 些的同事呢？）

他最主要是聽我說的東西，因為他熟悉我說的，他知道我說的（想法）行不行。主要是這樣。如果中間有什麼遺漏的，提醒我要 check check 什麼啊 maybe。（具體來說，在 implement 的時候，他會不會做了點什麼來幫助你？）提醒我要 check 一些東西來避免, for example, 如果有些他覺得 check check 這裡，在這裡多想一下，未必有我這些 case, 很多時候，都是由頭到尾都是我做出來的。主要是聽我做的東西，明白我做的東西，因為大家都是做這個 area 的，如果這個東西是好的大家都會知道。熟悉的人就知道，不熟的就是聽，不熟的這些就很難給意見了。因為 design 太過 detail，熟悉這個的人才能說處好或者不好。（resources 方面？與其他部門溝通？）Design 如果討論好了，就要找人做這方面就要幫手了。找人畫 layout, 找其他的 resources, test-end, 找人做 test, 做 management 這 part 的工作。design 這邊...(就 leave it to you?) 是的。我現在 immediate 的上司就不熟悉我做的 area 的，我做 digital camera 的，我說出來，好不好他也不清楚。要找另外一個 senior 的，做 digital 的我和他才有東西可以討論。

3. Can you describe the key factor(s) that have made you innovative in the task?

創新，我覺得想像力很重要。最重要要有很豐富的想像力，可以專注做某一範(某一個工作)。這樣才能想到一些別人想不到的東西出來。

（其他還有什麼呢？）

內在的，通常這種人都不是 bla bla 很多話說的人。靜的時候很靜的。就是有想像力，

接著要想的時候很。。。的。

就是要對自己做的工作有興趣，沒興趣的話是不行的。如果有興趣什麼都行。要夠膽去試，很多東西。因為新的東西不知道行不行的通的，要夠膽去試這樣。

4. Did your leader/manager play a role in it? What did the leader do? Please give some details of the leader's behaviors. Can you group the leader behaviors into the stages you mentioned?

上司有很多個。(最直接的) 最直接的不熟我這個專業的，只是坐著聽。然後會請一些，senior 一些，熟悉我所做的工作的同事來討論。有些舊 product 是他做出來的，然後我要用些新的方法去做。舊的方法不行了，怎麼樣不行呢，要和他們說。然後告訴他們現在的新的方法有什麼好處，他們覺得 okay 了，大家都覺得 okay, 最主要熟悉我這個專業的人，做舊的 product 的人都覺得 okay 了，那就去做了。

5. Can you think of an innovation which finally turned out to be unsuccessful? Did your supervisor/manager play a role in that unsatisfactory outcome? What specifically did the person do or did not do? Can you group the above behaviors into these stages?

都有些的，有些不是很適合做。去...的 data, 我們...去 collect 一些 data 讓我們的將來做 design 的時候 competing level 都可以高些, 對自己做出來的產品都有信心一些。有時都是靠估計的，如果有 test tree, 只是做 test 不是做 Product, 只是這 part 做 test 的，讓自己心中有數，畫這麼長的線可不可以有沒有問題呢？接著可能某些原因最後還是做不到。(上司做過什麼？或者沒有這樣做？) 如果只是說 design 這 Part, 我覺得他因為不熟悉，就不能做到什麼幫到我。爭取 resources 這方面可以幫到我們, management 這方面可以幫到。比如 management flow 啊這些，找人啊，contact 一些人啊，這些方面可以幫到。另外 design 這方面，他不熟悉這方面，就很難幫到。(除了 design 這方面，他怎麼幫你？) 我剛剛來的時候，如果想找個人要畫個 test tree, 不是 product, 要找人畫 layout, resources 不是你很 powerful, (我自己) 出去找同事是沒有人會幫忙的。要找人，找幾個人出來幫我說做這個工作。如果像我上司，他在這裡做的時間長了，有威望了，出來說我要人，幫誰誰誰畫這個，那同事就會聽了。(他用他自己的 Power 來幫你？) 是啊，在爭取 resources 的方面。誰誰誰怎麼樣，那些同事才會聽。剛剛來的時候，真的是沒有人理我的。

(你有沒有試過 lead 住幾個同事？)

找同事畫 layout 的時候，我會看著他畫，然後就給他一些 guideline. 我會說這裡不要這樣畫，要注意什麼，有些什麼 requirement, 或者真的畫好之後我再看看，如果不行的，就說不行，有什麼 improvement 去改。如果真的是和幾個同事一起搞 design, 就沒有。雖然我是一個 memory design team 的 leader, 但整個 team 只有我一個人。



### **APPENDIX 3: Dropped innovation-oriented leadership items**

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#### *Dropped Items (According to the EFA results)*

Let us do the innovation by ourselves instead of giving guidelines or instructions

Never dictates his/her ideas to us

Helps build consensus

Gets key decision makers involved

Enthusiastically promotes the innovation's advantages

Gets problems into the hands of those who can solve them

Gets the right people involved

Strives for more time for testing our ideas and prototypes

According to the CFA results, the following 5 more items were dropped:

Questions our ideas in a constructive way

Sticks with it

Knocks down barriers to the innovation

Persists in the face of adversity

Raises questions and poses challenges in the innovation review meeting

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**APPENDIX 4:  $r_{wg}$  values of Team Learning Behavior and Team initiation (Study 2)**

	TLB	Team Initiative
team 1	.95	.95
team 2	.93	.95
team 3	.95	.97
team 4	.96	.97
team 5	.95	.97
team 6	.97	.98
team 7	.93	.95
team 8	.93	.96
team 9	.94	.98
team 10	.98	.96
team 11	.90	.93
team 12	.94	.95
team 13	.95	.96
team 14	.95	.94
team 15	.95	.96
team 16	.93	.95
team 17	.93	.96
team 18	.94	.96
team 19	.94	.92
team 20	.95	.98
team 21	.96	.95
team 22	.97	.97
team 23	.95	.96
team 24	.96	.95
team 25	.94	.96
team 26	.94	.97
team 27	.94	.92
team 28	.94	.96
team 29	.94	.95
team 30	.96	.97
team 31	.96	.94
team 32	.97	.98
team 33	.87	.98
team 34	.93	.95
team 35	.95	.94
team 36	.94	.95
team 37	.96	.96
team 38	.92	.97
team 39	.95	.93
team 40	.94	.98
Average $r_{wg}$	.94	.96

**APPENDIX 5:  $r_{wg}$  values of Team Learning Behavior and Team initiation (Study 3)**

	TLB	Team Initiative
team 1	.88	.92
team 2	.89	.89
team 3	.95	.98
team 4	.92	.95
team 5	.93	.96
team 6	.96	.93
team 7	.95	.95
team 8	.88	.92
team 9	.91	.91
team 10	.96	.96
team 11	.90	.92
team 12	.91	.91
team 13	.93	.92
team 14	.95	.95
team 15	.98	.94
team 16	.95	.93
team 17	.94	.94
team 18	.90	.93
team 19	.96	.94
team 20	.97	.94
team 21	.97	.96
team 22	.94	.95
team 23	.96	.97
team 24	.94	.97
team 25	.91	.92
team 26	.91	.94
team 27	.94	.95
team 28	.94	.95
Average $r_{wg}$	.93	.94

**APPENDIX 6: Additional Analyses: Transformational leadership and its interactions with TLB, Work contacts, and Team initiative on IWB1, IWB2, & IWB3, controlling for the effects of IL1, IL2, & IL3 (Study 2)**

	Model 1 IWB1	Model 2 IWB2	Model 3 IWB3
<i>Variables</i>			
<i>Null Model</i>			
Intercept	4.12 (.11) ***	4.03 (.11) ***	3.81 (.12) ***
<i>Level 1</i>			
Intercept	4.12 (.10) ***	4.03 (.11) ***	3.81 (.12) ***
Age	.07 (.04)	.04 (.04)	.02 (.03)
Education	.04 (.10)	.01 (.10)	-.07 (.10)
Org tenure	.00 (.00)	.00 (.00)	.01 (.01)
Transformational leadership (TL)	.10 (.13)	.30 (.26)	.02 (.11)
IL for idea generation (IL1)	.11 (.05) *	.05 (.16)	.02 (.13)
IL for idea promotion (IL2)	.02 (.09)	.18 (.08) *	.06 (.10)
IL for idea implementation (IL3)	.13 (.13)	.16 (.17)	.18 (.12)
Work contacts (WC)		.45 (.23) *	
<i>Level 2</i>			
Team Size	.09 (.11)	-.01 (.11)	.05 (.10)
Team learning behavior (TLB)	.49 (.22) *		
Team initiative (TI)			.52 (.21) *
<i>Interactions</i>			
TLxTLB	-.07 (.26)		
TLxWC		-.09 (.07)	
TLxTI			-.11 (.23)

Note:  $N = 166$  (Level 1, Individuals);  $N = 40$  (Level 2, Teams).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: standard error.

**APPENDIX 7: Additional analyses: Transformational leadership and its interactions with TLB, Work contacts, and Team initiative on IWB1, IWB2, & IWB3, controlling for the effects of IL1, IL2, & IL3 (Study 3)**

	Model 1 IWB1	Model 2 IWB2	Model 3 IWB3
<i>Variables</i>			
<i>Null Model</i>			
Intercept	4.07 (.12) ***	3.60 (.16) ***	3.87 (.16) ***
<i>Level 1</i>			
Intercept	4.07 (.12) ***	3.60 (.16) ***	3.87 (.16) ***
Age	.01 (.01)	.01 (.01)	-.00 (.01)
Education	-.06 (.10)	-.06 (.11)	-.01 (.11)
Org tenure	.00 (.00)	-.00 (.00)	-.00 (.00)
Transformational leadership (TL)	-.12 (.08)	.14 (.10)	-.17 (.10)
IL for idea generation (IL1)	-.09 (.11)	.07 (.11)	-.03 (.10)
IL for idea promotion (IL2)	.11 (.08)	.14 (.07) *	.10 (.08)
IL for idea implementation (IL3)	.12 (.09)	.05 (.08)	.23 (.09) *
Work contacts (WC)		.43 (.21) *	
<i>Level 2</i>			
Team Size	-.10 (.15)	-.08 (.20)	.05 (.11)
Team learning behavior (TLB)	.16 (.29)		
Team initiative (TI)			.34 (.37)
<i>Interactions</i>			
TLxTLB	-.15 (.10)		
TLxWC		-.09 (.06)	
TLxTI			-.22 (.13)

Note:  $N = 137$  (Level 1, Individuals);  $N = 28$  (Level 2, Teams).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: standard error.

**APPENDIX 8: Additional analyses: Transformational leadership and its interactions with TLB, Work contacts, and Team initiative on IWB1, IWB2, & IWB3 (Study 2)**

	Model 1 IWB1	Model 2 IWB2	Model 3 IWB3
<i>Variables</i>			
<i>Null Model</i>			
Intercept	4.12 (.11) ***	4.03 (.11) ***	3.81 (.12) ***
<i>Level 1</i>			
Intercept	4.12 (.10) ***	4.03 (.11) ***	3.81 (.12) ***
Age	.07 (.04)	.04 (.04)	.02 (.03)
Education	.06 (.11)	.02 (.11)	-.03 (.11)
Org tenure	.00 (.01)	.00 (.00)	.01 (.01)
Transformational leadership (TL)	.24 (.09) *	.42 (.26)	.20 (.12)
Work contacts (WC)		.46 (.36)	
<i>Level 2</i>			
Team Size	.09 (.11)	-.01 (.11)	.05 (.10)
Team learning behavior (TLB)	.48 (.22) *		
Team initiative (TI)			.52 (.21) *
<i>Interactions</i>			
TLxTLB	-.13 (.25)		
TLxWC		-.07 (.07)	
TLxTI			-.21 (.20)

Note:  $N = 137$  (Level 1, Individuals);  $N = 28$  (Level 2, Teams).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: standard error.

**APPENDIX 9: Additional analyses: Transformational leadership and its interactions with TLB, Work contacts, and Team initiative on IWB1, IWB2, & IWB3 (Study 3)**

	Model 1 IWB1	Model 2 IWB2	Model 3 IWB3
<i>Variables</i>			
<i>Null Model</i>			
Intercept	4.07 (.12) ***	3.60 (.16) ***	3.87 (.16) ***
<i>Level 1</i>			
Intercept	4.07 (.12) ***	3.60 (.16) ***	3.87 (.16) ***
Age	.00 (.01)	.01 (.01)	-.01 (.01)
Education	-.07 (.11)	-.08 (.06)	-.02 (.11)
Org tenure	.00 (.00)	-.00 (.00)	.00 (.00)
Transformational leadership (TL)	-.01 (.05)	.23 (.14)	.01 (.04)
Work contacts (WC)		.40 (.35)	
<i>Level 2</i>			
Team Size	-.09 (.15)	-.08 (.13)	-.08 (.20)
Team learning behavior (TLB)	.16 (.29)		
Team initiative (TI)			.35 (.37)
<i>Interactions</i>			
TLxTLB	-.13 (.06) *		
TLxWC		-.07 (.07)	
TLxTI			-.11 (.10)

Note:  $N = 137$  (Level 1, Individuals);  $N = 28$  (Level 2, Teams).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

In parentheses: standard error.

## APPENDIX 10: Questionnaire for Subordinate (Chinese Version)



致

參與調查研究的員工：

您好！首先，衷心感謝各位參與此項目研究。這是由香港理工大學管理及市場學系所設計的關於創新的調查問卷。創新是一個過程：從提出新構思乃至新企劃的實踐，也包括了改進現有的產品、工序或服務。目前的研究旨在因循創新過程的不同階段，從而鑒定和識別不同的部門和個人所擁有的有助于創新的特徵。

爲了獲得精確的調查結果，我們懇請您誠實地作答。這裏沒有最正確或是最理想的答案。這是一項匿名的調查，您的所有回答將被保密，您所屬的公司將不會接觸此問卷。研究的結果只會以一般的統計資料來表示。

如果您有任何有關此問卷調查的問題，可以致電 3400 3586 聯絡孔顯或發送電郵至 0790 。最後，再次對您的參與及幫助表示衷心的感謝！

趙之琨 副教授及副系主任  
香港理工大學管理及市場學系 領袖及創新中心總監

孔顯 博士研究生  
香港理工大學管理及市場學系



第一部分：以下句子是有關您的直接領導（上司）在創新過程中的一些描述；他（她）是您所在的工作團隊，部門或分支機構的領導。

你的部門上司有多經常地在 <u>創新過程</u> 中採取以下行動？請在適當的數位上畫圈。 1-7 表示採取行動的頻率 我的上司…		從來沒有	極少	較少	有時候	較多	經常	幾乎總是
1	對創新項目具強烈的信念	1	2	3	4	5	6	7
2	對創新項目能達成的成果表現信心	1	2	3	4	5	6	7
3	指出創新項目會成功的原因	1	2	3	4	5	6	7
4	對創新的成功抱樂觀的態度	1	2	3	4	5	6	7
5	不斷熱切地推動創新	1	2	3	4	5	6	7
6	對創新專案貫徹始終	1	2	3	4	5	6	7
7	于創新過程中表現堅毅，排除萬難	1	2	3	4	5	6	7
8	邀請團隊外的資深同事瞭解我們的創新概念	1	2	3	4	5	6	7
9	為創新項目排除阻礙	1	2	3	4	5	6	7
10	面對逆境亦堅持而不放棄	1	2	3	4	5	6	7
11	與我分享他/她的個人經驗，評價，見解或過往案例	1	2	3	4	5	6	7
12	用自己的想法拋磚引玉來激發我們提出自己想法	1	2	3	4	5	6	7
13	營造自主的氛圍	1	2	3	4	5	6	7
14	對我們的構想提出有建設性的問題	1	2	3	4	5	6	7
15	帶領我和我的同事進行深入的討論	1	2	3	4	5	6	7
16	鼓勵多樣化	1	2	3	4	5	6	7
17	幫助總結我們的構思及建議	1	2	3	4	5	6	7
18	幫助我們的討論集中在創新的本身	1	2	3	4	5	6	7
19	幫助我們免受規定，政策，官僚政治的束縛	1	2	3	4	5	6	7
20	在檢討會議上提出問題與考驗	1	2	3	4	5	6	7
21	為我們提供合適的工具及設備	1	2	3	4	5	6	7
22	爭取足夠的人手來執行創新	1	2	3	4	5	6	7
23	對創新的執行與我們召開定期的檢討會議	1	2	3	4	5	6	7
24	與我們并肩解決創新執行中的問題	1	2	3	4	5	6	7
25	聯絡其它部門確保執行創新的合作順利	1	2	3	4	5	6	7
26	与其它部門溝通，清楚表達我們的要求與標準	1	2	3	4	5	6	7
27	邀請資深的同事參加我們的檢討會議	1	2	3	4	5	6	7
28	與其他部門建立對預期創新執行結果的共識	1	2	3	4	5	6	7
29	檢查并評估新產品/服務的表現	1	2	3	4	5	6	7

請表明您不同意或同意這些句子的程度。請在適當的數位上畫圈。		非常不同意	不同意	有點不同意	中立	有點同意	同意	非常同意
我的上司...								
30	清楚的理解我們的發展方向	1	2	3	4	5	6	7
31	生動地描繪我們團隊的未來遠景	1	2	3	4	5	6	7
32	以他/她的未來計劃來啓發我們	1	2	3	4	5	6	7
33	鼓勵我們成爲“團隊成員”	1	2	3	4	5	6	7
34	使我們爲同一目標而共同奮鬥	1	2	3	4	5	6	7
35	在團隊成員中建立一種團隊精神	1	2	3	4	5	6	7
36	通過“做”而不是簡單地“講”來進行領導	1	2	3	4	5	6	7
37	爲我提供一個好的追隨典範	1	2	3	4	5	6	7
38	以身作則	1	2	3	4	5	6	7
39	激勵我超越現有的標準	1	2	3	4	5	6	7
40	激發我付出更多額外的努力	1	2	3	4	5	6	7
41	鼓勵我表現出最佳的自己	1	2	3	4	5	6	7
42	沒有考慮我的感受而採取行動**	1	2	3	4	5	6	7
43	尊重我個人的感受	1	2	3	4	5	6	7
44	爲我的個人需要著想而行事	1	2	3	4	5	6	7
45	激發我用新的方式來思考問題	1	2	3	4	5	6	7
46	提出能使我促進思考的問題	1	2	3	4	5	6	7
47	激發我重新思考我做事的方式	1	2	3	4	5	6	7

第二部分：請對你所在的團隊做出評價。

請表明您不同意或同意這些句子的程度。請在適當的數位上畫圈。		非常不同意	不同意	有點不同意	中立	有點同意	同意	非常同意
在團隊中…								
1	團隊成員積極地解決問題	1	2	3	4	5	6	7
2	每當出現錯誤時，團隊成員會立即搜尋解決方法	1	2	3	4	5	6	7
3	團隊成員會把握每個可以積極參與的機會	1	2	3	4	5	6	7
4	我們的團隊比其它團隊更經常地立刻採取主動	1	2	3	4	5	6	7
5	我們的團隊迅速地把握機遇以達到目標	1	2	3	4	5	6	7
6	團隊成員經常會做的比他們所被要求的更多	1	2	3	4	5	6	7
7	團隊成員特別善于將構想變成現實	1	2	3	4	5	6	7
8	團隊成員能夠把問題和棘手的事宜提出來	1	2	3	4	5	6	7
9	團隊成員有時會反駁其它人以顯示與眾不同**	1	2	3	4	5	6	7
10	在團隊中，可以大膽地承擔風險	1	2	3	4	5	6	7
11	團隊成員難以獲得其它成員的幫助**	1	2	3	4	5	6	7
12	團隊中不會有成員故意破壞我的工作	1	2	3	4	5	6	7
13	在團隊中，我的獨特技能和才幹得到肯定和發揮	1	2	3	4	5	6	7
14	如果我犯了錯誤，團隊成員會經常責怪于我**	1	2	3	4	5	6	7
15	我的團隊自信有能力創造性的解決遇到的問題	1	2	3	4	5	6	7
16	我的團隊自認為善于產生新奇的想法	1	2	3	4	5	6	7
17	我的團隊能借鑒并完善別的團隊的想法	1	2	3	4	5	6	7
18	我們會定期尋求改進工作流程的方法	1	2	3	4	5	6	7
19	我的團隊會私下處理意見的不同，而不會在團隊中直接地討論	1	2	3	4	5	6	7
20	我們的團隊時常尋找新的、會引起重要改變的信息	1	2	3	4	5	6	7
21	在團隊中，總會有人確保我們會暫停下來反省團隊的工作進程	1	2	3	4	5	6	7
22	團隊成員經常暢所欲言來測試討論中的問題的各種假設	1	2	3	4	5	6	7

### 第三部分：個人屬性

下列問題有關你的個人信念和價值觀。請在適當的數位上畫圈。		非常不同意	不同意	有點不同意	中立	有點同意	同意	非常同意
1	我的工作職責包括搜尋新的技術和方法	1	2	3	4	5	6	7
2	把新的構想引進組織（公司）是我工作職責的一部分	1	2	3	4	5	6	7
3	完成我的工作要求我不必很創新**	1	2	3	4	5	6	7
4	我的工作要求我創始新的方法解決問題	1	2	3	4	5	6	7
5	提出新的構想是我工作職責的一部分	1	2	3	4	5	6	7
6	我自認為善于產生新奇的想法	1	2	3	4	5	6	7
7	我自信有能力創造性的解決遇到的問題	1	2	3	4	5	6	7
8	我能借鑒并完善別人的想法	1	2	3	4	5	6	7
9	我迅速地把握機遇以達到目標	1	2	3	4	5	6	7
10	我經常會做的比被要求做到的更多	1	2	3	4	5	6	7
11	我特別善于將構想變成現實	1	2	3	4	5	6	7
12	我會主動的解決問題	1	2	3	4	5	6	7
13	每當事情出錯時，我會立即找尋解決問題的方案	1	2	3	4	5	6	7
14	我把握每個可以積極參與的機會	1	2	3	4	5	6	7
15	即使沒人採取主動時，我也會採取主動	1	2	3	4	5	6	7
16	我很享受尋找解決複雜問題方法的過程	1	2	3	4	5	6	7
17	我很享受能想出產品的新構想	1	2	3	4	5	6	7
18	我很享受從事分析性的思考	1	2	3	4	5	6	7
19	我很享受創造出新的完成工作任務的程序	1	2	3	4	5	6	7
20	我很享受改進現有的流程或產品	1	2	3	4	5	6	7

你有多經常地表現出以下行爲？請在適當的數位上畫圈。 1-5 表示採取行動的頻率		從來沒有	較少	有時候	較多	幾乎總是
21	我會拜訪公司的外部客戶	1	2	3	4	5
22	我與公司的潛在客戶保持聯繫	1	2	3	4	5
23	我會參觀研討會，交易會和/或展覽會	1	2	3	4	5
24	我與同行（其它公司的員工）交談	1	2	3	4	5
25	我與大學/學術機構的人員保持溝通聯繫	1	2	3	4	5
26	我會與非直屬上司(高層)探討/反映工作中的問題	1	2	3	4	5
27	我與公司資深有經驗的同事討論/反映工作中的問題	1	2	3	4	5

#### 第四部分：統計資料

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性別：       男性                       女性

---

年齡：      \_\_\_\_\_

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最高教育程度     初中                       高中/中專                       大專                       學士學位(本科)  
                          碩士學位                       博士學位                       其它 請注明 \_\_\_\_\_

---

在現職公司的任職年限： \_\_\_\_\_ 年及 \_\_\_\_\_ 個月

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在現職部門的任職年限： \_\_\_\_\_ 年及 \_\_\_\_\_ 個月

---

再次感謝您能抽出時間完成是次問卷！

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## APPENDIX 11: Questionnaire for Supervisor (Chinese Version)



致

參與調查研究的領導：

您好！首先，衷心感謝各位參與此項目研究。這是由香港理工大學管理及市場學系所設計的關於創新的調查問卷。創新是一個過程：從提出新構思乃至新企劃的實踐，也包括了改進現有的產品、工序或服務。目前的研究旨在因循創新過程的不同階段，從而鑒定和識別不同的部門和個人所擁有的有助于創新的特徵。

爲了獲得精確的調查結果，我們懇請您誠實地作答。這裏沒有最正確或是最理想的答案。這是一項匿名的調查，您的所有回答將被保密，您所屬的公司將不會接觸此問卷。研究的結果只會以一般的統計資料來表示。

如果您有任何有關此問卷調查的問題，可以致電 3400 3586 聯絡孔顥或發送電郵至 0790 。最後，再次對您的參與及幫助表示衷心的感謝！

趙之琨 副教授及副系主任

香港理工大學管理及市場學系 領袖及創新中心總監

孔顥 博士研究生

香港理工大學管理及市場學系

## 領導問卷

你的團隊成員有多經常地在創新過程中表現出以下行爲？請在對應的團隊成員欄中填上數字。

1-7 表示採取行動的頻率

從來沒有	極少	較少	有時候	較多	經常	幾乎總是
1	2	3	4	5	6	7

**\*\*請對每位團隊成員做出評價**

這位團隊成員會：

1. 為棘手的問題創造全新的構思							
2. 搜尋新的工作方法，技巧或工具							
3. 產生原創的解決問題的方法							
4. 動員起對創新構想的支持							
5. 獲取（高層）對創新構想的認可							
6. 令公司重要的成員對創新構想充滿熱情							
7. 將創新構想轉變成實際應用							
8. 將創新構想系統地引入工作環境							
9. 評估創新構想的效用							

## REFERENCES

- Ahearne, M., Mathieu, J., & Rapp, A. (2005). To empower or not to empower your sales force? An empirical examination of the influence of leadership empowerment behavior on customer satisfaction and performance. *Journal of Applied Psychology, 90*, 945-955.
- Aiken, J. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.
- Allen, T. D., & Rush, M. C. (1998). The effects of organizational citizenship behavior on performance judgments: A field study and a laboratory experiment. *Journal of Applied Psychology, 83*, 247-260.
- Amabile, T. M. (1988). A model of creativity and innovation in organizations. In B. M. Stow & L. L. Cummings (Eds.), *Research in organizational behavior* (Vol. 10, pp. 123-167). Greenwich, CT: JAI Press.
- Amabile, T. M. (2000). Stimulate creativity by fueling passion. In E. Locke (Ed.), *Handbook of principle of organizational behavior* (pp. 331-341). Malden, MA: Blackwell.
- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of management, 39*, 1154-1184.
- Amabile, T. M., Schatzel, E. A., Moneta, G. B., & Kramer, S. J. (2004). Leader behaviors and the work environment for creativity: perceived leader support. *Leadership Quarterly, 15*, 5-32.
- Andrews, F. M. (1979). *Scientific productivity*. Cambridge: Cambridge University Press.
- Anthony, R. (1998). Innovative Leadership: Spark Plug of Progress. *Innovative Leader, 7*, Retrieved September 20, 2008, from [http://www.winstonbrill.com/bril001/html/article\\_index/articles/301-350/article329\\_body.html](http://www.winstonbrill.com/bril001/html/article_index/articles/301-350/article329_body.html).
- Argote, L., Gruenfeld, D., & Naquin, C. (1999). Group learning in organizations. In M. E.



- Turner (Ed.), *Group at work, Advances in theory and research*. New York, Erlbaum.
- Argyris, C. (1993). *Knowledge for action: A guide to overcoming barriers to organizational change*. Jossey-Bass Inc., San Francisco.
- Arnold, J. J., Arad, S., Rhoades, J. A., & Drasgow, F. (2000). The Empowering Leadership Questionnaire: The construction and validation of a new scale for measuring leader behaviors. *Journal of Organizational Behavior, 21*, 249-269.
- Ashford, S. J., Rothbard, N. P., Piderit, S. K., & Dutton, J. E. (1998). Out on a limb: The role of context and impression management in issue selling. *Administrative Science Quarterly, 43*, 23-57.
- Axtell, C. M., Holman, D. J., Unsworth, K. L., Wall, T. D., Waterson, P. E., & Harrington, E. (2000). Shopfloor innovation: Facilitating the suggestion and implementation of ideas. *Journal of Occupational and Organizational Psychology, 73*, 265-285.
- Baer, M., & Frese, M. (2003). Innovation is not enough: Climates for initiative and psychological safety. *Journal of Organizational Behaviors, 24*, 45-68.
- Bain, P. G., Mann, C., & Pirola-Merlo, A. (2001). The innovation imperative: the relationships between team climate, innovation, and performance in research and development teams. *Small Group Research, 32*, 55-73.
- Bandalos, D. L., & Finney, S. J. (2001). Item parceling issues in structural equation modeling. In G. A. Marcoulides (Ed.), *New developments and techniques in structural equation modeling* (pp. 269-296). Mahwah, NJ: Lawrence Erlbaum.
- Basadur, M. S. (2004). Leading others to think innovatively together: Creative leadership. *Leadership Quarterly, 15*, 103-121.
- Basadur, M. S., Graen, G. B., & Green, S. G. (1982). Training in creative problem solving: Effects on ideation and problem finding in an applied research organization, *Organizational Behavior and Human Performance, 30*, 41-70.

- Basadur, M. S., Graen, G. B., & Wakabayashi, M. (1990). Identifying individual differences in creative problem solving style. *Journal of Creative Behavior*, 24, 111-131.
- Basadur, M. S., & Head, M. (2001). Team performance and satisfaction: a link to cognitive style within a process framework. *Journal of Creative Behavior*, 35, 227-248.
- Basadur, M. S., Wakabayashi, M., & Takai, J. (1992). Training effects on the divergent thinking attitudes of Japanese managers. *International Journal of Intercultural Relations*, 16, 329-345.
- Bass, B. M. (1985). *Leadership and Performance Beyond Expectations*. New York: Free Press
- Bass, B. M., & Avolio, B. J. (1997). *Full range of leadership: Manual for the multifactor leadership questionnaire*. Palto Alto, CA: Mind Garden
- Bass, B. M., Avolio, B. J., Jung, D. I., & Berson, Y. (2003). Predicting unit performance by assessing transformational and transactional leadership. *Journal of Applied Psychology*, 88, 207-218.
- Basu, R., & Green, S. G. (1997). Leader-member exchange and transformational leadership: An empirical examination of innovative behaviors in leader-member dyads. *Journal of Applied Social Psychology*, 27, 477-499.
- Bennis, W. & Nanus, B. (1985). *Leaders: the strategies for taking charge*. New York: Harper and Row.
- Bettis, R. A., & Hitt, M. A. (1995). The new competitive landscape. *Strategic Management Journal*, 7, 7-19.
- Bliese, P. D. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation and Analysis. In K. J. Klein & S. W. Kozlowski (Eds.). *Multilevel Theory, Research, and Methods in Organizations* (pp. 349-381). San Francisco, CA: Jossey-Bass, Inc.
- Boisot, M. H. (1998). *Knowledge assets: Securing competitive advantage in the information*

*economy*, Oxford: Oxford University Press.

Bollen, K. A. (1989). A New Incremental Fit Index for General Structural Equation Models.

*Sociological Methods Research*, 17, 303-316.

Brislin, R. W., Lonner, W., & Thorndike, R. M. (1973). *Cross-Culture Research Method*.

Wiley, New York.

Brislin, R. W. (1980). Translation and content analysis of oral and written materials. In H. C.

Triandis & J. W. Berry (Eds.), *Handbook of cross-cultural psychology* (Vol. 2, pp. 389-444). Boston, MA: Allyn and Bacon.

Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical linear models: Applications and data*

*analysis methods*. Newbury Park, CA: Sage.

Burgelman, R. A. (1983). A process model of internal corporate venturing in the diversified

major firm. *Administrative Science Quarterly*, 28, 223-244.

Bycio, P., Hackett, R. D., & Allen, J. S. (1995). Further assessments of Bass's (1985)

conceptualization of transactional and transformational leadership. *Journal of Applied Psychology*, 80, 468-478.

Chakrabarti, A. K., & Hauschild, J. (1989). The division of labor in innovation management.

*R&D Management*. 19, 161-171.

Cole, M. S., Bruch, H., & Shamir, B. (2009). Social distance as a moderator of the effects of

transformational leadership: Both neutralizer and enhancer. *Human Relations*, 62, 1697-1733

Conger, J. A., & Kanungo, R. N. (1998). *Charismatic leadership in organizations*, Thousand

Oaks, CA: Sage

Cooper, R. B., & Zmud, R. W. (1990). Information technology implementation research: a

technological diffusion approach. *Management Science*, 36, 123-139.

Csikszentmihalyi, M. (1997). *Creativity: Flow and the psychology of discovery and invention*,

New York: Harper Collins

- Cummings, L. L. (1965). Organizational climate for creativity. *Academy of Management Journal*, 3, 220-227.
- Daft, R. L. (1978). A dual-core model of organizational innovation. *Academy of Management Journal*, 21, 193-210.
- Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34, 555-590.
- Davenport, T. H. (2001). Knowledge work and the future of management. In W. G. Bennis, G. M. Spreitzer, & T. G. Cummings (Eds.), *The future of leadership: Today's top leadership thinkers speak to tomorrow's leaders* (pp. 41-58). Jossey-Bass, San Francisco.
- Davila, T., Epstein, M. J., & Shelton, R. (2006). *Making Innovation Work: How to Manage it, Measure it, and Profit from it*. Pearson Education, Upper Saddle River, NJ.
- Deci, E., & Ryan, R. (1985). The support of autonomy and control of behavior. *Journal of Personality and Social Psychology*, 53, 1024-1037.
- Deci, E. L., Connell, J. P., & Ryan, R. M. (1989). Self-determination in a work organization. *Journal of Applied Psychology*, 74, 580-590.
- De Jong, J. P. J., & Den Hartog, D. N. (2007). How leaders influence employees' innovative behaviour. *European Journal of Innovation Management*, 10, 41-64.
- De Jong, J. P. J., & Den Hartog, D. N. (2010). Measuring Innovative Work Behaviour. *Creativity and Innovation Management*, 19, 23-36.
- Deschamps, J. (2005). Different leadership skills for different innovation strategies. *Strategy & Leadership*, 33, 31-38.
- Deschamps, J. (2008). *Innovation-oriented leaders*. Jossey-Bass.
- Dess, G. G., & Picken, J. C. (2000). Leadership in the 21st Century. *Organizational Dynamics*,

28, 18-24.

- Dionne, S. D., Yammarino, F. J., Howell, J. P., & Villa, J. (2005). Substitutes for leadership, or not. *Leadership Quarterly, 16*, 169-193.
- Dougherty, D. (1992). Interpretive barriers to successful product innovation in large firms. *Organization Science, 3*, 179-202.
- Dunham, L., & Freeman, R. E. (2000). There is Business Like Show Business: Leadership Lessons from the Theater. *Organization Dynamic, 29*, 108-122.
- Dunphy, D., & Stace, D. (1993). The strategic management of corporate change. *Human Relations, 46*, 905-920.
- Edmondson, A. C. (1999). Psychological safety and learning behavior in work teams. *Administrative Science Quarterly, 44*, 350-383.
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review, 14*, 532-550.
- Ekvall, G., & Ryhammer, L. (1999). The creative climate: its determinants and effects at a Swedish University. *Creativity Research Journal, 12*, 303-310.
- Enson, J., Cottam, A., & Band, C. (2001). Fostering knowledge management through the creative work environment: a portable model from the advertising industry. *Journal of Information Science, 27*, 147-155.
- Erez, M., & Arad, R. (1986). Participative goal-setting: Social, motivational, and cognitive factors. *Journal of Applied Psychology, 71*, 591-597.
- Evans, M. G. (1985). A Monte Carlo study of the effects of correlated method variance in moderated regression analysis. *Organizational Behavior and Human Decision Processes, 36*, 305-323.
- Farh, J. L., Lee, C., & Farh, C. C. I. (2010). Task Conflict and Team Creativity: A Question of How Much and When. *Journal of Applied Psychology, 95*, 1173-1180.

- Farris, G. F. (1969). Organizational factors and individual performance: a longitudinal study. *Journal of Applied Psychology, 53*, 87-93.
- Ferketich, S. (1991). Focus on psychometrics. Aspects of item analysis. *Research in Nursing and Health, 14*, 165-168.
- Flanagan, J. C. (1954). The Critical Incident Technique. *Psychological Bulletin, 51*, 327-359.
- French, J., & Raven, B. (1959). The basis of social power. In D. Cartwright (Ed.), *Studies in social power* (pp. 150-167). Ann Arbor University of Michigan, Institute for Social Research.
- Frese, M., Fay, D., Hilburger, T., Leng, K., & Tag, A (1997). The concept of personal initiative: Operationalization, reliability and validity in two German samples *Journal of Occupational and Organizational Psychology, 70*, 139-161.
- Frese, M., Kring, W., Soose, A., & Zempel, J. (1996). Personal initiative at work: differences between East and West Germany. *Academy of Management Journal, 39*, 37-63.
- Frese, M., & Sabini, J. (Eds.) (1985). *Goal-directed Behavior: The Concept of Action in Psychology*. Hillsdale, NJ: Erlbaum.
- Frese, M., & Zapf, D. (1994). Action as the core of work psychology: A German approach. In H. C. Triandis, M. D. Dunnette & J. M. Hough (Eds.), *Handbook of Industrial and Organizational Psychology* (vol. 4, 2nd ed., pp. 271-340). Palo Alto, CA: Consulting Psychologists Press.
- Frost, P. J., & Egri, C. P. (1991). The political process of innovation. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (pp. 229-295). Greenwich, CT: JAI Press.
- Galbraith, J. R. (1982). Designing the innovating organization. *Organizational Dynamics, 10*, 5-25.
- Gallucci, N. T., Middleton, G., & Kline, A. (2000). Perfectionism and creative strivings.

*Journal of Creative Behaviour*, 34, 135-141.

Gardner, W. L., & Avolio, B. J. (1998). The charismatic relationship: A dramaturgical perspective. *Academy of Management Review*, 23, 32-58.

Gibson, C. B., & Vermeulen, F. (2003). A healthy divide: Subgroups as a stimulus for team learning. *Administrative Science Quarterly*, 48, 202-239.

Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New York: Aldine de Gruyter.

Gliem, J. A., & Gliem, R. R. (2003). Calculating, Interpreting, and Reporting Cronbach's Alpha Reliability Coefficient for Likert-Type Scales. In *Midwest Research to Practice Conference in Adult, Continuing, and Community Education*, The Ohio State University, Columbus, OH, (pp. 82-88).

Glynn, M. A. (1996). Innovative genius: A framework for relating individual and organizational intelligences to innovation. *Academy of Management Review*, 21, 1081-1111.

Goldenberg, J., Lehmann, D. R., & Mazursky, D. (2001). The idea itself and the circumstances of its emergence as predictors of product success. *Management Science*, 47, 69-84.

Gong, Y. P., Huang, J. C., & Farh, J. L. (2009). Employee learning orientation, transformational leadership, and employee creativity: The mediating role of employee creative self-efficacy. *Academy of Management Journal*, 52, 765-778.

Greenberg, E. (1992). Creativity, autonomy, and the evaluation of creative work: artistic workers in organizations. *Journal of Creative Behavior*, 26, 75-80.

Gronn, P. (1999). Substituting for leadership: The neglected role of the leadership couple. *Leadership Quarterly*, 10, 41-62.

Gumusluoglu, L., & Ilsev, A. (2009). Transformational leadership, creativity, and organizational innovation. *Journal of Business Research*, 62, 461-473.

- Hacker, W. (1985). Activity: A fruitful concept in industrial psychology. In M. Frese & J. Sabini (Eds.), *Goal Directed Behavior: The Concept of Action in Psychology* (pp. 262-284). Hillsdale, NJ/London: Erlbaum
- Hakanen, J. J., Perhoniemi, R., & Toppinen-Tanner, S. (2008). Positive gain spirals at work: From job resources to work engagement, personal initiative and work-unit innovativeness. *Journal of Vocational Behavior, 73*, 78-91.
- Hater, J. J., & Bass, B. M. (1988). Superiors' evaluations and subordinates' perceptions of transformational and transactional leadership. *Journal of Applied Psychology, 73*, 695-702.
- Hirokawa, R. Y. (1990). The role of communication in group decision making efficacy: A task contingency perspective. *Small Group Research, 21*, 190-204.
- Hirst, G., Van Knippenberg, D., & Zhou, J. (2009). A cross-level perspective on employee creativity: Goal orientation, team learning behavior, and individual creativity. *The Academy of Management Journal, 52*, 280-293.
- Hofmann, D. A. (1997). An overview of the logic and rationale of hierarchical linear models. *Journal of Management, 23*, 723-744.
- Hofmann, D. A., Griffin, M. A., & Gavin, M. B. (2000). The application of hierarchical linear modeling to organizational research. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations* (pp. 467-511). San Francisco: Jossey-Bass.
- Holman, D., Totterdell, P., Axtell, C., Stride, C., Port, R., Svensson, R., & Zibarras, L. (in press). Job Design and the Employee Innovation Process: The Mediating Role of Learning Strategies. *Journal of Business Psychology*.
- House, R. J., Spangler, W. D., & Woycke, J. (1991). Personality and Charisma in the U.S. Presidency: A Psychological Theory of Leadership Effectiveness. *Administrative Science*



*Quarterly*, 36, 364-396.

Howell, J. M., & Boise, K. (2004). Champions of technological innovation: The influence of contextual knowledge, role orientation, idea generation, and idea promotion on champion emergence. *Leadership Quarterly*, 15, 123-143.

Howell, J. P., Dorfman, P. W., & Kerr, J. (1986). Moderator Variables in Leadership Research. *The Academy of Management Review*, 11, 88-102.

Howell, J. M., & Higgins, C. A. (1990). Champions of Technological Innovation. *Administrative Science Quarterly*, 35, 317-341.

Howell, J. M., & Shea, C. M. (2001). Individual differences, environmental scanning, innovation framing, and champion behavior: key predictors of project performance. *Journal of Product Innovation Management*, 1, 15-27.

Howell, J. M., Shea, C. M., & Higgins, C. A. (2005). Champions of product innovations: defining, developing, and validating a measure of champion behavior. *Journal of Business Venturing*, 20, 641-661.

Howell, J. P., & Costley, D. L. (2001). *Understanding behaviors for effective leadership*. Upper Saddle River, Prentice-Hall.

Isaksen, S. G. (1983). Toward a model for the facilitation of creative problem solving. *Journal of Creative Behavior*, 17, 18-31.

James, L. R., Demaree, R. G., & Wolf, G. (1984). Estimating withingroup interrater reliability with and without response bias. *Journal of Applied Psychology*, 69, 85-98.

Janis, I., & Mann, L. (1977). *Decision making: A psychological analysis of conflict, choice, and commitment*. New York: Free Press.

Janssen, O. (2000). Job demands, perceptions of effort-reward fairness and innovative work behaviour. *Journal of Occupational and Organizational Psychology*, 73, 287-302.

Janssen, O. (2001). Fairness perceptions as a moderator in the curvilinear relationships

between job demands, and job performance and job satisfaction. *Journal of Academy of Management*, 44, 1039-1050.

Janssen, O. (2002). Transformational leadership and innovative employee behaviour: A matter of approachability of the leader. *Gedrag en Organisatie*, 15, 275-293.

Janssen, O., & Huang, X. (2008). "Us and Me": Team identification and individual differentiation as complementary drivers of team members' citizenship and creative behavior. *Journal of Management*, 34, 69-88.

Jaussi, K. S., & Dionne, S. D. (2003). Leading for creativity: The role of unconventional leader behavior. *Leadership Quarterly*, 14, 475-498.

Jehn, K. E., Northcraft, G. B., & Neale, M. A. (1999). Why differences make a difference: A field study of diversity, conflict, and performance in work groups. *Administrative Science Quarterly*, 44, 741-763.

Jung, D. I., Chow, C., & Wu, A. (2003). The role of transformational leadership in enhancing organizational innovation: hypotheses and some preliminary findings. *Leadership Quarterly*, 14, 525-544.

Kahai, S. S., Sosik, J. J., & Avolio, B. J. (2003). Effects of leadership style, anonymity, and rewards on creativity-relevant processes and outcomes in an electronic meeting system context. *Leadership Quarterly*, 14, 499-524.

Kanter, R. M. (1983). *The change masters*. New York: Simon & Schuster.

Kanter, R. M. (1988). When a thousand flowers bloom: Structural, collective, and social conditions for innovation in organization. *Research in Organizational Behavior*, 10, 169-211.

Kasperson, C. J. (1978). Psychology of the scientist: XXXVII. Scientific creativity: A relationship with information channels. *Psychological Reports*, 42, 691-694.

Kerr, S., & Jermier, T. M. (1978). Substitutes for leadership: their meaning and measurement.

*Organizational Behavior and Human Performance*, 22, 375-403.

- Kidder, T. (1981). *The sole of a new machine*. New York: Avon.
- Kimberly, J. R., & Evanisko, M. J. (1981). Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal*, 24, 689-713.
- Knapp, T. R., & Brown, J. K. (1995). Ten measurement commandments that often should be broken. *Research in Nursing and Health*, 18, 465-469.
- Kotter, J. P. (1990). *A Force for Change: How Leadership Differs from Management*. The Free Press, New York, NY.
- Krause, D. E. (2004). Influence-based leadership as a determinant of the inclination to innovate and of innovation-related behaviors: An empirical investigation, *Leadership Quarterly*, 15, 79-102.
- Krause, D. E., & Klöhn, C. (2002). Führung in Innovationsprozessen als Balance zwischen Vertrauen und Machteinsatz (Leadership in innovative processes: A balance between trust and power). *Wirtschaftspsychologie*, 9, 71-79.
- Landy, F. J., & Farr, J. L. (1980). Performance rating. *Psychological Bulletin*, 87, 72-107.
- Liao, H., Liu, D., & Loi, R. (2010). Looking at both sides of the social exchange coin: A Social cognitive perspective on the joint effects of relationship quality and differentiation on creativity. *Academy of Management Journal*, 53, 1090-1109.
- Liao, H., & Rupp, D. E. (2005). The Impact of Justice Climate and Justice Orientation on Work Outcomes: A Cross-Level Multifoci Framework. *Journal of Applied Psychology*, 90, 242-256.
- Luecke, R., & Katz, R. (2003). *Harvard Business Essentials: Managing Creativity and Innovation*. Boston, MA: Harvard Business School Press.
- Madjar, N., Oldham, G. R., & Pratt, M. G. (2002). There's no place like home? The

contributions of work and non-work creativity support to employees' creative performance. *Academy of Management Journal*, 45, 757-767.

Maier, N. R. F., & Solem, A. R. (1962). Improving solutions by turning choice situations into problems. *Personnel Psychology*, 15, 151-157.

Marsh, H. W., & Hocevar, D. (1985) Application of confirmatory factor analysis to the study of self-concept: First- and higher order factor models and their invariance across groups. *Psychological Bulletin*, 97, 562-582.

McGourty, J., Tarshis, L. A., & Dominick, P. (1996). Managing innovation: lessons from world class organizations. *International Journal of Technology Management*, 11, 354-368.

Michaelis, B., Stegmaier, R. & Sonntag, K. (2010). Shedding light on followers' innovation implementation behavior. The role of transformational leadership, commitment to change, and climate for initiative. *Journal of Managerial Psychology*, 25, 408-429.

Miller, G. A., Galanter, E., & Pribram, K. H. (1960). *Plans and the structure of behavior*. New York: Henry Holt.

Miron, E., Erez, M., & Naveh, E. (2004). Do personal characteristics and cultural values that promote innovation, quality, and efficiency compete or complement each other? *Journal of Organizational Behavior*, 25, 175-199.

Morrison, E. W., & Phelps, C. C. (1999). Taking charge at work: Extrarole efforts to initiate workplace change. *Academy of Management Journal*, 42, 403-419.

Mumford, M. D. (2000). Managing creative people: Strategies and tactics for innovation. *Human Resources Management Review*, 10, 313-351.

Mumford, M. D. (2003). Where Have We Been, Where Are We Going? Taking Stock in Creativity Research. *Creativity Research Journal*, 15, 107-120

Mumford, M. D., & Gustafson, S. B. (1988). Creativity syndrome: Integration, application and

- innovation. *Psychological Bulletin*, 103, 27- 43.
- Mumford, M. D., Hunter, S. T., Eubanks, D. L., Bedell, K. E., & Murphy, S. T. (2007). Developing leaders for creative efforts: A domain-based approach to leadership development. *Human Resource Management Review*, 17, 402-417.
- Mumford, M. D., & Licuanan, B. (2004). Leading for innovation: Conclusions, issues, and directions. *Leadership Quarterly*, 15, 163-171.
- Mumford, M. D., Scott, G. M., Gaddis, B., & Strange, J. M. (2002). Leading creative people: Orchestrating expertise and relationships. *Leadership Quarterly*, 13, 705-750.
- Nijstad, B. A., & De Dreu, C. K. W. (2002). Creativity and group innovation. *Applied Psychology: An International Review*, 51, 401-407.
- Nisbett, R. E., & Wilson, T. (1977). The Halo Effect: Evidence for Unconscious Alteration of Judgments. *Journal of Personality and Social Psychology*, 35, 250-256.
- Nohari, K., & Gulatti, S. (1996). Is slack good or bad for innovation. *Academy of Management Journal*, 39, 799-825.
- Oldham, G. R., & Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. *Academy of Management Journal*, 39, 607-634.
- Paulus, P. B., & Yang, H. C. (2000). Idea generation in groups: A basis for creativity in organizations. *Organizational Behavior and Human Decision Processes*, 82, 76-87.
- Pelz, D. C., & Andrews, F. M. (1966). Autonomy, coordination, and simulation in relation to scientific achievement. *Behavioral Science*, 12, 89-97.
- Pelz, D. C., & Andrews, F. M. (1976). *Scientists in organizations*. Ann Arbor, MI: Institute for Social Research.
- Perry-Smith, J. E., & Shalley, C. E. (2003). The Social Side of Creativity: A Static and Dynamic Social Network Perspective. *Academy of Management Review*, 28, 89-106.
- Pieterse, A. N., Van Knippenberg, D., Schippers, M., & Stam, D. (2010). Transformational and

transactional leadership and innovative behavior: The moderating role of psychological Empowerment. *Journal of Organizational Behavior*, 31, 609-623.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich & M. Zeinder (Eds.), *The handbook of self regulation* (pp. 451–502). San Diego: Academic Press.

Podsakoff, P. M., MacKenzie, S. B., & Bommer, W. (1996). Transformational leader behaviors and substitutes for leadership as determinants of employee satisfaction, commitment, trust, and organizational citizenship behaviors. *Journal of Management*, 22, 259-298.

Podsakoff, P. M., MacKenzie, S. B., & Fetter, R. (1993). Substitutes for leadership and the management of professionals. *Leadership Quarterly*, 4, 1-44.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879-903.

Podsakoff, P. M., MacKenzie, S. B., Moorman, R. H., & Fetter, R. (1990). Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors. *Leadership Quarterly*, 1, 107-142.

Raven, B. H. (1990). Political applications of the psychology of interpersonal influence and social power. *Political Psychology*, 11, 493-520.

Raven, B. H. (1992). A power/interaction model of interpersonal influence: Franch and Raven thirty years later. *Journal of Social Behavior and Personality*, 7, 217-244.

Raven, B. H., Schwarzwald, J., & Koslowsky, M. (1998). Conceptualizing and measuring a power/interaction model of interpersonal influence. *Journal of Applied Social Psychology*, 28, 307-332.

Redmond, M. R., Mumford, M. D., & Teach, R. (1993). Putting Creativity to Work: Effects of Leader Behavior on Subordinate Creativity. *Organizational Behavior and Human*

*Decision Processes*, 55, 120-151.

Richard, D., & Engle, S. (1986). After the vision: Suggestions to corporate visionaries and vision champions. In J. D. Adams (Ed.), *Transforming leadership* (pp. 199-215). Alexandria, VA: Miles River Press.

Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. (2006). Productivity is not enough: A comparison of interactive and nominal brainstorming groups on idea generation and selection. *Journal of Experimental Social Psychology*, 42, 244-251.

Roberts, E. B., & Fusfeld, A. R. (1981). Staffing the innovative technology-based organization. *Sloan Management Review*, 22, 19-34.

Roberts, E. B., & Fusfeld, A. R. (1988). Critical functions: needed roles in the innovation process. In Katz, R. (Ed.), *Managing Professionals in Innovative Organizations* (pp. 101-120). New York: Harper Collins.

Rogers, E. M. (1983). *Diffusion of innovations* (3rd ed.). New York: The Free Press.

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York: The Free Press.

Rosenthal, T. L., & Zimmerman, B. J. (1978). *Social learning and cognition*. New York: Academic Press.

Runco, M. A., & Chand, I. (1994). Problem finding, evaluative thinking, and creativity. In M. A. Runco (Ed.), *Problem finding, problem solving, and creativity* (pp. 40-76). Norwood, NJ: Ablex.

Sarin, S., & McDermott, C. (2003). The Effect of Team Leader Characteristics on Learning, Knowledge Application, and Performance of Cross-Functional New Product Development Teams. *Decision Sciences*, 34, 707-739.

Schneider, B., White, S. S., & Paul, M. C. (1998). Linking service climate and customer perceptions of service quality: Tests of a causal model. *Journal of Applied Psychology*, 83, 150-163.

- Schön, D. A. (1963). Champions for radical new inventions. *Harvard Business Review*, 41, 77-86.
- Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior: A path model of individual innovation in the work place. *Academy of management Journal*, 37, 580-607.
- Shalley, C. E., & Gilson, L. L. (2004). What leaders need to know: a review of social and contextual factors that can foster or hinder creativity. *Leadership Quarterly*, 15, 33-53.
- Shalley, C. E., Zhou, J. & Oldham, G. R. (2004). The Effects of Personal and Contextual Characteristics on Creativity: Where Should We Go from Here? *Journal of Management*, 30, 933-958.
- Shamir, B., House, R. J., & Arthur, M. B. (1993). The Motivational Effects of Charismatic Leadership: A Self-Concept Based Theory. *Organization Science*, 4, 577-594.
- Sharma, R., & Yetton, P. (2003). The Contingent Effects of Management Support and Task Interdependence on Successful Information Systems Implementation. *MIS Quarterly*, 27, 533-556.
- Shin, S. J., & Zhou, J. (2003). Transformational leadership, conservation and creativity: evidence from Korea. *Academy of Management Journal*, 46, 703-714.
- Sosik, J. J. (1997). Effects of transformational leadership and anonymity on idea generation in computer-mediated groups. *Group and Organization Management*, 22, 460-487.
- Sosik, J. J., Avolio, B. J., & Kahai, S. S. (1997). Effects of leadership style and anonymity on group potency and effectiveness in a group decision support system environment. *Journal of Applied Psychology*, 82, 89-103.
- Sosik, J. J., Kahai, S. S., & Avolio, B. J. (1998). Transformational leadership and dimensions of creativity: Motivating idea generation in computer mediated groups. *Creativity Research Journal*, 11, 111-121.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for*



*developing grounded theory*. Thousand Oaks, CA: Sage.

Taggar, S. (2001). Group composition, creative synergy, and group performance. *Journal of Creative Behavior*, 35, 261-282.

Tierney, P. (2008). Leadership and employee creativity. In J. Zhou & C. E. Shalley (Eds.), *Handbook of organizational creativity* (pp. 95-123). New York: Taylor and Francis.

Tierney, P., Farmer, S. M., & Graen, G. B. (1999). An examination of leadership and employee creativity: The relevance of traits and relationships. *Personnel Psychology*, 52, 591-620.

Tierney, P., & Farmer, S. M. (2002). Creative self-efficacy: Its potential antecedents and relationship to creative performance. *Academy of Management Journal*, 45, 1137-1148.

Trevelyan, R. (2001). The Paradox of Autonomy: A Case of Academic Research Scientists. *Human Relations*, 54, 495-525.

Tse, H. & Chiu, C.K., (forthcoming). Transformational leadership and job Performance: A social identity perspective. *Journal of Business Research*.

Van Der Vegt, G. S., & Bunderson, J. S. (2005). Learning and Performance in Multidisciplinary Teams: The Importance of Collective Team Identification. *Academy of Management Journal*, 48, 532-547.

Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management Sciences*, 32, 590-607.

Van de Ven, A. H. (1993). Managing the Process of Organizational Innovation. In P. G. Huber & W. H. Glick (Eds.), *Organizational change and redesign: ideas and insights for improving performance* (pp. 269-294). New York: Oxford University Press.

Van de Ven, A. H., Angle, H. L., & Poole, M. (Eds.). (1989). *Research on the management of innovation: The Minnesota studies*. New York: Harper & Row.

Villa, J. R., Howell, J. P., Dorfman, P. W. & Daniel, D. L. (2003). Problems with detecting moderators in leadership research using moderated multiple regression. *Leadership*

*Quarterly*, 14, 3-23.

- Waldman, D. A., & Bass, B. M. (1991). Transformational leadership at different phases of the innovation process. *The Journal of High Technology Management Research*, 2, 169-180.
- Wall, T. D., Jackson, P. R., & Davids, K. (1992). Operator work design and robotics system performance: A serendipitous field study. *Journal of Applied Psychology*, 77, 353-362.
- Wang, P., & Rode, J. C. (2010). Transformational leadership and follower creativity: The moderating effects. *Human Relations*, 63, 1105-1128.
- West, M. A. (1989). Innovation amongst health care professionals. *Social Behaviour*, 4, 173-184.
- West, M. A. (2002). An Integrative Model of Creativity and Innovation Implementation in Work Groups. *Applied Psychology: An international review*, 51, 355-387.
- West, M. A., & Farr, J. L. (1989). Innovation at work: Psychological perspectives. *Social Behaviour*, 4, 15-30.
- Williams, K. Y., & O'Reilly, C. A. (1998). Demography and Diversity in Organizations: A Review of 40 Years of Research. *Research in organizational behavior*, 20, 77-140.
- Woodman, R. W., Sawyer, J. E., & Griffin, R. W. (1993). Toward a Theory of Organizational Creativity. *The Academy of Management Review*, 18, 293-321.
- Yukl, G. (1999). An evaluation essay on current conceptions of effective leadership. *European Journal of Work and Organizational Psychology*, 8, 33-48.
- Yukl, G. (2002). *Leadership in organizations* (5th ed.). New Jersey: Prentice-Hall.
- Zaltman, G., Duncan, R., & Holbek, J. (1973). *Innovations and Organizations*, New York: Wiley.
- Zhang, X. M., & Bartol, K. M. (2010). Linking Empowering Leadership and Employee Creativity: The Influence of Psychological Empowerment, Intrinsic Motivation, and Creative Process Engagement. *Academy of Management Journal*, 53, 107-128.

Zhou, J. (2003). When the Presence of Creative Coworkers Is Related to Creativity: Role of Supervisor Close Monitoring, Developmental Feedback, and Creative Personality. *Journal of Applied Psychology, 88*, 413-422.