

The impact of entrepreneurial leadership on innovation management and its measurement validation

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Abstract

Purpose – This paper aims to validate the measurement of entrepreneurial leadership (EL) in the context of innovation management and strategic entrepreneurship, and to examine the relationship between EL and the innovation process (IP). It proposes the measurement of EL and outlines the reason and the importance of EL in the IP. The study further examines whether the IP would have direct impact on innovation performance.

Design/methodology/approach – The paper opted for an explanatory and confirmatory study using a quantitative approach employing an online survey/questionnaire distributed to two groups of employees representing middle and senior management having mixed background such as finance, marketing, operations and management. The first group consists of 222 respondents spread across multiple industries, and the second group consists of 60 respondents mainly from the financial services industry to validate the measurement of the EL construct.

Findings – The paper provides empirical insights into the validation of EL measurement through two samples, and on the impact of EL in fostering all elements in the IP (i.e. idea generation, idea selection and development or idea conversion and idea diffusion). The paper also confirms some of the literature views on the difficulty of identifying a significant relationship between the IP and innovation performance. It suggests counterintuitively that the IP may not necessarily have a positive relationship with innovation performance.

Research limitations/implications – Most of the respondents were those from the financial services industry, which may have an impact on the overall model but less on the validation of the EL measurement. The research affirms the theoretical concept of the dimensions of EL and validates its measurement. The research also shows intriguing findings on the missing link between the IP and innovation performance. Therefore, researchers are encouraged to identify variables or factors that should link the influence of the IP on innovation performance so that the contribution of innovation management to competitiveness can be clearly identified.

Practical implications – The research validates the measurement of the EL construct, which could be used as a screening tool in measuring the EL capacity at all levels within an organization as part of its leadership development in fostering its IP.

Originality/value – This paper fulfills an identified need to have a validated measurement of EL and its relationship with the IP.

Keywords Innovation performance, Innovation management, Innovation process, Entrepreneurial leadership

Paper type Research paper



Introduction

Leadership is becoming increasingly important as a capability that encourages teams to engage in collective creativity toward the best possible outcome. Moreover, leadership plays an even more crucial role when the competitive landscape in the global business environment changes with increasing risks, decreasing ability to forecast, disappearing industry boundaries and emerging new business arenas across industries (Bettis and Hitt, 1995; Hitt and Reed, 2000). Such conditions require organizations to continuously explore and exploit opportunities to sustain their competitive advantage to ensure their wealth creation through organization learning, creativity and innovation (Ireland *et al.*, 2003; Torokoff, 2010). Organizations must embrace entrepreneurial behaviors and attitudes that foster adaptation and innovation (Renko *et al.*, 2013). Mintzberg and Waters (1982) characterized entrepreneurial strategy by its degree of deliberateness and clear vision with flexibility to allow such vision to change. Drucker (1985, 1993, p. 209) stated that each entrepreneurial strategy requires specific behavior on the part of the entrepreneur. He further defined entrepreneurship as the act of innovation involving endowing existing resources with new wealth-producing capacity (Drucker, 1985). Tidd (2014) indicated that there is a strong linkage between entrepreneurship and innovation. Innovation is defined as the socially and economically successful introduction of a new technology or a new combination of existing technologies in converting or transforming input into output such that it creates a drastic or significant change in the use value and monetary value (price) relationship based on the perception of consumers and/or users (Fontana, 2009, 2010, 2011). Stevenson and Jarillo (1990) defined entrepreneurship as a process by which individuals or teams in the organization pursue opportunities without regard to the resources they currently control to create wealth. Entrepreneurship is a context-dependent social process through which individuals and teams create wealth by bringing together unique packages of resources to exploit marketplace opportunities (Ireland *et al.*, 2003) under the direction of leadership. Cogliser and Brigham (2004) further indicated that there are intersections between entrepreneurship and leadership. Vecchio (2003) viewed entrepreneurship as a type of leadership that occurs in a specific setting with the emphasis on opportunities seeking to create wealth. Entrepreneurial leadership (EL) thus is a unique leadership style that focuses on making heterogeneous talents work in an organization more creatively and innovatively in collective processes to respond to an uncertain business environment (innovation process [IP]) and to create coherent strategies and novel outcomes (innovation performance). Hence, organizations need to be able to measure and thus manage their EL consistently.

This study aims to validate the EL measurement based on the conceptual EL dimensions developed by Musa and Fontana (2014) taking into consideration the characteristics of EL identified by Covin and Slevin (2002), Kuratko (2007) and Gupta *et al.* (2004). Next, the study examines the relationship between EL and IP, and the relationship between the IP and innovation performance. Figure 1(a) shows the research conceptual model on EL, IP and innovation performance.

Theory development and hypotheses

Entrepreneurial leadership

EL exists at the fusion of entrepreneurship (Schumpeter, 1934), entrepreneurial orientation (Covin and Slevin, 1988; Miller, 1983), entrepreneurial management (Stevenson, 1985) and leadership concepts (Musa and Fontana, 2014). EL could be defined as the process of influencing organizations through leading and direct involvement in creating value for stakeholders by bringing together a unique innovation and package of resources to respond to a recognized opportunity (Darling *et al.*, 2007). EL involves breaking new ground beyond

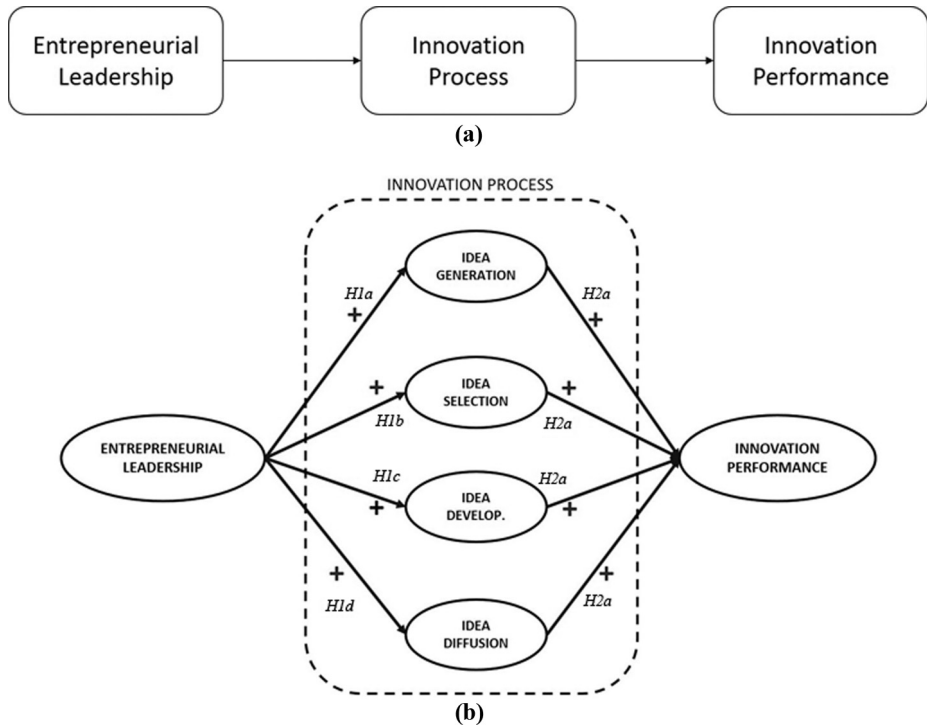


Figure 1.
(a) Research model on entrepreneurial leadership, innovation process and innovation performance; (b) entrepreneurial leadership, innovation process and innovation performance

the unknown to create the future by transforming its current transaction sets into entrepreneurial actions. [Gupta et al. \(2004\)](#) indicated that EL creates visionary scenarios to assemble and mobilize a supporting cast of participants who become committed by the vision of the discovery and exploitation of strategic value creation. Further, the study of [Kuratko and Hornsby \(1996\)](#) indicates that EL must be able to make strategic plans for the future to maintain organizations' goal achievement.

From a strategic leadership perspective, EL is a leadership style that provides strategic thinking to the organization. [Rowe \(2001, pp. 81-82\)](#) defined strategic leadership as “the ability to influence others to voluntarily make day-to-day decisions that enhance the longterm viability of the organization while at the same time maintaining its short-term financial stability”. Strategic thinking is a planning process aimed at creating strategy that is coherent, unifying, explicit and proactive, with an integrative framework for decision-making; defining the competitive domain for corporate strategic advantages over its rivals ([Baloch and Inam, 2007](#)); and defining the competitive domain to sustain competitive advantage over its rivals. [Mintzberg \(1994\)](#) indicated that strategic thinking emphasizes synthesis in applying intuition and creativity to create “an integrated perspective of the enterprise”. Moreover, [Liedtka \(1998\)](#) defined strategic thinking as a particular way of thinking, with specific attributes that address:

- systems perspective referring to the ability to recognize the “big picture”, the economic intuition in business decision-making and the ability to establish an information system for exploring environmental changes occurring within an organization;

- “intent-focused” to assign a vision for all levels within the organization, the ability to illustrate future events and the ability to deal with threats through innovativeness;
- intelligent opportunism showing the flexibility in making decisions and the willingness to invest in risky projects; and
- “thinking in time” to predict future problems and crises based on past experience and present action plans.

Thus, EL is about influencing others toward a goal through effective communication to recognize opportunity and share a vision about future possibilities that organizations could exploit to sustain competitiveness. EL must also have the capability to motivate people to continuously recognize and act on opportunities, to be creative and to be agile in adapting to change. Further, EL also possesses the ability to do resource orchestration effectively by understanding resource allocations and organizational discipline to link entrepreneurship to strategic management.

Musa and Fontana (2014) have defined the EL dimensions as follows:

- *Strategic dimension* deals with the ability to determine the organization system in a comprehensive manner taking into account its resources, people and strategy, as well as the business model that an organization adopts. The strategic dimension also addresses strategic thinking that EL must have to ensure the vision of future possibilities that is shared, so that the organization will have a sense of direction, destiny and discovery. Furthermore, the strategic dimension injects flexibility in making decisions and a willingness to face ambiguity. The ability to “think in time” by understanding the gap between the current reality and future possibilities would improve the quality of decision-making and the speed of implementation. Last but not least, strategic dimension deals with the capacity to develop good hypotheses and to test them efficiently in the context of a complex and changing business environment.
- *Communicative dimension* deals with how such vision of future possibilities is shared throughout the organization. It deals with the ability to persuade members of the organization, to manage conflicts and to foster knowledge management by understanding emotions in social interactions (Subramanian and Nilakanta, 1996; Szulanski, 1996). Communication is important for effective EL, which it first deals with influencing others toward a goal (Cogliser and Brigham, 2004) through persuasion for both upward, lateral and downward influence (Yukl and Falbe, 1990). Second, EL shares vision of future possibilities enabling an organization to transform its current transaction sets through adaptation, and leading, through direct involvement, a process of value creation for its stakeholders employing innovation to achieve competitive advantage, and a package of resources to respond to recognized opportunity.
- *Motivational dimension* deals with human action within the organization that affects both motivation and cognition of people in the organization. Shane *et al.* (2001) indicated that human motivation plays a critical role in the entrepreneurial process. It addresses the ability to motivate people in the organization, to understand the needs of the organization, to maintain an entrepreneurial spirit in people within the organization and to have the self-confidence to influence others. Gupta *et al.* (2004) stated that EL is all about managing and instituting transformational and social enactment through positive motivation.
- *Personal and/or organizational dimension* addresses factors relating to creativity, stability, proper resource allocation (job fit) and discipline. *Creativity* deals with the

creative skills to organize the needed resources and enact the role of framing the challenge. *Stability* refers to emotional stability at the individual level, passion and the commitment of the organization to entrepreneurial activities. *Proper resource allocations* refers to managing resources and maintaining dynamic capabilities to enhance knowledge management within the organization, which in turn could support efforts to recognize opportunities, while *organizational discipline* deals with building a bridge that links entrepreneurship and strategic management.

EL through its dimensions makes an organization work more creatively and innovatively in collective processes to maintain the organization's agility and adaptability by encouraging idea generation, idea selection, idea development and idea diffusion, which is often referred to as innovation management or IP.

Innovation management/Innovation process

Innovation management is an increasingly covered topic in strategic management research and literature driven by the realization that innovation is a key factor in the survival of an organization. Furthermore, innovation management is often referred to as an organization's capability to renew itself to enhance value for their stakeholders through the creation of new or modified ideas or the creation of a drastic change in the relationship between a stakeholder's perceived value relative to the price or monetary value being sacrificed to obtain the stakeholder perceived value, which is generally called the consumer perceived value (Fontana, 2009; O'Sullivan and Dooley, 2009). Furthermore, innovation management enhances an organization's capacity to create new business models innovation which could lead to the creation of new industries (Teece, 2010). Adams *et al.* (2006) also indicated that a competitive success is dependent upon an organization's management of IP. Hansen and Birkinshaw (2007) define innovation management or IP as an active and conscious process of an organization's control, and execution of activities that lead to innovation. Furthermore, they view IP as a sequential, three-phase process that involves idea generation, idea conversion and the diffusion of developed concepts. Within this three-phase process, an organization needs to perform internal sourcing, cross-unit sourcing and external sourcing, as well as the selection, development and company-wide spread of ideas. Kotsemir and Meissner (2013) suggested that the IP consists of three major steps, namely, idea of something new (product, service or process), development of something new and commercialization (diffusion) of something new. In contrast, Adams *et al.* (2006) presented an IP framework that consists of seven categories: inputs management, knowledge management, innovation strategy, organizational culture and structure, portfolio management, project management and commercialization. These IP frameworks are similar. Combining these IP frameworks, this study views IP as a four-phase process that involves idea generation, idea selection, idea development and idea diffusion.

Idea generation deals with the process of generating ideas for new products (goods and/or services, in general). Ideas are the raw materials for innovation, and they can have significant impact on the success or failure of innovation management. It deals with inputs in an organization such as slack resources, which are regarded as an important catalyst for innovation (Adams *et al.*, 2006); knowledge management within an organization, which involves sourcing information through internal cross-collaboration and external sourcing; and organizational structure and culture, which encourage information flow and foster creativity. Motivation becomes important in this IP phase to ensure that people in an organization are engaged.

Idea selection deals with the screening of those new concepts based on an organization strategic orientation and taking into account the organization's resource allocation

conditions and objectives. It involves strategy and portfolio management to select the best new idea for the organization. Portfolio management focuses on making strategic, technological and resource choices that govern project selection and the future shape of the organization (Cooper *et al.*, 1999). A clear vision, resource allocation and long-term commitment to innovation are crucial in idea selection.

Idea development deals with converting ideas into viable products based on known best practices. It involves strong project management that supports the processes required to turn inputs into a marketable innovation. Internal and external communications are important in project management.

Idea diffusion deals with delivering new innovation products to end customers. Zaltman *et al.* (1973) refer to this IP phase as a commercialization of innovation. Commercialization is concerned with making an innovative process or product into a commercial success. It involves marketing, selling, distributing and creating joint ventures.

Thus, diffusion stage is one of the fundamental aspects of the process of growth and transformation of the economics of an organization with respect to innovation (Silverberg *et al.*, 1988).

At this phase of the IP, strategy execution, “thinking in time” communication and organizational discipline are important factors to ensure successful execution of idea-diffusion.

The goal of innovation management/IP is to ensure that an organization is able to continuously provide new innovation products and services to end customers, as well as business model innovation to maintain the organization’s competitiveness by having a sustained innovation performance.

Innovation performance

There are different ways to measure innovation performance (P) at the organizational level. Tidd (2001) indicated that some people often use indicators that are available in the public domain, such as R&D expenditure, number of patents and new product announcements, to measure innovation performance, while others use survey instruments to capture a broader range of indicators, such as the ratio of research personnel to the total number of people in an organization and the ratio of sales or profits to new products or services launched. Moreover, innovation performance can also be measured based on perceptual measures through survey instruments that cover different aspects of an innovation system.

Based on the definition of innovation in De Meyer and Garg (2005) that has been further developed to cover not only economic performance but also social performance (Fontana, 2009), Fontana in Aryanto *et al.* (2015) described and examined innovation performance measurement based on the following dimensions:

- *Internal aspect of innovation performance (internal performance)* measures the perceptual organizational innovativeness before, during and after an IP. This dimension measures the contribution of internal tangible and intangible resources (such as climate, culture and resources) to innovation performance. It basically shows that an organization has been successful in fostering innovativeness, knowledge management and a climate for generating new ideas, selecting, developing and diffusing products resulting from the process of innovation.
- *Technical performance* refers to the organizational ability to realize creative and innovative ideas into real products, goods and/or services. This dimension shows the capacity of an organization to manage the ideation, the selection and the development process of innovative products. The technical performance of innovation is an invention performance, that is a part of an innovation-process performance. At a

minimum, the product has been in the prototype stage at the time of the measurement. Technical performance can be viewed as measuring development process effectiveness, or the effectiveness of the IP.

- *Commercial performance* refers to the organizational ability in diffusing or distributing the innovative products in the market. It basically indicates that the IP has produced goods and/or services that can be sold to the market. Commercially successful products do not necessarily mean successful economically. In this sense, the economic performance, in terms of profit, must be measured, as it is a proxy of a successful commercialization of a product.
- *Social performance* refers to the positive impact that organizations create through their innovation input, process, and output not only to the pertinent stakeholders in particular but also to the community and society in general as part of their corporate social responsibility as well as their corporate-shared-values' actions toward the community and society at large. The attainment of a social performance assumes that organizations have at least fulfilled their obligations to their stakeholders. It is assumed here that social performance is attained before economic performance. Organizations measure their economic performance, after having distributed the value created to relevant stakeholders.
- *Economic performance* deals with the financial performance of an innovative output that has passed the commercialization phase in particular or the diffusion phase in general. Economic performance is measured by the organization's ability to create economic value added in terms of residual income or internal rates of returns that exceed the cost of capital. The economic performance of innovation must be measured after social performance.

This study refers to the premise of innovation-system performance (Fontana, 2010, 2011, 2016) that measures innovation in five performance dimensions representing the input, process, output and outcome aspects of the organization's innovation systems.

Research model

Figure 1(a) shows the overall research model of the study, while Figure 1(b) indicates the relationships between variables that are examined in the study. It is reasonable that EL's attributes, which are embedded in its dimensions, can have positive relationships with the IP. The strategic dimension of EL could certainly play an important role in the IP, specifically in idea selection and diffusion phases through its strategic thinking, and "thinking in time". The communicative dimension of EL could enhance the IP, particularly in the idea generation and development phases. The motivational dimension of EL could support the IP, particularly in the idea generation and diffusion phases. Last but not least, the personal/organizational dimension of EL could have a positive relationship with the IP, particularly during the idea generation and diffusion phases. Based on those premises, we make the following hypotheses:

H1a. EL has a positive relationship with idea generation.

H1b. EL has a positive relationship with idea selection.

H1c. EL has a positive relationship with idea development.

H1d. EL has a positive relationship with idea diffusion.

IP could have an impact on the organization's innovation performance (P) that consists of five dimensions discussed above. We make the following hypotheses:

H2a. Idea generation has a positive relationship with performance.

H2b. Idea selection has a positive relationship with performance.

H2c. Idea development has a positive relationship with performance.

H2d. Idea diffusion has a positive relationship with performance.

Based on the above research model [Figure 1(a)], the study examines the relationships among EL, IP and innovation performance [Figure 1(b)] across different industries as the research context of this study.

Research method

Sample and procedure

The data for the study were collected from a sample of 222 employees from 135 organizations representing different industries [see Figure 2(a)] as well as different levels of positions starting from two levels below the board of executive directors and the board of non-executive directors (i.e. Sample I). The data were collected in the second quarter of 2015 through online questionnaires. The process of data collection took about four weeks.

The survey consists of three parts: the Entrepreneurial Leadership Questionnaire (ELQ), the Innovation Process Questionnaires (IPQ) and the Innovation Performance Questionnaires (PQ). The respondents were asked to complete all parts of the survey at once.

To validate the ELQ, the study took another sample of 60 employees from an organization in the financial-service industry (i.e. a bank) to see if the results would be consistent with the validation of the ELQ (i.e. Sample II). The survey was done separately and at a different time than Sample I. Thus, Sample II was only used to validate the ELQ, and not the research model.

The data analysis was performed using SEM Lisrel 8.8 to validate and test the goodness of fit of the model, construct validity and reliability. An SPSS program was used for the descriptive statistics.

Measurement

Entrepreneurial leadership. EL is measured with 24 items of ELQ across the four dimensions of EL, namely, strategic dimension (STRAT) with ten items, communicative dimension (COMM) with five items, motivational dimension (MOTIV) with five items and personal/organizational dimension (PERS) with four items. The ELQ was developed by [Musa and Fontana \(2014\)](#) to measure employees' perceptions of their organization's EL.

The ELQ uses a five-point Likert scale (i.e. from 1 – strongly disagree to 5 – strongly agree) for ranking of agreement with each of the items. Sample items for STRAT include: "My leader or organizational leadership has the ability to see the big picture of the business opportunities"; for COMM: "My leader or organizational leadership has the ability to control feeling in managing conflict"; for MOTIV: "My leader or organizational leadership has the ability to transfer positive affective to others in the organization"; for PERS: "My leader or organizational leadership encourages creativity in developing and applying innovation in the organization".

Innovation process. The four dimensions of IP include idea generation (IGEN), idea selection (ISEL), idea development (IDEV) and idea diffusion (IDIFF). IP was measured with 13 items of IPQ across the four dimensions of IP. IGEN dimension has six items; ISEL dimension has two items; IDEV dimension has two items; and IDIFF dimension has three items. The IPQ was

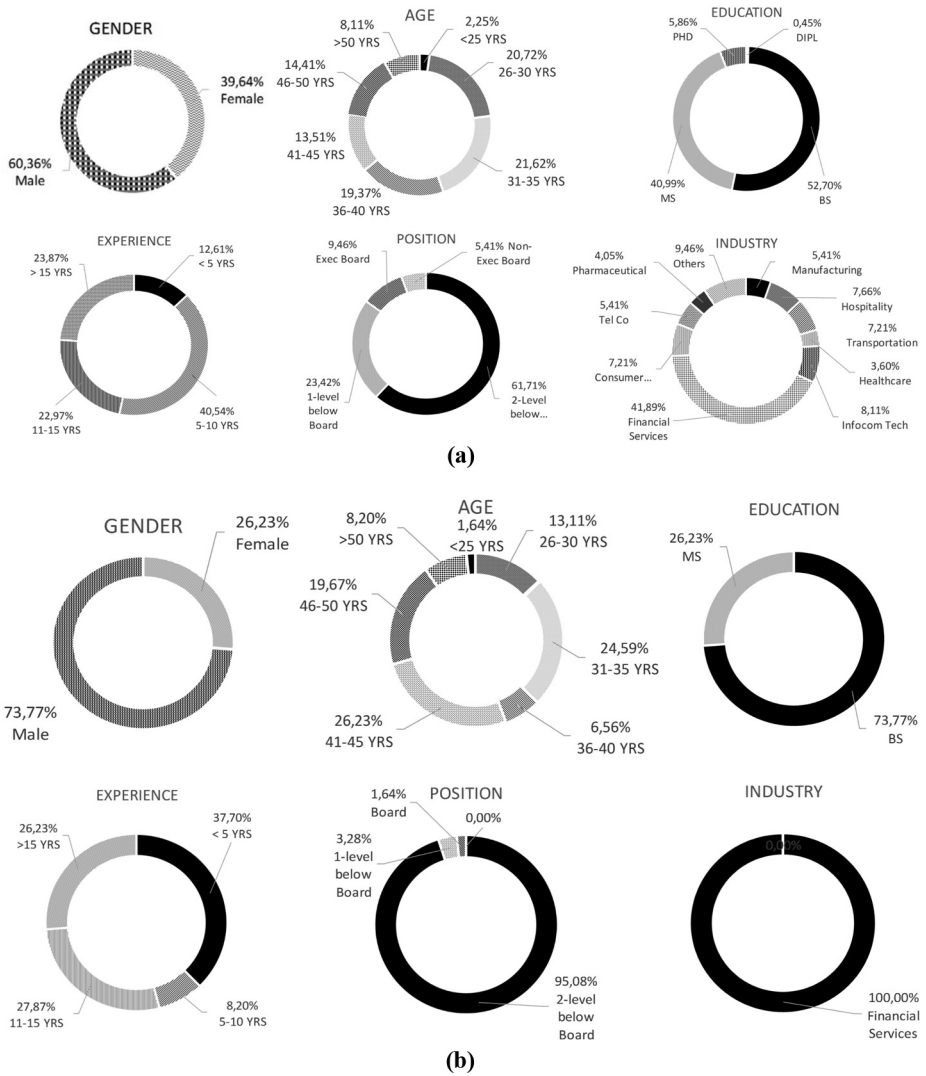


Figure 2.
(a) Demographic respondents – Sample I;
(b) demographic respondents – Sample II

adopted from the innovation value chain questionnaire developed by Hansen and Birkinshaw (2007). The IPQ uses a five-point Likert scale (i.e. from 1 – strongly disagree to 5 – strongly agree) for ranking of agreement with each of the items.

Innovation performance. The five dimensions of P include internal performance (PINT), technical performance (PTECH), commercial performance (PCOM), social performance (PSOC) and economic performance (PECON). P was measured with 34 items across the five dimensions, namely, PINT dimension with nine items, PTECH dimension with 11 items, PCOM dimension with seven items, PSOC dimension with three items and PECON dimension with four items. The PQ was adopted from the innovation performance

questionnaire developed by Fontana (2011) and used in Aryanto *et al.* (2015). A five-point Likert scale was used for ranking agreement to each of the items in PQ.

Results

The first part of the analysis was designed to confirm the ELQ as a valid and consistent measurement of EL. The construct validity of the ELQ has been elaborated in Musa and Fontana (2014), which was based on the strategic entrepreneurship model and theories (Covin and Miles, 1999; Covin and Slevin, 2002; Gupta *et al.*, 2004; Ireland *et al.*, 2003; Kuratko, 2007; Kuratko and Hornsby, 1996).

The second part of the analysis was designed to test two hypotheses on the relationships between EL and IP as well as between IP and P.

Descriptives statistics

Around 60.36 per cent of the respondents in the first sample (Sample I) were male and 39.64 per cent were female. The respondents' age was ranged from below 25 years old to above 50 years old, where the majority of the age of the respondents was in the range of 26-40 years old. With respect to education level, 52.70 per cent of the respondents had a bachelor's degree, while 40.99 per cent of the respondents had completed their master's degree. Regarding the length of experience in the industry, 40.54 per cent of the respondents had 5-10 years of experience in their respective industries. The majority of the respondents (61.71 per cent) were two levels below the board of directors, while the senior-level management were represented 38.29 per cent of the total respondents. With respect to the industry classifications, 41.89 per cent of the total respondents were from the financial services industry; the remainder were distributed across multiple other industries. Figure 2(a) shows the demographic of the respondents in Sample I.

In the second sample, 73.8 per cent of the respondents were male and 26.2 per cent were female. The majority of the respondents were 36-45 years old. The second highest age group was 26-30 years old. With respect to the education level, 73.77 per cent of the respondents had a bachelor's degree, while 26.23 per cent had a master's degree. With respect to the working experience, 54.1 per cent of the respondents had more than 11 years of working experience in their industry, while 37.70 per cent had less than five years of working experience. Most of the respondents' positions were two levels below the board of directors (i.e. 95.08 per cent). All of the respondents in Sample II were from the financial services industry. Figure 2 shows the demographic profile of the respondents in Sample II.

Validity assessment

Confirmatory factor analysis was done using SEM Lisrel 8.8. The Cronbach's alpha for the ELQ on both samples was done using SPSS for all constructs in the model (i.e. ELQ, IPQ and PQ).

Entrepreneurial leadership construct

The Cronbach's alpha values of Sample I and II were 0.957 and 0.958, respectively, showing a good reliability of the observed variables (i.e. Cronbach's alpha > 0.70). The two samples showed relatively the same level of Cronbach's alpha on EL's 24 items.

A confirmatory factor analysis was done on Sample I EL's 24 items, and the results showed that all EL items had standardized loading factor (SLF) ≥ 0.45 , with the exception of the EL8 item with an SLF of 0.33. All of the EL items (i.e. EL1-EL24) had t -value ≥ 2.0 , with EL8 having the lowest t -value of 4.99. Furthermore, the results of construct validity (CR) and variance extracted (VE) for EL were 0.96 (>0.70) and 0.49 (<0.50), respectively. The EL8 item also showed a t -value of 4.94 with an SLF of 0.40. Based on these results, we decided to

drop item EL8 in the ELQ. By dropping the EL8 item, the results from Sample I showed CR and VE for EL were 0.97 (>0.7) and 0.51 (>0.50), while Sample II showed CR of 0.95 (0.70) and VE of 0.53 (>0.50). Appendix shows the entire 24-item ELQ.

Furthermore, the results show acceptable fit indices for both Sample I and Sample II. Table I shows the fit indices for Sample I and Sample II.

The RMSEA for Sample I and II were 0.037 and 0.00, respectively. They were both less than 0.05 threshold figure. Other fit indices, such as NFI, CFI, IFI and GOFI, were all above 0.90, indicating that the measurement of the model has a good fit. Thus, it is in line with the psychometric requirement to validate a measure of a construct.

Innovation process construct

The Cronbach's alpha of Sample I was 0.842, showing a good reliability of the observed variables (i.e. Cronbach's alpha > 0.70).

A confirmatory analysis was done on the 13-item IP, and the results showed that item IP5, IP6, IP9, IP11 and IP12 had SFL of 0.24, 0.30, 0.48, 0.40 and 0.06, respectively, with *t*-values of 3.31, 4.25, 6.96, 5.51 and 0.89, respectively. The other items in IPQ had SLF above 0.45 and *t*-values above 2.0. The results of CR and VE were 0.90 and 0.40, respectively. Based on the IPQ results, these items were dropped from the IPQ. A confirmatory analysis was done on the reduced IP, and the results showed that the IP construct had CR of 0.90 and VE of 0.50, which indicates a good reliability and validity. Table II shows the results of the fit indices of the IP construct in this study.

The RMSEA were 0.00. Other fit indices, such as NFI, CFI, IFI and GOFI, were all above 0.90, indicating that the measurement of the model has a good fit. The χ^2/df was lower than 1.0, indicating that the reduced IPQ is due to low SFL on the dropped items.

Table I.
Fit indices from Lisrel
8.8 for entrepreneurial
leadership construct

Fit indices	Sample I	Sample II
χ^2/df	1.30	1.05
RMSEA	0.037	0.00
Standardized RMR	0.034	0.040
<i>p</i> -value	0.93	0.92
Normed fit index/NFI	0.99	0.98
Comparative fit index/CFI	1.00	1.00
Incremental fit index/IFI	1.00	1.00
Relative fit index/RFI	0.98	0.94
Goodness of fit index/GOFI	0.94	0.93

Table II.
Fit indices from Lisrel
8.8 for innovation
process construct

Fit indices	Sample I
χ^2/df	0.75
RMSEA	0.00
Standardized RMR	0.024
<i>p</i> -value	0.95
Normed fit index/NFI	0.99
Comparative fit index/CFI	1.00
Incremental fit index/IFI	1.00
Relative fit index/RFI	0.98
Goodness of fit index/GOFI	0.99

Innovation performance construct

The Cronbach's alpha of Sample I was 0.973, showing a good reliability of the observed variables (i.e. Cronbach's alpha > 0.70).

A confirmatory analysis was done on the 34 items of P, and the results showed that all items in PQ had SFL above 0.45 and *t*-values above 2.0. Therefore, all items could be used in the research study. The CR and VE of this construct were 0.97 and 0.53, respectively, indicating a good reliability and validity. Table III shows the results of the fit indices of the IP construct.

The RMSEA was 0.056. Other fit indices, such as NFI, CFI, IFI and GOFI, were all above or equal to 0.90, indicating that the measurement of the model has a good fit.

Structural equation modeling

The study used Sample I as the basis to test the two hypotheses using Lisrel 8.8. The model tested all the relationships shown in Figure 1. The results of the structural equation modeling (SEM) indicated that the model supported *H1* but did not support *H2*.

H1a-H1d refer to the relationship between EL and IP dimensions, namely, IGEN, ISEL, IDEV and IDIFF. It is clear that EL has a positive significant impact on the IP dimensions. All the paths from EL to IGEN, ISEL, IDEV and IDIFF had positive *t*-values above 2.0 and SLFs above 0.45, with the exception of the path from EL to IDIFF. Hence, it provided full support for *H1a-H1d*.

H2a-H2d were concerned with the relationship between the IP dimensions and the P. Based on the results of SEM Lisrel 8.8, all paths from the innovation-process dimensions had negative *t*-values and SLFs, with the exception of the path from IGEN to P having a positive *t*-value of 2.09 and SLF of 0.38, which is below 0.45. Hence, it did not support *H2a-H2d*. This is a counterintuitive finding.

Table IV shows the overall fit indices of the research model. Figure 3(a) and (b) shows the output of the SEM on the overall model.

Fit indices	Sample I
χ^2/df	1.70
RMSEA	0.056
Standardized RMR	0.044
<i>p</i> -value	0.13
Normed fit index/NFI	0.99
Comparative fit index/CFI	0.99
Incremental fit index/IFI	0.99
Relative fit index/RFI	0.90
Goodness of fit index/GOFI	0.90

Table III.
Fit indices from Lisrel 8.8 for innovation performance construct

Fit indices	Model
χ^2/df	1.71
RMSEA	0.057
Standardized RMR	0.036
<i>p</i> -value	0.23
Normed fit index/NFI	0.98
Comparative fit index/CFI	0.99
Incremental fit index/IFI	0.99
Relative fit index/RFI	0.97
Goodness of fit index/GOFI	0.93

Table IV.
Fit indices from Lisrel 8.8 for the overall research model

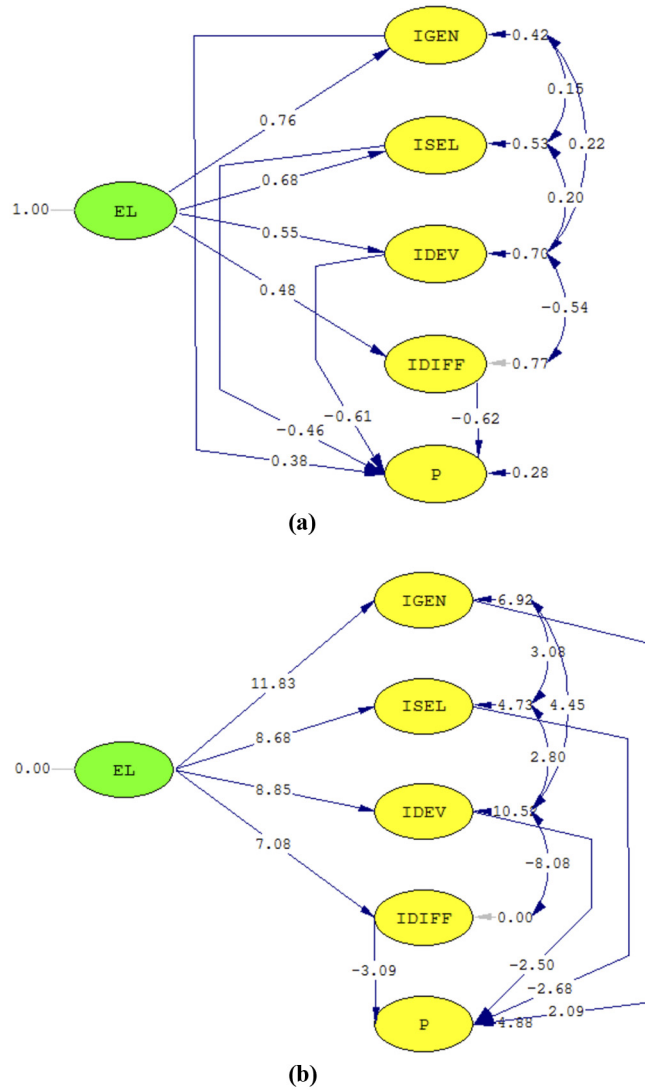


Figure 3. (a) SEM output on the overall research model; (b) SEM output on the overall research model *t*-values

Notes: (a) Standard solution: Chi-square = 141.93; *df* = 83; *P*-value = 0.00006; RMSEA = 0.057; (b) T-values: Chi-square = 141.93; *df* = 83, *P*-value = 0.00006; RMSEA = 0.057

The fit indices, such as NFI, CFI, IFI and GOFI, are all above or equal to 0.90, indicating that the measurement of the overall model has a good fit.

Discussion

The first part of this study uses SEM (with maximum estimate) to validate likelihood EL measurement by comparing the data analysis from results of the Sample I and II using a

unidimensional questionnaire (ELQ). Previous studies on EL did not specifically validate the measurement of EL, and there has been very limited discussion on the measurement of EL. This study contributes to the study of EL by providing a validated instrument to measure it.

The second part of this study examines the relationship between EL, IP and P in the context of innovation management. SEM supported *H1a-H1d*, showing positive relationship between EL and IP. It supports the theoretical model that organization with EL would have a more effective IP. However, *H2a-H2d* were not supported. Idea selection, development and diffusion have a negative relationship with innovation performance. This could happen because during these phases, an organization may in fact incur costs with respect to timing needed in the selection phase, more resources allocated during the development phase and more time and resources allocated during the diffusion phase. This is actually in line with the finding of past empirical studies showing mixed results of negative and positive relationships and even insignificant ones when it comes to innovation performance (Kafourous *et al.*, 2008). Tidd (2001) stated that it is difficult to establish a strong empirical relationship between innovation management (that is proxied by IP) and performance. Adams *et al.* (2006) also indicated that there is an absence of evidence that the innovation management practices actually relate to innovation performance. Further discussion may arrive at concluding that innovation performance is not determined solely by the IP, but also by organizational configuration, environmental contingencies and types of innovation. Furthermore, innovation performance must be measured from multiple perspectives and multiple dimensions to reflect the reality of the innovation. The performance of the IP is a multi-sided performance and should be viewed from different perspectives of innovation management. It is in line with Pavitt's (1984) view on innovation performance, which is determined by the sources of knowledge inputs, by the size and principal lines of activity of the organizations and the sectors of innovations' production and main use. Can we measure the performance of innovation management solely by the performance of the IP? The findings apparently provide perspectives on the necessary condition of integrated innovation management with the process of innovation. Lack of such a condition may be indicated by the absence of relationships or partial presence of the relationships between IP and performance. A total innovation system must be applied for better overall organizational performance.

Implications for management

The study suggests that the validated EL measurement would help organizations to measure their EL at all levels. The results would help organizations in developing their leadership program as part of organization learning to foster IP and its management in a systematic way. The study also shows that EL has the greatest impact on the idea generation phase, followed by idea selection, idea development and idea diffusion. This confirms that EL plays an important role as the catalyst for having innovative organizations.

EL contributes from the earliest phase of the IP.

Furthermore, study also suggests that IP does not automatically result in veritable innovation performance. In fact, the study indicates that idea selection, development and diffusion have negative relationships toward innovation performance. Such a finding suggests that innovations are not necessarily marketable in an economic sense with direct monetary impact or resulted in innovation performance (Kotsemir and Meissner, 2013).

Innovation is complex, is difficult to measure and requires close coordination of adequate technical knowledge and excellent market judgment to result in veritable innovation

performance. Therefore, IP is a series of changes in a complex system involving technology, environment, knowledge management and social context of the innovation organization (Kline and Rosenberg, 1986).

Directions for future research

The study shows that there could not be a direct relationship between IP and innovation performance. Thus, further research is needed to identify what variables or factors could link IP as a proxy of innovation management, and innovation performance, so that not only the contribution of innovation management to competitiveness can be clearly identified, but also its contribution to organization performance can be established as well in the context of EL, IP and innovation performance studies.

Strengths and limitations

The strength of this study is that the measure of EL was validated and the link between EL and IP was positively established. However, the limitations of this study are that the distribution of the data collected from the respondents was dominated by those who were in the financial services industry. It may have impact on the overall model but less on the validation of the EL measurement. Further study is necessary to explore and further explain the current findings.

Conclusion

EL facilitates the innovation management/IP through its strategic, communicative, motivational and personal/organizational discipline dimensions. It is important for organizations to foster the development of their EL at all levels within the organization to ensure that innovation management/IP is managed effectively. The study also validates the measurement of EL using a unidimensional questionnaire. However, the study found that the positive relationship between IP and innovation performance was not supported. Such a finding was rather counterintuitive; however, it confirms the difficulty in establishing a solid relationship between IP and performance, as it has been indicated in previous studies, and suggests that the IP may not be the only factor that shapes the innovation performance.

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Appendix

ENTREPRENEURIAL LEADERSHIP QUESTIONNAIRE [ELQ]

Please respond to the statements below which you feel the most accurately characterizes your leader’s characteristics or style using the following scale 1 to 5:

1 2 3 4 5
Strongly disagree Strongly agree

My leader or organizational leadership:

1. Has the ability to see the big picture of the business opportunities
2. Is able to establish information system for exploring environmental changes of an organization
3. Has economic intuition in making business decision
4. Has the ability to give a sense of direction throughout the organization
5. Has the ability to provide a sense of destiny throughout the organization
6. Has the ability to deal with opportunities and threats through innovativeness
7. Is able to have flexibility in selecting strategies or making decisions when it comes to business opportunities
8. Has willingness to invest in risky projects
9. Has the ability to forecast future issues or crisis based on the past experience and the present action plans
10. Is able to prepare the organization to deal or face with unforeseen circumstances
11. Ability to influence members of the organization through effective persuasion
12. Has the ability to control feeling in managing conflict
13. Has the ability to foster a positive organization climate
14. Is able to encourage members of the organization to participate actively in the organization activities and/or in decision making process
15. Recognizes others’ emotions in social interactions to create innovative organization with sustainable performance
16. Has motivation for success in business
17. Understands the organization’s needs
18. Has the ability to transfer positive affective to others in the organization
19. Shows entrepreneurial spirit for others to follows within the organization
20. Has self-confident in convincing people on business opportunities
21. Encourages creativity in developing and applying innovation in the organization
22. Has commitment to support entrepreneurial activities within the organization
23. Has the ability to manage resources effectively in maintaining the dynamic capabilities of the organization
24. Shows discipline in making solid business model to maintain the competitiveness of the organization through enactment of opportunities that arises

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