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Knowledge-oriented leadership and open innovation: Role of knowledge management capability in France-based multinationals

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ABSTRACT

This paper discusses the links between knowledge-oriented leadership, open innovation and knowledge management in the international business context. Open innovation has become crucial for an increasing number of multinational enterprises (MNEs) to gain and maintain competitive advantage and become a market leader. Despite the recent proliferation of papers dealing with open innovation practices of MNEs, there is limited work investigating the role of knowledge management (KM) capability on the relationship between knowledge-oriented leadership and open innovation. Given MNEs' growing interest in open innovation, the lack of research on knowledge-oriented leadership and KM capability in the open innovation context is a significant research gap in our knowledge. In response, we conducted a study on the mediating role of KM capability in the linkage between knowledge-oriented leadership and open innovation (inbound and outbound), using data collected from 172 subsidiaries of MNEs based in France. A structural equation modelling approach is employed to study the impact of the latent variables associated with knowledge-oriented leadership and KM capability on open innovation. The results indicate that higher levels of knowledge-oriented leadership can lead to enhanced KM capability and improved open innovation outcomes. That is, knowledge-oriented leadership has a direct, positive impact on KM capability and open innovation. Also, KM capability is found to mediate the linkage between knowledge-oriented leadership and open innovation. This study provides useful insights for managers who wish to enhance open innovation activities in MNEs, and offers useful guidance to international business scholars, encouraging further research in this area.

1. Introduction

Open innovation is crucial for a multinational enterprise (MNE) to maintain its competitive advantage and become a leader in the market. Open innovation has become increasingly important as a source of competitive advantage for a firm (Schneckenberg, 2015). Open innovation indicates that innovative performance can be improved by both acquiring knowledge from outside sources and employing external paths to commercialize knowledge resources developed internally. Innovation performance is often represented by the number of achievements (e.g., the quality of new products, new processes) (Hung, Lien, Yang, Wu, & Kuo, 2011). MNEs exhibit a tendency to seek access to others' knowledge and technology in order to enhance their global competitiveness (Jasimuddin, Li, & Perdakis, 2015a; Steensma & Lyles, 2000). Park and Ghauri (2011) highlight key factors affecting the acquisition of technological capabilities of MNEs. Due to the challenges of market dynamism, MNEs have started to embrace the open innovation model, and reduce their reliance on the inward-looking closed

innovation. Many MNEs currently engage in KM by adopting this model, in order to leverage knowledge both within their boundaries and externally to their stakeholders. MNEs such as Lucent, IBM, Intel and Millennium Pharmaceutical, DMS, P&G and ItalCementi are pioneers in adopting open innovation (Mortara & Minshall, 2011).

In the knowledge-based society, MNEs face not only the challenge of offering innovative products and services through effective exploitation of knowledge resources available to them (Vaccaro, Jansen, Van Den Bosch, & Volberda, 2012), but also the challenge of how they capture and use the knowledge available outside their boundaries (Chesbrough & Crowther, 2006; Zahra & George, 2002; Zahra, Nielsen, & Bogner, 1999). Knowledge-based view of the firm regards knowledge as a strategic resource whereby the MNE can create value by exploring and exploiting it through its proper management and gain a competitive market position (Grant, 1996; Jasimuddin, Connell, & Klein, 2005; Zack, 1999). The proper management of knowledge demands leaders to influence their firm for constructive acquisition and application of knowledge (Ribiere & Sitar, 2003). Due to Shifting leadership from the

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industrial age to the knowledge era (Uhl-Bien, Marion, & McKelvey, 2007), knowledge-oriented leadership become a core factor in organizations to meet challenges in open innovation. For this, MNEs managers need knowledge management (KM) capability (i.e., infrastructure and process) to enhance open innovation.

Although research interests in leadership and knowledge management (KM) capability is growing, limited empirical research has been directed towards the impact of knowledge-oriented leadership and KM capability on open innovation. There has been a growing interest among scholars and practitioners in the area of inbound and outbound open innovation. Donate and de Pablo (2015) pioneer in contributing to the leadership and knowledge management theory by presenting a model, which explains how knowledge-oriented leadership promotes effective KM. However, in order to account for the indirect role of leadership, they explore the linkage between knowledge-oriented leadership and innovation through KM practices. The study, however, overlooked how knowledge-oriented leadership might directly influence innovation outcomes. Hence, there is a research gap in explaining the direct association between knowledge-oriented leadership and open innovation outcomes (inbound OI and outbound OI). To the best of our knowledge, the empirical evidence of the intervening role of KM capability on the relationship between knowledge-oriented leadership and open innovation (inbound and outbound) is scant.

Against this backdrop, an empirical evidence is required to validate how knowledge-oriented leadership influences inbound and outbound open innovation in the context of MNE. We propose the mediating role of KM capabilities by arguing that the leaders are responsible for enhancing KM capability of MNEs by developing culture and structures that are conducive for knowledge creation and utilization (Donate & Guadamillas, 2010; Gold & Malhotra, 2001) as well as the application of technology (Lin & Huang, 2008). In addition, leaders also influence KM capability by setting the direction and vision for followers to manage the knowledge in the MNE (Mumford, Whetzel, & Reiter-Palmon, 1997).

This study aims to contribute to the theoretical development of a conceptual model for explaining the relationships among knowledge-oriented leadership, KM capability, and open innovation of MNEs. This study contributes to the literature by empirically examining the relationships among knowledge-oriented leadership, KM capability, and open innovation of MNEs. This study is an attempt to extend the literature in the fields of leadership, KM, open innovation and international business. The study will also provide insights to the MNEs in understanding how knowledge-oriented leadership style and KM capabilities can influence their OI targets. An understanding of these phenomena can help MNEs in selecting appropriate leaders and in developing leadership behaviors and promoting technologies, culture, structures and procedures so as to enhance open innovation activity in MNEs.

The remainder of this paper is organized as follows. Section 2 presents the research framework, discusses the concepts of knowledge-oriented leadership, KM capability, and open innovation, and develops the hypothesized relationships. The research methodology and analysis of results are then presented, followed by the discussion of the findings. Finally, we highlight its implications and give suggestions for future research.

2. Theoretical background and hypotheses

This section reviews the literature to propose a research model which posits that knowledge-oriented leadership and KM capability facilitate open innovation in the context of French-based MNEs. The theoretical framework suggested in this study draws on knowledge-oriented leadership, KM capability, and open innovation. Fig. 1 displays the research model that guides the execution of the study. The article tests four hypotheses regarding these concepts, which are developed in the following paragraphs.

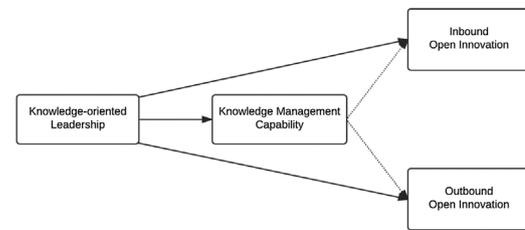


Fig. 1. Theoretical framework.

2.1. Knowledge-oriented leadership

For the purpose of the study, knowledge-oriented leadership is defined as an attitude or action, observed or imputed, that prompts the creation, sharing, and utilization of new knowledge in a way that seems to bring a shift in thinking and collective outcomes (Mabey, Kulich, & Lorenzi-Cioldi, 2012). Several scholars (e.g., Bryant, 2003; Garcia-Morales, Llorens-Montes, & Verdú-Jover, 2006) have highlighted the role of leadership in prompting innovation outcomes. Others (e.g., Agbor, 2008; Bryant, 2003; Vaccaro et al., 2012; Yang, 2007) have recognized the role of leadership in sourcing, creating, transforming and utilizing knowledge, mentioning several functions such as role models, motivators, and facilitators. Moreover, Bryant (2003) and Vaccaro et al. (2012) shed light on how leadership styles, such as transactional and transformational leadership styles, affect innovation outcomes. more recently, Donate and de Pablo (2015) argue that to effectively manage knowledge, leaders are required to adopt a combination of leadership styles, and not just adopt a single leadership style. These researchers explored the role of a specific type of leadership, knowledge-oriented leadership, combining the elements of transactional and transformational leadership.

2.2. Open innovation

Open innovation processes combine internal and external ideas into architectures and systems (Chesbrough, 2011). The open innovation research focuses on the knowledge flow directions (inflows and outflows) and importance of openness level for the companies (Enkel, Gassmann, & Chesbrough, 2009; Žemaitisa, 2014). Open innovation comprises two dimensions: inbound open innovation and outbound open innovation. Inbound OI involves identifying and acquiring knowledge from external sources (Chesbrough, 2003). Accordingly, after careful analyses of the available knowledge, firms identify, select and acquire ideas that they see useful and complementary to their business models. Outbound OI involves exploitation of a firm's knowledge and technology through commercialization in the external market (Chesbrough, 2003). Reflecting this view, Lichtenthaler and Ernst (2006) argue that outbound open innovation highlights the active persuasion of external knowledge exploitation, which refers to its commercialization using licensing and other transfer means.

2.3. Knowledge-oriented leadership and inbound OI

The previous literature recognizes leadership as a critical factor in effectively managing organizational knowledge (Singh & Kant, 2009; Singh, 2008). To effectively acquire and integrate knowledge from external sources, firms rely on leaders who encourages managing activities that support the development of knowledge and its acquisition (DeTienne, Dyer, Hoopes, & Harris, 2004). While leadership in general affects most aspects of an organization, Donate and de Pablo (2015) specifically identified a particularly type of leadership that promotes creating, transferring, storing and applying knowledge which can be coined as knowledge-oriented leadership. Knowledge-oriented

leadership combines transformational and transactional leadership styles and is characterized by a leader's focus on enhanced communication regarding employee expectations and firm's objectives. It lays emphasis on knowledge worker motivation and appreciates knowledge development in followers (Donate & de Pablo, 2015). One of the major roles that a leader plays is to inspire and motivate followers to accomplish firm's goals in enhancing innovation outcomes (Ribiere & Sitar, 2003). In doing so, leaders develop, exemplify, acknowledge, appreciate and reward new and innovative ideas coming from followers (Ho, 2009; Ribiere & Sitar, 2003). In addition, leaders guide followers on how to acquire and integrate knowledge which leads to the successful exploration and exploitation of knowledge (Donate & de Pablo, 2015) which, in other words, is termed as inbound OI. Therefore, leaders who emphasize the creation, exploration and integration of new knowledge into existing knowledge base facilitate inbound OI. Based on these arguments we hypothesize that:

Hypothesis 1a. Knowledge-oriented leadership is positively related to inbound OI.

2.4. Knowledge-oriented leadership and outbound OI

The management of knowledge in an organization should be undertaken carefully by knowledge-oriented leadership who are highly capable to handle this function (Dahlander & Gann, 2010). This generates a need for leaders who possess expertise in knowledge management, which eventually enhances innovation outcomes of the firm. Knowledge-oriented leaders can communicate firm's innovative strategies, and clarify role expectation to their followers (Singh, 2008). They assign objectives and roles to followers appropriately that boosts a firm's innovative performance (Rosling, Frese, & Bausch, 2011). They also motivate their followers to exploit firm's knowledge resources by identifying a mode of motivation which they adopt depending on the nature of activity they want to promote in the followers (Chang, Hsu, & Yen, 2012). Such leaders encourage followers through intellectual stimulation and empowerment to take risks to utilize new ideas resulting in effective diffusion and commercialization of knowledge (Williams & Sullivan, 2011). This subsequently can facilitate outbound open innovation efforts of a firm. Based on these arguments, it is hypothesized that:

Hypothesis 1b. Knowledge-oriented leadership is positively related to outbound OI.

2.5. Knowledge management capability

Firms have realized the importance of knowledge management (KM) because of their ability to effectively use their knowledge to innovate (Sandhwalia & Dalcher, 2011; Jasimuddin, Connell, & Klein, 2006). Many MNEs currently engage in KM to leverage knowledge both within their organization and externally to their shareholders and customers (Žemaitisa, 2014; Jasimuddin, Li, & Perdakis, 2015b). Drawing on organizational learning theory, Lichtenthaler (2011) identifies knowledge acquisition, retention and application as capacities that represent in their sum the capability of firms to explore and exploit knowledge in open innovation. An MNE's KM practice involves two dimensions (i.e., knowledge process capability and knowledge infrastructure capability) to influence organizational performance (Bryant, 2003). The first dimension of a firm's KM capability, knowledge process capability, involves acquisition, conversion, application and protection of a firm's knowledge. The second dimension of a firm's KM capability, knowledge infrastructure capability, is based on three factors: technical, which comprises the technology and technology-enabled social ties within the firm (Davenport, De Long, & Beers, 1998); structural, that addresses formal organizational hierarchy and rewards systems (Gold & Malhotra, 2001); and cultural infrastructure, that is

characterized by shared norms and context (Leonard & Sensiper, 1998).

Innovation activities in MNEs require high level of collaborative, creative initiatives and effective KM models (Žemaitisa, 2014). According to Chesbrough (2011), inward and outward flow of the knowledge help accelerate the internal innovations, and expand the markets for the external use of the innovation. KM practice involves a set of activities that a company engages to improve its performance including innovation activities, and thereby to gain its competitive advantage (Jasimuddin, 2012; Jasimuddin, Connell, & Klein, 2012).

The notion of open innovation indicates that MNEs can improve their innovative activities by both the acquisition of knowledge from outside the company and employing external outlets to commercialize new knowledge. KM capability helps improve the open innovation activities of the organization. KM of an MNE enhances its ability to innovate (Du Plessis, 2007; Gold & Malhotra, 2001). The linkage between KM capability and open innovation are developed from inbound and outbound perspectives below.

2.6. Mediating role of KM capability in the relationship between knowledge-oriented leadership and inbound OI

An MNE's KM capability encompass knowledge creation and transfer that identify the linkage between leadership and KM outcomes which are consequently found to influence organizational performance (Bryant, 2003). As mentioned earlier, knowledge-based leadership supports various knowledge-based processes of a MNE. Leaders influence firm's knowledge processes of acquisition, conversion, application and protection by virtue of their key roles of inspiring followers to create, share, and experiment with new ideas.

Leaders usually do this by instituting a proper reward/incentive system and by promoting effective channels of communication (Ho, 2009; Ribiere & Sitar, 2003; Williams & Sullivan, 2011; Yang, 2007). In this way, leaders encourage the development of new ideas that come out from their followers, and empower them to apply such ideas and knowledge (Crawford, Gould, & Scott, 2003). As a result, leadership behavior considerably influences the knowledge processes of firms (Yahya & Goh, 2002). The effective organization of the processes leads to enriched inflows of knowledge within the firm in such a way that knowledge can be sourced and acquired effectually (Zack, McKeen, & Singh, 2009). The foregoing discussion suggests that knowledge-oriented leadership supports a firm's knowledge process capability, which consequently influences inbound OI.

Similarly, knowledge-oriented leaders help develop knowledge infrastructure of firms by influencing their culture, structure and technology infrastructure. Leaders also perform the roles of advising and motivating their followers in this regard. This is often done by developing, appreciating and rewarding the creation of new ideas that are in turn supported by developing a culture and structure (Donate & Guadamillas, 2010; Nguyen & Mohamed, 2011; Williams & Sullivan, 2011; Islam, Jasimuddin, & Hasan, 2017). Knowledge-oriented leaders further facilitate sourcing and acquiring of new knowledge. This is often done by using innovative technical systems and routines which help followers learn new ideas prevailing in the market (Lin & Huang, 2008). Hence, leaders play a significant role in the development of a firm's knowledge infrastructure.

To ensure the best use of their knowledge repositories, firms are required to have infrastructure such as technology, structures and a conducive organizational culture. The knowledge infrastructure capability, backed by proficient technical systems, helps it maintain a database of knowledge resources. Furthermore, flexible organizational structures facilitate formal and informal communication within an organization while a conducive culture supports generation of new ideas and knowledge (Donate & de Pablo, 2015; Islam, Jasimuddin, & Hasan, 2015). As a result, knowledge-oriented leadership promotes the development of knowledge infrastructure capability which, in turn, facilitates inbound OI. The foregoing discussion highlights the overall

role of a firm's KM capability in the linkage between its knowledge-oriented leadership and inbound OI. This leads to the following hypothesis:

Hypothesis 2a. KM capability mediates the relationship between knowledge-oriented leadership and inbound OI.

2.7. Mediating role of KM capability in the relationship between knowledge-oriented leadership and outbound OI

Knowledge-oriented leadership has a role in influencing knowledge process capability of MNEs. As noted earlier, leaders influence organizational routines, procedures and systems through which an MNE acquires, transfers and utilizes knowledge resources. As noted earlier, they inspire and motivate followers to develop and implement new ideas through bringing formal and informal communication channels to practice (Amidon & Macnamara, 2004; Jasimuddin, Connell, & Klein, 2014). These processes are further facilitated when knowledge leaders welcome, appreciate and incentivize knowledge sharing, utilization and experimentation with new ideas (Crawford et al., 2003; Williams & Sullivan, 2011). Accordingly, leaders shape capabilities of firms, and enhance their KM activities (Sarin & McDermott, 2003).

Firms that are capable of managing their knowledge are enabler in exploiting and commercializing their knowledge resources. Systems in firms that are conducive for new knowledge creation, sharing and implementation play key roles in the development of innovative products for commercialization (Darroch, 2005). This leads to argue that knowledge-oriented leadership results in promoting a firm's KM processes which promotes commercialization of innovative products and knowledge resources, thereby enhancing outbound OI outcomes of a firm. It is, thus, predicted that knowledge process capability of a firm plays an intervening role in the association between knowledge-oriented leadership and outbound OI.

Furthermore, knowledge-oriented leaders exemplify, instruct, envision and motivate their followers to share and utilize the knowledge and ideas that they develop internally or acquire from external sources (Williams & Sullivan, 2011). At the same time, flexible organizational structures empowers the employees to make decisions based on the knowledge available to them (Donate & Guadamillas, 2010). Knowledge-oriented leaders also employ technology that aids in utilization of ideas. Hence, knowledge-oriented leadership supports KM infrastructure that involves technology, culture and structures, which in turn build KM capability of a firm. Several scholars (e.g., Donate & de Pablo, 2015; Jones, Herschel, & Moesel, 2003) argue that firms with better knowledge infrastructure capability outperform their competitors in terms of innovative outcomes. These studies show that adopting new technology and developing a favorable organizational culture helps to exploit knowledge that plays a crucial part in improving a firm's innovative performance including the development of innovative products. The above discussion suggests that knowledge-oriented leadership in an organization promotes the two dimensions of KM capability, which consequently affects outbound OI of firms. Hence, the following hypothesis is formulated:

Hypothesis 2b. KM capability mediates the relationship between knowledge-oriented leadership and outbound OI.

3. Method

3.1. Procedures

Structural equation modeling (SEM) is used in this study to test the relationships between the constructs (e.g., knowledge infrastructure capability, knowledge-oriented leadership and open innovation) and determine the predictive power of the model. SEM is capable of handling simultaneity, where the conceptual network of relationships

provides meaning to embedded measures. This approach using AMOS 7.0 software is employed to test the research model and hypotheses. Moreover, it combines a dual focus on prediction concerning the structural relationships among constructs with the measurement of latent, observed indicators (Venai, Midgley, & Devinney, 2005). Our structural model assessment will offer an analysis of the path coefficients (direct and indirect effects between latent variables), the goodness of the fit of the entire model, and the boot-strapped scores (Tubadji & Nijkamp, 2015).

3.2. Research setting

The objective of the paper is to measure the knowledge-oriented leadership, KM capability, and open innovation of Multinational enterprises. A cross-sectional design was adopted, where data was collected from a sample drawn from subsidiaries of the companies based in France, utilizing a survey questionnaire. There are three reasons for undertaking research in such a setting. First, open innovation is relatively new in French innovation research landscape, thereby study on open innovation application in France is still immature. Secondly, the French government encourages greater knowledge and technologies transfers from public research to the private sector. Thirdly, in 21st century, France aimed at opening innovation to international collaboration for increased productivity and competitiveness.

3.3. Sample

The OECD defines industries under two categories. The first group is high-tech industrial companies in the manufacturing sector, which include the electronic, aerospace, and biotechnology industries, and the second group is knowledge-intensive service firms, which include education, communications, and information service industries. The companies surveyed in this study are from the first category, i.e., high-tech in manufacturing industries, according to the OECD classifications. A convenient sampling method is used to select 310 sample French based MNEs from various sectors. One of the benefits of this research design is that the multiple sectors have been covered in the survey. As a result, potential common source issues were reduced. A multi-industry sampling design helped to broaden the generalizability of the findings (Katsikea, Theodosiou, Perdakis, & Kehagias, 2011), which included aircraft and spacecraft, pharmaceuticals, medical instruments chemical, machinery, and electrical sectors.

The data were collected from March 22 to August 20, 2016. 340 questionnaires were distributed and 310 were returned. Finally, 172 valid responses were usable, with an effective response rate of 55.5%. This study sought to choose respondents who have enough knowledge about the KM capability, knowledge-oriented leadership and open innovation in his/her organization. The questionnaires with a cover letter explaining the objective of this research were distributed A self-addressed postage-paid envelope were included in the package. Moreover, a web-address of the online version of the survey was also provided in the letter in case any of the respondents intended to fill it in electronically (Li, Nathan, Nathan, & Rao, 2006).

3.4. Measurements

A rigorous review of the extant literature was undertaken to develop the observed items of all the latent variables in order to address the relationship between knowledge-oriented leadership and open innovation, and the mediating effect of the KM capability on this linkage. Measurement of the research constructs involved the employment of multi-item reflective scales (Bollen & Lennox, 1991). The use of multi-item measures enhances confidence so that the measurement of the research construct will be consistent (Churchill, 1979). The measurement instruments are depicted in Appendix A. Most of the constructs used are derived from the previous studies on KM, leadership and open

innovation. Tables in the “Data analysis and Results” section tabulate the descriptive statistics along with the items used in each construct, Cronbach’s alpha and the composite reliability.

3.4.1. Knowledge-oriented leadership

Knowledge-oriented leadership was measured with items adopted from the work of [Donate and de Pablo \(2015\)](#). The respondents (i.e., mid and junior management) were asked to evaluate their top management on a Likert scale of 1 (strong disagreement with the item) to 5 (strong agreement with the item). The scale (composite reliability = 0.90) consisted of six items.

3.4.2. Knowledge management capability

As highlighted earlier, KM capability comprises two dimensions. The first dimension, knowledge process capability, measured the acquisition (4 items), application (5 items) and sharing (4 items) capabilities of the surveyed firms using 13 items adopted from the work of [Lin and Lee \(2005\)](#). Managers rated the items on a Likert scale of 1 (strong disagreement) to 5 (strong agreement). The composite reliability of the measures is 0.96. To measure the second dimension of KM capability (i.e. knowledge infrastructure capability), we used 35 items adopted from a seminal study of [Gold and Malhotra \(2001\)](#). Managers rated the items on a Likert scale of 1 (strong disagreement) to 5 (strong agreement). Technological KM infrastructure was measured with 12 items. Cultural KM infrastructure was measured with 11 items, while structural KM infrastructure was measured using 12 items. The composite reliability of the measures is 0.96.

3.4.3. Open innovation

Inbound OI and outbound OI were measured with 6 and 4 items respectively. Items were taken from the previous studies ([Naqshbandi, 2016](#); [Naqshbandi & Kaur, 2011, 2014](#); [Sisodiya, 2008](#); [Sisodiya, Johnson, & Grégoire, 2013](#)). Managers rated each item on a scale of 1 (strong disagreement) to 5 (strong agreement). The composite reliability of the measures relating to inbound and outbound open innovation are 0.90 and 0.70 respectively.

Three out of the four items that measured outbound OI were reverse-coded, and were dealt with appropriately before conducting further analyses. Five items in the questionnaire were reverse-coded and were dealt with accordingly. As mentioned earlier, after discarding a good number of responses as they had more than 10 percent missing values ([Hair, Black, Babin, & Anderson, 2010](#)), a total of 172 responses were included in further data analysis. We ensured that the data met the assumption of multivariate techniques such as normality, linearity and homoscedasticity.

4. Results

Data were analyzed and interpreted, following a two-stage process, as prescribed by [Anderson and Gerbing \(1998\)](#). The units of analysis in this study were MNEs based in France. The analysis was designed as a structure equation model using survey data on 172 companies, covering information on various measures on KM capability, knowledge-oriented leadership and open innovation. [Table 1](#) provides a profile of the respondents in the survey along the profile for the MNEs under study. Following Anderson and Gerbing’s (1988) SEM guidelines, the reliability and validity of the research model is evaluated. Based on [Campbell and Fiske’s \(1959\)](#) criteria, confirmatory factor analysis (CFA) was undertaken to assess the convergent and discriminant validity. The testing of the research hypotheses then followed to determine the significance of the paths among the constructs. This sequence of the procedure helps to understand whether the construct measures are valid and reliable before drawing any conclusion on the relationships among them ([Kiessling, Richey, Meng, & Dabic, 2009](#)). This will be discussed, in turn, below.

[Table 1](#) shows that the responses came from various industries with

Table 1
Respondents’ profile (n = 172).

	Frequency (s)	Percentage (%)
Industry		
Aircraft and spacecraft	6	3.5
Pharmaceuticals	15	8.7
Office, accounting and computing machinery	15	8.7
Radio, TV and communications equipment	8	4.7
Medical, precision and optical instruments	24	14
Building and repairing of ships and boats	20	11.6
Electrical machinery and apparatus	32	18.6
Non-metallic mineral products	6	3.5
Motor vehicles, trailers and semi-trailers	21	12.2
Chemicals excluding pharmaceuticals	15	8.7
Railroad equipment and transport equipment	8	4.7
Others	10	5.71
Position		
Middle Manager	111	64.5
Junior Manager	61	35.5
Years served in Firm		
0–5 years	64	37.2
6–10 years	68	39.5
11–15 years	34	19.8
Above 16 years	6	3.5
Firm Age		
0–10 years	22	12.8
11–20 years	66	38.4
21–30 years	53	30.8
31–40 years	17	9.9
Above 40 years	14	8.1
Market Orientation		
Local/National	67	39
Regional	76	44.2
Global	29	16.9
Firm Ownership		
100% Foreign owned subsidiaries	89	51.7
Mixed ownership (Joint venture)	83	48.3

the most response collected from the Electrical machinery and apparatus (18.6%) and Motor vehicles, trailers and semi-trailers (12.2%) industries. Middle managers and junior managers accounted for 64.5% and 35.5% of the responses respectively. The majority of these managers had served their ‘current’ organizations for 6–10 years (39.5%). The majority of the organizations surveyed were established and operating for 11–20 years (38.4%). Most of these organizations had regional market orientation (44.2%) and were fully foreign-owned subsidiaries (51.7%).

4.1. Non-response bias and common method bias

T-test was used to establish the absence of non-response bias in the data. Comparisons were made with respect to all variables between 40 early and 40 late responses. No significant differences ($p > .05$) were found leading to the conclusion that the data are free from non-response bias. Similarly, we took measures from the questionnaire development stage by including psychological separators ([Podsakoff, MacKenzie, Lee, & Podsakoff, 2003](#)) to minimize any potential effect of biasness. All the measurement items were subjected to an exploratory factor analysis (EFA) in which the number of factors was constrained to 1. The process requires the researcher to enter all variables, perceptually assessed, into factor analysis to observe the unrotated factor solution so as to discover the number of factors necessary to account for the variance in the variables ([Park & Ghauri, 2011](#); [Podsakoff & Organ, 1986](#)). The unrotated solution was analyzed and the single factor obtained that explains much less than 50 percent of the variance, suggesting absence of common method bias. To confirm this finding, we created a common latent factor and loaded all the items on this factor. An assessment of this model revealed a poor model fit: $\chi^2/df = 3.12$,

Table 2
Model fit.

	χ^2	Df	χ^2/df	CFI	RMSEA
Initial model	4404.23	1936	2.27	.70	.09
First order model	833.63	511	1.63	.91	.06
Second order model	826.53	509	1.62	.92	.06

CFI = 0.703 and RMSEA = 0.11 (Hair et al., 2010). Thus, the data are free from common method bias (Podsakoff et al., 2003).

4.2. Psychometric properties of measures

To ensure the measurements used are psychometrically sound, we first conducted an exploratory factor analysis (EFA) to understand the factor structure. The EFA helps a researcher eliminate the 'offending items' that had low factor loadings or contributed to an unclear factor structure. This was followed by performing a confirmatory factor analysis (CFA). We used the guidelines for model fit as recommended by Hair et al., 2010, using only three fit indices (i.e., χ^2/df , CFI and RMSEA) to avoid redundancy. The initial model containing all the measurement items was analyzed and, as expected in view of the results of EFA conducted earlier. A poor model fit was obtained: $\chi^2/df = 2.27$, CFI = 0.704 and RMSEA = 0.086 (Hair et al., 2010). We, therefore, removed the 'offending items' that had low factor loadings. Besides, the first and second order measurement models were analyzed. As shown in Table 2, the second order model fitted the data better ($\chi^2/df = 1.62$, CFI = 0.915 and RMSEA = 0.060) than the first order model ($\chi^2/df = 1.63$, CFI = 0.914 and RMSEA = 0.061). The second order measurement model was thus retained as the final model.

4.3. Convergent and discriminant validity

Table 3 shows that all the items were correlated significantly to their respective constructs in the measurement model. All the items loadings were statistically significant at $p < .001$ and AVE were > 0.50 . Reliability of the measure is also established as Cronbach's α for all the variables exceeded 0.70.

Additionally, discriminant validity is confirmed for all the variables as the square root of each variable's AVE are greater than the bivariate correlation. For adequate discriminant validity, the square root of every AVE value should be greater than the off-diagonal elements in the corresponding row and column of the correlation table (Fornell & Larcker, 1981). These assessments indicate discriminant validity of the measures. That is, the comparisons using the values in Table 4 confirms the items' discriminant validity.

4.4. Control variables in the model

Previous studies (e.g., Damanpour, 1991; Moohammad, Nor'Aini, & Kamal, 2014; Mortara & Minshall, 2011; Roxas, Battisti, & Deakins, 2014) have well documented some of the organizational characteristics that influence firms innovation practices. It is found that the firm factors can support innovation practices (Moohammad et al., 2014). Among these characteristics, the firm ownership status, firm age and sector are often termed organization's characteristics (Roxas et al., 2014). The fact that influences of the organization characteristics on its open innovation practice have been found to exist in literature. Most specifically, organizational factors have been identified in various innovation studies to include firm ownership status (Moohammad et al., 2014; Shefer & Frankel, 2005; Urem, Alcorta, & An, 2007), firm age (Moohammad et al., 2014) and firm sector (Moohammad et al., 2014; Urem et al., 2007). In order to capture the firms' open innovation, the firm's own characteristic hence should be controlled.

This study uses several control variables to eliminate whatever

effects these variables might have on open innovation. Sector, firm age, employee tenure, employee's position, market orientation, and firm ownership were collected as the control variables as these factors have been found to influence open innovation. That is, we control for this set of variables in the model to decrease the possibility of confounding effects on the variables of interest and to factor out the possibility that the results are driven by the exclusion of these variables. For example, we controlled for firm Age, as measured by the number of years since the opening of the business in France. In this study, ownership status implies either a 100% foreign ownership or an international joint venture in France, any potential effects from ownership status were controlled for.

To identify control variables, we used *t*-test and found a significant difference in mean scores of inbound OI between Middle managers (Mean = 3.80, Standard Deviation = 0.57) and Junior managers (Mean = 4.13, SD = 0.59); $t = -3.59$ (170), $p = 0.000$. No significant difference in mean scores of outbound OI was found between Middle managers (Mean = 3.39, SD = 0.69) and Junior managers (Mean = 3.51, SD = 0.81); $t = -1.06$ (170), $p = 0.290$. Middle managers and Junior managers were dummy coded as 0 and 1 respectively. In addition, a series of separate one-way ANOVA tests were conducted for other demographic variables that could possibly affect inbound OI and outbound OI. With respect to in-bound OI, significant differences were noticed for Industry Type ($F = 2.59$, $p < 0.05$), Years served in Firm ($F = 10.14$, $p < 0.05$), Age of Firm ($F = 5.42$, $p < 0.05$), Firm's Market Orientation ($F = 14.23$, $p < 0.05$), and Firm Ownership ($F = 7.60$, $p < 0.05$). With respect to outbound OI, significant differences were found for Age of Firm ($F = 3.5$, $p < 0.05$), Firm's Market Orientation ($F = 3.74$, $p < 0.05$), and Firm Ownership ($F = 3.80$, $p < 0.05$). As a result, respondent position, industry type, years served in the firm, firm age, market orientation and ownership (for inbound OI) while firm age, market orientation and ownership (for outbound OI) were used as control variables during hypothesis testing.

Most of the control variables have effects that can be explained intuitively (Mudambi & Navarra, 2004). We tested hypotheses using traditional, multistep path analyses (Baron & Kenny, 1986) and a multiple mediation analysis using bootstrapping that is more accurate, provides higher statistical power, and makes fewer distributional assumptions (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Preacher & Hayes, 2008; Preacher, Rucker, & Hayes, 2007). For all tests of hypotheses, the authors confirmed that control variables in the models did not affect the results in the French context.

Table 5 shows that a significantly positive association was observed between Knowledge-oriented leadership and Inbound OI ($r = 0.484$, $p < 0.01$), out-bound OI ($r = 0.349$, $p < 0.01$), and KM Capability ($r = 0.613$, $p < 0.01$). In addition, KM capability was also found to be significantly and positively associated with in-bound OI ($r = 0.672$, $p < 0.01$) and out-bound OI ($r = 0.381$, $p < 0.01$).

4.5. Hypothesis testing

Before testing the hypotheses, model fit of the structural model was assessed. Based on guidelines of Hair et al. (2010), an acceptable model fit was obtained: Chi-square = 832.29; $df = 512$; Ratio = 1.63; CFI = 0.914; RMSEA = 0.060. We next tested the direct relationships. H1a and H1b that predicted a positive relationship of Knowledge-oriented Leadership with inbound OI ($\beta = 0.466$, $p < 0.001$) and outbound OI ($\beta = 0.345$, $p < 0.001$) respectively, were supported.

Two hypotheses (H2a and H2b) of this study proposed the mediating role of KM capability in the relationships of knowledge-oriented leadership with inbound and outbound open innovation. In the interest of rigor, we followed two approaches to test for mediation.

First, the traditional Baron and Kenny (1986) approach was used. Table 6a shows the related results. The results indicate that, when the KM capability (mediator) is introduced in the model, the significant direct effect of knowledge-oriented leadership on inbound open

Table 3
Factor loadings, reliability, convergent and discriminant validity.

	Dimension	Items	Factor loadings	AVE	MSV	ASV	Square root of AVE	CR	Item-total correlation	Cronbach's α
Knowledge Management Capability	KMI Technological	KIC5	0.74	0.93	0.52	0.42	0.97	0.96	0.598	0.77
		KIC6	0.67						0.573	
		KIC7	0.78						0.639	
	KMI Structural	KIC13	0.57						0.586	
		KIC14	0.76						0.756	
		KIC15	0.9						0.77	
		KIC16	0.77						0.636	
	KMI Cultural	KIC26	0.69						0.659	
		KIC28	0.65						0.66	
		KIC30	0.67						0.634	
		KIC32	0.8						0.726	
		KIC33	0.74						0.675	
	KPC Application	KIC34	0.77						0.704	
		KIC35	0.68						0.629	
		KPC5	0.65						0.537	
		KPC6	0.84						0.755	
KPC7		0.65	0.604							
KPC8		0.77	0.713							
KPC Acquisition	KPC9	0.76	0.693							
	KPC1	0.78	0.644							
KPC Sharing	KPC2	0.83	0.644							
	KPC12	0.73	0.55							
Knowledge-oriented Leadership	Knowledge-oriented Leadership	KPC13	0.75	0.55						
		KOL1	0.77	0.823						
		KOL2	0.82	0.848						
		KOL3	0.96	0.862						
		KOL4	0.86	0.78						
Open Innovation	Inbound OI	INOI2	0.72	0.67	0.55	0.37	0.82	0.9	0.726	0.91
		INOI3	0.81						0.82	
		INOI4	0.83						0.78	
		INOI5	0.86						0.796	
		INOI6	0.86						0.781	
		OUTOI3	0.77						0.644	
	Outbound OI	OUTOI4	0.84						0.644	

Notes: CR, composite reliability; AVE, average variance extracted; MSV, maximum shared variance; ASV, average shared variance; KOL, knowledge-oriented leadership; InOI, inbound OI; OutOI, outbound OI; KMC, KMI, knowledge management infrastructure; KPC, knowledge process capability.

Table 4
Test of discriminant validity.

Variable	1	2	3	4
1. Inbound OI	0.82			
2. Outbound OI	0.45**	0.80		
3. Knowledge Management Capability	0.67**	0.38**	0.97	
4. Knowledge-oriented Leadership	0.48**	0.34**	0.61**	0.85

Notes: The bold Values on the diagonal represent the square root of the average variance extracted. Other entries represent intercorrelations of the constructs.

Table 5
Zero-order correlations and descriptive statistics.

Variable	Mean	Std. Dev.	1	2	3
1. Inbound OI	3.92	0.60	1		
2. Outbound OI	3.44	0.74	.445**	1	
3. Knowledge Management Capability	4.03	0.44	.672**	.381**	1
4. Knowledge-oriented Leadership	3.70	0.81	.484**	.349**	.613**

innovation (β 0.466) and outbound open innovation (β 0.345) is reduced considerably to β 0.047 and β 0.069, respectively. In addition, the direct effect of the predictor variable (knowledge-oriented leadership) on the outcome variable (open innovation) was found to be insignificant when the mediator was introduced. This significant drop indicates full mediation according to the Baron and Kenny (1986) approach.

Table 6a
Hypothesis testing.

Direct Effects		Estimate	S.E.	C.R.	P value	R ²	Result
H1a	KL - > InOI	0.466	0.053	5.61	0.00	.313	Significant
H1b	KL - > OutOI	0.345	0.077	3.58	0.00	.182	Significant
Direct Effect with mediator							
H2a	KL - > InOI	.047	.062	.492	.623	.580	Not Significant
H2b	KL - > OutOI	.069	.091	.589	.556	.277	Not Significant

Notes: KL, knowledge-oriented leadership; InOI, inbound open innovation, OutOI, outbound open innovation; KMC, knowledge management capability.

Second, since the Baron and Kenny (1986) has recently been criticized, we also used a contemporary method suggested by Preacher and Hayes (2008). Therefore, to assess the mediating role of KM capability, we used the bootstrapping method with bias-corrected confidence estimates, using the process macro (Hayes, 2013). Accordingly, the lower and upper limit confidence intervals (LLCI and ULCI) were obtained for the indirect effect of knowledge-oriented leadership on the two dimensions of open innovation. It was observed that with 5000 bootstrap resamples, the confidence interval for the indirect effect of knowledge-oriented leadership on inbound open innovation [LLCI 0.1903 and ULCI 0.3738] and outbound open innovation [LLCI 0.0758 and ULCI 0.2435] did not include zero. In the bootstrapped confidence interval procedure, mediation is indicated by the exclusion of zero from the confidence interval for the unstandardized indirect effect. Since in this case, the upper and lower limit confidence intervals do not contain zero between

Table 6b
Mediation analysis (Preacher & Hayes, 2008 method).

DV	Effect of IV on M (a)		Effect of M on DV (b)		Total effect of IV on DV (c)		Direct effect of IV on DV (c)		Bootstrap results for indirect effects through mediator (ab)	
	B	t	β	T	β	t	β	t	LL 95% CI	UL 95% CI
Inbound OI	.33**	10.13	.83**	8.40	.36**	7.21	.085	1.60	.1903	.3738
Outbound OI	.329**	10.13	.45**	3.00	.32**	4.86	.17*	2.09	.0758	.2435

Note: IV, independent variable; DV, dependent variable; M, mediator; OI, open innovation. **p < .001; *p < .05.

them, it is concluded that the indirect effect is significantly different from zero at $p < 0.05$ which indicates that KM capability mediates the relationships of knowledge-oriented leadership with inbound and outbound open innovation (see Table 6b). This suggests the presence of full mediation and confirms the results obtained earlier using the Baron and Kenny (1986) method.

5. Discussion

Knowledge-oriented leadership and KM capability of MNEs matter for open innovation in the MNE environment. The data of the current research forms part of a broader study that analyzes the relationship between knowledge-oriented leadership, KM capability, and open innovation of MNEs based in France. A significant body of research has highlighted the importance of a firm's resources in shaping its innovative performance and competitive position. The knowledge-based view (KBV) of the firm recognizes knowledge as one of the most fundamental strategic resources, which, if managed effectively, can lead a firm towards the achievement of better performance and competitive advantage (Grant, 1996). Among the factors that play a noteworthy role in management of knowledge resources of a firm is leadership (Sarin & McDermott, 2003). This study, therefore, assessed the proposed model empirically to shed some light on the links between knowledge-oriented leadership, KM capability and open innovation. The results of our SEM analysis are shown in Fig. 2.

Interestingly, the data from the MNEs based in France fully support four hypotheses. The first Hypothesis (H1a) suggested a positive role of knowledge-oriented leadership in predicting inbound OI. We found support for this hypothesis, suggesting that firm, where leadership displays knowledge-oriented behaviors, perform better in acquiring knowledge from external knowledge sources. Hence, knowledge-oriented leadership coupled with effective communication and motivation, assists firms in knowledge creation and its internal integration. This finding is consistent with the past research (i.e., Garcia-Morales et al., 2006; Sarin & McDermott, 2003) that has highlighted the role of leadership in promoting the creation and adoption of new ideas by exemplifying the desired activities and motivating followers to create and share knowledge.

Hypothesis 1b proposed that knowledge-oriented leadership facilitates outbound OI. The findings support this hypothesis, leading to the conclusion that leaders motivate and empower their followers to share

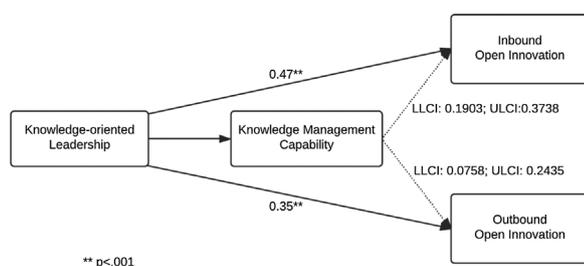


Fig. 2. Path coefficients in the research model.

and utilize ideas that lead to the successful exploitation of new knowledge, by encouraging commercialization of a firm's knowledge. This findings confirm the previous literature (Garcia-Morales et al., 2006; Sarin & McDermott, 2003) that also highlights the facilitating, motivating and promoting role of leaders in knowledge sharing and utilization

Hypothesis 2a proposed the mediating role of KM capability in the relationship between knowledge-oriented leadership and inbound OI. It is found that knowledge process capability of firms serves as a mechanism between knowledge-oriented leadership and inbound OI. This leads to the conclusion that leaders play an important role in influencing organizational processes of acquiring, converting, applying and protecting knowledge of a firm. In doing so, they can promote the effective exploration of knowledge (Amidon & Macnamara, 2004; Sarin & McDermott, 2003). By promoting KM processes such as facilitating the development and sharing of new knowledge through formal and informal communication channels, leaders influence a firm's capabilities to create and integrate new knowledge (Lakshman, 2005; Viitala, 2004). On the other hand, knowledge-oriented leadership shapes a firm's knowledge infrastructure capability such as its technology, structure and culture. Leaders can take varied approaches to do so by appreciating, motivating or empowering followers to encourage the development and experimentation with new ideas. Leaders clarify a firm's values and vision to the followers which sets a direction for them to work with creative ideas (Garcia-Morales et al., 2006). In addition, leaders assign roles and duties to followers by identifying their skills and expertise, and making optimal use of their potential creative ideas (Viitala, 2004). Leaders can also promote effective exploration of knowledge by helping followers with new technology and motivate them to use new technical systems that ensure the effective flow of information and its integration (Lakshman, 2005).

Hypothesis 2b proposed the mediating role of KM capability in the linkage between knowledge-oriented leadership and outbound OI. The hypothesis is supported which leads to the conclusion that leaders promote processes in a firm that encourage the diffusion and application of new knowledge for commercialization. This finding confirms the work of Donate and de Pablo (2015). Leaders directly influence the knowledge processes in an organization by promoting formal and informal ways of communication that enhance idea diffusion to knowledge decision-makers who can take decisions based on the updated knowledge thus acquired (Amidon & Macnamara, 2004). Leaders also promote the application of ideas by motivating and appreciating followers (Garcia-Morales et al., 2006), through intrinsic and extrinsic rewards. By influencing knowledge processes, leaders indirectly promote the effective exploitation and utilization of knowledge that enhances innovative outcomes (Sarin & McDermott, 2003). At the same time, knowledge leaders influence knowledge infrastructure capability of a firm by focusing on developing an organizational culture and a structure which promotes effective communication that facilitates the application and implementation of new knowledge (Amidon & Macnamara, 2004; Lakshman, 2005). Such an infrastructure marked by supportive technology and culture and promoted by knowledge leaders is conducive for experimenting with new ideas (Viitala, 2004).

5.1. Implications for theory and practice

This paper investigates how knowledge-oriented leadership affects open innovation through the mediating role of knowledge management (KM) capability. To the best of our knowledge, this is the first research for MNEs based in France, and is in line with the other studies conducted elsewhere. The findings of this study validate the proposed model and contribute to theory and practice.

5.1.1. Theoretical implications

The paper extends the literature in three broad areas i.e. leadership, knowledge management and open innovation in the MNE context. Very few studies have identified links between these three areas. By proposing an integrated model derived from leadership theory and knowledge based view of the firm, this study is a preliminary contribution to the intersection of these concepts. This study contributes to the theoretical development of a conceptual model for explaining the relationships among knowledge-oriented leadership, KM capability, and open innovation of MNEs. This study contributes to the innovation and international business literature by empirically examining the relationships among knowledge-oriented leadership, KM capability, and open innovation in the MNE context.

The linkage between knowledge-oriented leadership and open innovation has not received much attention in leadership and innovation literature (Lakshman, 2009). The literature on the linkage between knowledge-oriented leadership and open innovation has not received much attention in leadership and innovation literature Donate and de Pablo (2015) explore the indirect role of leadership on innovation through KM practices. This paper, however, focuses on how knowledge-oriented leadership might directly influence innovation outcomes. Hence, the study contributes to the literature by studying knowledge-oriented leadership and its relation with open innovation.

A plethora of studies identify the role of transactional and transformational leadership in influencing firm's innovation outcomes (Gumusluoglu & Ilsev, 2009; Jung, Chow, & Wu, 2003; Pieterse, Van Knippenberg, Schippers, & Stam, 2010). Achieving innovative outcomes, however, demands leaders to exhibit a mix of leadership styles (Bryant, 2003). This specific leadership style has been identified as knowledge-oriented leadership, which is a blend of transactional and transformational leadership styles. Donate and de Pablo (2015) contend that knowledge-oriented leaders with the support of KM efforts make use of leadership styles, motivation, communication, promotion and recruitment, and lead the company's innovation performance. This article explains the direct association between knowledge-oriented leadership and OI outcomes (inbound OI and outbound OI) in the MNE context. Most specifically, to the best of our knowledge, the mediating effect of the KM capabilities in the linkage between knowledge-oriented leadership and open innovation has not received much attention in international business literature This paper extends this, by studying the role of this type of leadership (i.e., knowledge-oriented leadership) and KM capabilities in promoting open innovation. Open innovation is recognised as a new paradigm to explain the changing nature of corporate innovation (Enkel et al., 2009; Huizingh, 2011; Schneckenberg, 2015). By drawing on the idea to leverage innovation through cross-boundary knowledge inflows and outflows, this study highlights the mediating role of KM capabilities in enhancing inbound and outbound open innovation, thereby extends the work of Darroch (2005) and Donate and De Pablo (2015).

5.1.2. Practical implications

To remain innovative, MNEs need to manage their knowledge resources effectively (Carneiro, 2000). KM helps handle the inflows and outflows of knowledge effectively. Many MNEs currently engage in KM by adopting the open innovation model, in order to leverage knowledge both within their boundaries and externally to their stakeholders. As a result, MNEs can enhance their innovative performance by both

acquiring knowledge and technologies from outside sources, and employing external paths to commercialize their own knowledge.

This study provides an evidence that leadership is one of the most vital resources that can take the organization to its envisioned destination in innovative and competitive targets through their KM initiative (Bryant, 2003; Singh, 2008). Based on this evidence, this study recommends that firms should hire and appreciate such leaders who are well-equipped with skills of creating, transforming, storing and applying knowledge resources. When firms appoint such leaders, they will support the development and sharing of new knowledge, which will result in effective exploration of new ideas. These ideas can, in turn, be effectively transformed, integrated and implemented to develop innovative products, leading to firm competitiveness (Bryant, 2003).

MNEs should encourage their managers to follow knowledge-oriented leadership style. The firms that have managers with knowledge-oriented leadership are better equipped with KM capabilities to acquire, assimilate, utilize and transform external knowledge and resources. This promotes firms to effectively internalize as well as commercialize their innovative resources which enhance OI outcomes. Knowledge-oriented leaders with the help of KM initiatives can make a stronger commitment in OI. This study also explored the process through which leaders influence the OI outcomes in their organizations. In light of our findings, there are consequences for global leaders in terms of recruitment, standardization of KM procedures, transfer of best practices in the MNE.

Moreover, MNEs can use knowledge-oriented leadership to develop KM capabilities to encourage their employees in their continuous open innovation performance. It is suggested that leaders who support knowledge exploration and exploitation help firms become more capable in managing knowledge by supporting their infrastructure and processes. Such leadership shapes the culture and structure of a firm, and gears them towards achieving innovative outcomes. Such leadership also makes the best use of technology to create, diffuse and implement new ideas. Such a leadership sets examples for employees by following firm's knowledge procedures, and encourages these behaviors among followers through an incentive system.

Based on the findings of this study, it is argued that firms should support such leaders and strive to develop such systems and infrastructure that promotes speedy and effective flow of information to the right sources where it can be used to create value. Leaders should be encouraged to bring such systems and technologies into practice so that the firm can benefit from its knowledge resources. It is anticipated that this study will serve as a guideline for the organizations that are striving towards achieving competitive advantage through excelling in innovation.

6. Limitations and future research directions

This study has some limitations. First, since the data were drawn only from a single country (i.e., France), the findings may not be generalizable to other contexts. Future study can test the research model in other contexts. Second, cross-sectional data were used in this study. Future research may use longitudinal data to test the model of this study. Thirdly, this study identified a constructive type of leadership, knowledge-oriented leadership, in promoting innovation. Further studies can highlight how negative types of leadership, such as laissez faire leadership or passive leadership, may relate to the two types of open innovation (Einarsen, Aasland, & Skogstad, 2007; Skogstad, Einarsen, Torsheim, Aasland, & Hetland, 2007). Fourthly, the results of this research is not based on a large sample of firms. Future research may wish to use larger data sets to increase the validity of the findings. In this study, KM capability is used as a mediating variable. However, it is important to carry out further research by using the two dimensions of KM capability (i.e., infrastructure and process) as two separate mediating variables with the organization's open innovation. It will, thus, give managers useful guidelines to further implement such activities in their firm.

7. Conclusion

This paper focuses on the current links between leadership, open innovation and knowledge management in the international business context. Open innovation (OI) has become a valuable means of gaining competitive advantage and enhancing organizational performance. To the best of our knowledge there is limited study that has explored how knowledge-oriented leadership influences innovation in the OI paradigm. Due to rapid changes in technology and market conditions, it has become necessary for MNEs to abandon their traditional innovation models and adopt the OI model. In order to be innovative in today's world, MNEs are keen to let go off their traditional innovation models and adopt models that are inward as well as outward-looking. As a result, this paper identifies how specific leadership style (knowledge oriented leadership) influence OI and how KM capability of a MNE can affect the associations between leadership styles and OI. In doing so, firms are required to be competent in managing their knowledge resources which can serve as crucial strategic resources for MNEs.

The data collected from the MNEs based in France fully support four hypotheses, which implies that knowledge-oriented leadership and KM capability matter for open innovation in the MNE environment. The study discusses and analyzes the knowledge-oriented leadership that has an impact on open innovation. Previous research focused on identifying the open innovation that promote innovation in general without adding the role that KM capabilities plays in that process. It was essential to understand the effect of knowledge-oriented leadership on open innovation using KM capabilities as mediators. Our model tested the often assumed direct and positive relationship between knowledge-oriented leadership and open innovation while also attempted to understand the effect of knowledge-oriented leadership on open innovation, using KM capabilities as mediators. By testing four hypotheses, this study finds that knowledge-oriented leadership has a statistically significant effect on KM capabilities, inbound and outbound open innovation. It also shows that KM capability is the mediating factor between knowledge-oriented leadership and open innovation.

Based on the findings of this study, it is inferred that firms that are capable of managing their knowledge resources effectively are enabler in exploring and exploiting their knowledge resources. This is possible when firms have competent knowledge experts in managerial position who know how to acquire, transfer, store and implement new ideas. Knowledge-oriented leaders are the fundamental unit of overall knowledge process of firms who act as role models, facilitators, motivators, and advisors in promoting successful use of knowledge of the firm. MNEs thus require knowledge-oriented leaders who can assist in exploring and exploiting knowledge by shaping the culture and structure of the firm, by promoting the usage of technology to speed up decision-making process, and by managing the processes of knowledge acquisition, diffusion and application.

By being available at different stages from idea development to its execution, such leaders inspire and support the followers by empowering them with essential resources and directing them to achieve the innovative targets. Therefore, the paper argues that firms should strive to achieve excellence in innovation through successful KM and they must pay attention to their leaders who develop capability in firms to manage the knowledge so as to attain open innovation targets of MNEs.

Appendix A. : The measurement instrument

Knowledge-oriented Leadership

1. Leadership has been creating an environment for responsible employee behavior and teamwork.
2. Managers are used to assuming the role of knowledge leaders, which is mainly characterized by openness, tolerance of mistakes, and mediation for the achievement of the firm's objectives.
3. Managers promote learning from experience, tolerating mistakes

up to a certain point.

4. Managers behave as advisers, and controls are just an assessment of the accomplishment of objective.
5. Managers promote the acquisition of external knowledge.
6. Managers reward employees who share and apply their knowledge.

Knowledge Management Capability

Knowledge process capability

1. My organization has processes for acquiring knowledge about our customers.
2. My organization has processes for generating new knowledge from existing knowledge.
3. My organization has processes for acquiring knowledge about our suppliers.
4. My organization uses feedback from projects to improve subsequent projects.
5. My organization has processes for distributing knowledge throughout the organization.
6. My organization has processes for exchanging knowledge with our business partners.
7. My organization has processes for inter-organizational collaboration.
8. My organization has processes for acquiring knowledge about new products/services within our industry.
9. My organization has processes for acquiring knowledge about competitors within our industry.
10. My organization has processes for benchmarking performance.
11. My organization has teams devoted to identifying best practice.
12. My organization has processes for exchanging knowledge between individuals.
13. My organization has processes for converting knowledge into the design of new products/services.
14. My organization has processes for converting competitive intelligence into plans of action.
15. My organization has processes for filtering knowledge.
16. My organization has processes for transferring organizational knowledge to individuals.
17. My organization has processes for absorbing knowledge from individuals into the organization.
18. My organization has processes for absorbing knowledge from business partners into the organization.
19. My organization has processes for distributing knowledge throughout the organization.
20. My organization has processes for integrating different sources and types of knowledge.
21. My organization has processes for organizing knowledge.
22. My organization has processes for replacing outdated knowledge.
23. My organization has processes for applying knowledge learned from mistakes.
24. My organization has processes for applying knowledge learned from experiences.
25. My organization has processes for using knowledge in development of new products/services.
26. My organization has processes for using knowledge to solve new problems.
27. My organization matches sources of knowledge to problems and challenges.
28. My organization uses knowledge to improve efficiency.
29. My organization uses knowledge to adjust strategic direction.
30. My organization is able to locate and apply knowledge to changing competitive conditions.
31. My organization makes knowledge accessible to those who need it.

32. My organization takes advantage of new knowledge.
33. My organization quickly applies knowledge to critical competitive needs.
34. My organization quickly links sources of knowledge in solving problems.
35. My organization has processes to protect knowledge from inappropriate use inside the organization.
36. My organization has processes to protect knowledge from inappropriate use outside the organization.
37. My organization has processes to protect knowledge from theft from within the organization.
38. My organization has processes to protect knowledge from theft from outside the organization.
39. My organization has incentives that encourage the protection of knowledge.
40. My organization has technology that restricts access to some sources of knowledge.
41. My organization has extensive policies and procedures for protecting trade secrets.
42. My organization values and protects knowledge embedded in individual.
43. My organization's knowledge that is restricted is clearly identified.
44. My organization clearly communicates the importance of protecting knowledge.

Knowledge infrastructure capability

1. My organization has clear rules for formatting or categorizing its product knowledge.
2. My organization has clear rules for formatting or categorizing process knowledge.
3. My organization uses technology that allows it to monitor its competition and business partners.
4. My organization uses technology that allows employees to collaborate with other persons inside the organization.
5. My organization uses technology that allows employees to collaborate with other persons outside the organization.
6. My organization uses technology that allows people in multiple locations to learn as a group from a single source or at a single point in time.
7. My organization uses technology that allows people in multiple locations to learn as a group from multiple source or at multiple point in time.
8. My organization uses technology that allows it to search for new knowledge.
9. My organization uses technology that allows it to map the location (i.e., an individual, specific system, or database) of specific types of knowledge.
10. My organization uses technology that allows it to retrieve and use knowledge about its products and processes.
11. My organization uses technology that allows it to retrieve and use knowledge about its markets and competition.
12. My organization uses technology that allows generate new opportunities in conjunction with its partners.
13. In my organization, employees understand the importance of knowledge to corporate success.
14. In my organization, high levels of participation are expected in capturing and transferring knowledge.
15. In my organization, employees are encouraged to explore and experiment.
16. In my organization, on-the-job training and learning are valued.
17. In my organization, employees are valued for their individual expertise.
18. In my organization, employees are encouraged to ask others for assistance when needed.

19. In my organization, employees are encouraged to interact with other groups.
20. In my organization, employees are encouraged to discuss their work with people in other workgroups.
21. In my organization, overall organizational vision is clearly stated.
22. In my organization, overall organizational objectives are clearly stated.
23. In my organization, knowledge is shared with other organizations (e.g. partners, trade groups)
24. In my organization, the benefits of sharing knowledge outweigh the costs.
25. In my organization, senior management clearly supports the role of knowledge in our firm's success.
26. My organization's structure of departments and divisions inhibits interaction and sharing of knowledge.
27. My organization's structure promotes collective rather than individualistic behavior.
28. My organization's structure facilitates the discovery of new knowledge.
29. My organization's structure facilitates the creation of new knowledge.
30. My organization bases our performance on knowledge creation.
31. My organization has a standardized reward system for sharing knowledge.
32. My organization designs processes to facilitate knowledge exchange across functional boundaries.
33. My organization has a large number of strategic alliances with other firms.
34. My organization encourages employees to go where they need for knowledge regardless of structure.
35. My organization's structure facilitates the transfer of new knowledge across structural boundaries.
36. My organization's employees are readily accessible.

Open innovation

Inbound Open innovation

1. My organization constantly scans the external environment for inputs such as technology, information, ideas, knowledge, etc.
2. My organization actively seeks out external sources of knowledge and technology (e.g., research groups, universities, suppliers, customers, competitors, etc.) when developing new products.
3. My organization believes it is good to use external sources (e. g., research groups, universities, suppliers, customers, competitors, etc.) to complement its own R&D.
4. My organization often brings in externally developed knowledge and technology to use in conjunction with our own R&D.
5. My organization seeks out technologies and patents from other firms, research groups, or universities.

My organization purchases external intellectual property to use in our own R &D.

Outbound Open innovation

1. Generally, in my organization all technologies are externally commercialized (i.e. sold to outside firms).
2. In my organization, external technology commercialization is restricted to technologies that are not used internally (reverse coded).
3. In my organization, external technology commercialization is restricted to relatively mature and proven technologies (reverse coded).
4. In my organization, external technology commercialization is restricted to non-core technologies (reverse coded).

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