



Exploring the longitudinal effects of emotional intelligence and cultural intelligence on knowledge management processes

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Accepted: 25 April 2022

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Abstract

Managing knowledge has become a new reality for multinational corporations (MNCs). Previous studies in the management field have closely examined personality traits as stable dispositional constructs over time, but they oversighted the possibilities that seemingly stable traits are likely to have different effects on outcomes in varying time waves. Combining horizontal and longitudinal surveys, this study collected two-wave datasets of 216 employees from MNCs, and built Fixed, Continuous and Interacting Models to investigate the effects of individual emotional intelligence (EI) and cultural intelligence (CI) as key traits on the processes of organizational knowledge management (KM) over time. This study discovered the fixed, continuous and interacting roles of EI and CI in KM processes at different times, and it also concluded that the traditional assumption of conceptualizing the effects of dispositional variables as fixed should be re-examined. The findings provided empirical and statistical evidence for future research as well as management suggestions for MNCs implementing KM practices.

Keywords Emotional intelligence · Cultural intelligence · Knowledge management processes · Longitudinal effects

Introduction

The development of the Asia Pacific region is an important force in promoting the global economy (Scuotto et al., 2022). With China being the largest emerging market in the Asia Pacific region (Gao, 2021; Zhong et al., 2021), the One Belt and Road Initiative is one of the largest infrastructure and investment projects, covering more than 68 countries. The Initiative has the potential to accelerate economic growth

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across the Asia Pacific area along with the Silk Road (Li et al., 2021a, b; Zhang et al., 2021a). In line with the recent shift of internationalization towards burgeoning Asia, multinational corporations (MNCs) attach importance to practices and information flows of knowledge creation, sharing and integration (Scalera et al., 2020; Zhao et al., 2021), making the management of cross-cultural knowledge a new normal (Pereira et al., 2021).

Knowledge management (KM) refers to a set of practices involving knowledge creating, capturing, storing, transferring and using (Barley et al., 2018). Although corporations that are successful in managing knowledge share the desire to achieve better performances on the knowledge-based view (KBV) (Grant, 1996), a large number of companies that carry out KM initiatives may not do well as expected (Muhammed & Zaim, 2020). Emerging topics on KM highlight the “human sides” or “individual factors” of KM (Agostini et al., 2020). Mercer’s 2020–2021 Global Talents Trend Report also calls for more talents of MNCs to handle and ameliorate international and cultural tasks. Knowledge as a valuable resource of an enterprise is intrinsic in the members of the organizations (Nonaka, 1994). Thus, MNCs need the knowledge to obtain better innovation and performance, and more competitive edges to survive in the turbulent post COVID-19 era, making the management of cross-cultural knowledge a new normal for contemporary enterprises (Pereira et al., 2021). Knowledge management (KM) is defined as managing knowledge resources within an organization whose goal is to generate value by handling these resources to obtain more competitive edges and better organizational performances (Jiang et al., 2021; Wong et al., 2015; Zhang & Min, 2021). The success largely depends on appropriate implementation of KM processes (Oufkir & Kassou, 2019; Wong et al., 2015), referring specifically to a set of practices involving knowledge creating, capturing, storing, transferring and using, with an aim to enhance the overall learning outcomes (Barley et al., 2018). Given that the source of organizational knowledge are the employees (Nonaka, 1994), there have been studies of KM processes’ antecedents related to human characteristics (e.g., Li et al., 2021; Shafait et al., 2021a; Shariq et al., 2019; Stoermer et al., 2021; Tuan, 2016).

As much as extant studies have implicitly suggested that the effects of dispositional variables such as gender and age must be stable and fixed, the variable role in longitudinal time may be overlooked (Lan et al., 2020). Stable characteristics have the potential to have different effects in varying periods. Based on this hypothesis, Lan et al. (2020) proposed three models related to the outcomes investigated at different times systematically, they are namely Fixed Model, Continuous Model and Interacting Model. Fixed Model reports the steady effects of dispositions on subsequent outcomes over time; Continuous Model argues that a dispositional construct causes different reactions to outcomes at different periods; and Interacting Model reflects that a dispositional variable may moderate the relationship between outcome variables over time. Through preliminary empirical research, they have subsequently verified this assertion with convincing findings.

Considering the risks brought by COVID-19 and the increasing trend of economic globalization, emotional intelligence (EI) and cultural intelligence (CI) are selected as the key traits of individuals undertaking cross-border tasks. While there are two major aspects of EI, i.e., ability and trait, we focus on EI trait aspect because intel-

ligence is generally considered a fixed attribute (Dweck et al., 1995). As an important personality trait, EI refers to the self-perception of a series of emotional skills that are measured through self-reporting (Petrides, 2011). It can help individuals detect and control their emotions, and guide others' emotions (Goleman, 2005; Shariq et al., 2019), all of which are conducive to the successful implementation of KM processes (Hislop et al., 2018). In addition, CI is particularly important when interacting with colleagues from different cultural backgrounds (Zhang et al., 2021b). CI can promote meaningful multicultural interactions (Li et al., 2021a, b), and it has greater predictability than EI in cross-cultural context (Zhang et al., 2017). Although there are cross-sectional studies related to KM processes with EI (Decker et al., 2009; Shafait et al., 2021a; Shariq et al., 2019; Tuan, 2016), and CI (Berraies 2019; Li et al., 2021a, b; Stoermer et al., 2021; Vlačić et al., 2019), we would argue that as particular dispositional variables EI and CI may influence how employees interpret various situations and events happening with regard to the implementation of KM over time.

As little is known to date about how knowledge management of MNCs is affected by dispositional EI and CI over time, this study, based on the KBV (Grant, 1996) and the recommendation by Lan et al. (2020), conducts a longitudinal survey through three existing models (i.e., Fixed Model, Continuous Model and Interacting Model) to fill this critical gap. In detail, the levels of EI and CI of employees of MNCs were collected at time 1, while the executions of KM processes of MNCs were recorded at both time 1 and time 2. The relationship between EI/CI and a sub-dimension of KM processes was tested to determine whether it conforms to Fixed Model, Continuous Model or Interacting Model so as to clarify the longitudinal impact of the key yet neglected traits. In brief, this study proposes the following two questions to answer:

Research question 1: Are the effects of EI/CI on these four KM processes (i.e., knowledge creation, knowledge capture and storage, knowledge sharing, and knowledge application and use) stable over time?

Research question 2: Among the Fixed Model, Continuous Model, and Interacting Model, which model fits the relations between EI/CI and KM processes respectively? And what possible causal factors are?

While trying to answer these two questions, this paper would make two main contributions as follows: (i) it contributes to the literature by examining the complex non-fixed effects of EI and CI as dispositional constructs, so as to further understand whether fixed personality traits have dynamic impacts over time; (ii) it updates views and empirical results of unconventional and non-fixed impacts of EI and CI on each of the dimensions of KM processes (i.e., knowledge creation, knowledge capture and storage, knowledge sharing, and knowledge application and use) at different times, thus to provide new ideas and directions to future researchers as well as management suggestions to MNCs.

Theoretical background and development

Knowledge management process

Similar to KM activities, practices or tasks (Al Ahabbi et al., 2019), KM processes are essential arrangements that a corporation makes in regulating and manipulating its knowledge resources (Holsapple & Joshi, 2000), in order to obtain higher performances (Oufkir & Kassou, 2019; Wong et al., 2015). In view of the vital role of KM in sustainable competitiveness of enterprises, scholars have launched in-depth discussions on the processes of KM, along with relevant practices. Various aspects such as knowledge acquisition, generation, utilization, codification, transferring and sharing related to both explicit and tacit knowledge have been investigated. The explicit knowledge is usually pertinent to work-related documents, organizational rules and work procedures, while the tacit involves intangible skills such as personal experience (Lu et al., 2006). Although no authoritative classification has been adopted, the process of KM generally includes four aspects: knowledge creation, knowledge capture and storage, knowledge sharing, and knowledge application and use (Al Ahabbi et al., 2019; Barley et al., 2018).

Knowledge creation of enterprises is defined as the creating and diffusing of new knowledge to be integrated into products, services and systems (Nonaka, 1994). It focuses on generating new knowledge instead of accessing to readily available resources (Al Ahabbi et al., 2019). From the perspective of the dynamic theory of knowledge creation, the creating of knowledge requires intensive interaction between explicit knowledge and tacit knowledge (Nonaka, 1994). It is noteworthy that knowledge can be created not only from new ideas and views, but also from the reconfiguration of existing resources. Other means and attributes such as the philosophy of cooperation, brainstorming meetings and even the reward system for recognizing innovation can also promote the generation of knowledge during the process (Al Ahabbi et al., 2019).

Upon its generation, knowledge must be captured and stored in the organization's knowledge base for later use, as generated knowledge does not translate into knowledge resources of the organization automatically. For transnational corporations, international knowledge acquisition can be meaningful only when enterprises acquire international market knowledge to guide their strategic actions (Armario et al., 2008). Since there are two kinds of knowledge called explicit and tacit knowledge respectively in an organization, it should be considered and distinguished when dealing with knowledge capturing and storing. Explicit knowledge can usually be acquired in written form, making it easy to find through a series of collection, summary, refinement and elaboration; tacit knowledge is often invisible and needs to be collected from individual experience (Dalkir, 2013).

Knowledge sharing has always been the focus of knowledge literature. It refers to a series of practical activities that transfer or disseminate information from an individual, team or organization to others (Lee, 2001). It is therefore crucial to share and enhance the organization's knowledge among individuals. As mentioned earlier, with knowledge being explicit and tacit in nature, there are different ways of sharing and storing knowledge depending on its nature. Generally speaking, explicit knowledge

is easier to be transmitted due to its formality, while tacit knowledge is harder to convey as it taps usually into deep values and beliefs (Nonaka, 1994; Shariq et al., 2019).

The application of knowledge refers to the process of using knowledge for specific purposes such as making decisions or policies (Al Ahbabi et al., 2019). Its importance is manifested and reflected in the utilization of valuable information to enable individuals or organizations to gain competitive advantages. Without the proper and effective using of knowledge, all the previous steps like creation, storing and sharing are less than meaningful. During this process, individuals should interpret knowledge according to a given situation, make decisions and/or solve problems based on available information, experience and constraints.

Emotional intelligence and knowledge management process

EI is defined as people's perceptions of their emotional worlds or a constellation of emotional self-perceptions located at lower levels of the personality hierarchy (Petrides, 2011). The function of an individual's perceptions and management of their feelings and emotions serves to guide their thinking and actions (Salovey & Mayer, 1990). Given the widespread use of EI in the workplace, it has been proved to be conducive to task performance (Chen et al., 2012; Law et al., 2008), as well as to organizational innovation and creation (Rivera-Vazquez et al., 2009; Shafait et al., 2021a, b).

EI is usually divided into four aspects (Mayer & Salovey, 1997; Shariq et al., 2019; Wong & Law, 2002), namely appraising and expressing self-emotion, evaluating and recognizing emotions in others, regulating self-emotions and using emotions. Firstly, appraising and expressing self-emotions refers to the awareness of individuals' own feelings and thoughts related to the abstract emotions; then, recognizing others' emotions refers to skills of evaluating and recognizing others' emotions accurately as well as expressing and re-experiencing these feelings vicariously; regulating self-emotions involves adjusting one's feelings, and even guiding and changing the emotions of others (e.g., recovering from psychological pain); lastly, using emotions speaks to individuals who can carry out constructive practices to facilitate performance through guiding and managing emotions (Davies et al., 1998; Mayer & Salovey, 1997).

The source of creating and transmitting knowledge comes from each and every individual in the organization (Nonaka, 1994), and the development of knowledge is inseparable from their emotions (Decker et al., 2009; Shafait et al., 2021b). Out of all relevant literature, most studies support the positive role of EI in knowledge sharing (Rivera-Vazquez et al., 2009; Shariq et al., 2019; Tuan, 2016). Individuals with high EI can communicate better both verbally and in writing (Shariq et al., 2019), showing closer social ties with others so as to strengthen the ties and reciprocate mutual behaviors among members (Tuan, 2016). The promotion of knowledge sharing is based on social capital theory (Wang & Noe, 2010). In addition, EI can also reduce obstacles in the using of knowledge and its transfer from person-to-person or person-to-documents, all of which are conducive to the processes of KM (Decker et al., 2009). Furthermore, there is also evidence that EI is closely related to the identification and acquisition of knowledge. A high level of EI can help individuals man-

age their emotions to be aware of and identify their own and colleagues' knowledge (Shariq et al., 2019), which is especially important in negotiating the access to documents that hold important knowledge (Decker et al., 2009). Finally, there are empirical findings in recent studies on academic and administrative staff showing that EI as an enabler can in return stimulate KM processes including creating, capturing, sharing, transferring and using of knowledge, leading to more creative performances and better learning outcomes (Shafait et al., 2021a, b).

Cultural intelligence and knowledge management process

Given the cross-cultural challenges, whether multinational organizations can effectively carry out KM in a dynamic environment largely depends on the CI of its members. CI is a multidimensional structure and refers to the knowledge and cognition in the effective interaction characterized by diverse cultures (Earley & Ang, 2003). Only being aware of cultural values of all parties in cross-border work can individuals or corporations achieve more benign interaction and higher task performance (Ang et al., 2007; Presbitero, 2020; Zhang, 2013; Zhang & Oczkowski, 2016; Zhang et al., 2021a, b). So far, the positive role of CI in organizational embeddedness (Stoermer et al., 2021), innovation behavior and performance (Berraies, 2019; Li et al., 2021a, b) has been confirmed, and it has the potential to promote the success of broader cross-border tasks.

CI is a multidimensional structure composed of four aspects, namely meta-cognitive CI, cognitive CI, motivational CI and behavioral CI (Earley & Ang, 2003). Meta-cognitive CI is a high-level thinking skill (Presbitero, 2020), related to the use of abstract cognitive strategies in different cultural backgrounds (Eisenberg et al., 2013); cognitive CI refers to the systematic knowledge such as practices and norms of other cultures, and it can be obtained through acquired learning or experience (Ang et al., 2007; Earley & Ang, 2003); motivational CI reflects the degree of attention on driving consideration and energy to carry out practices, referring to both intrinsic and extrinsic interest in other cultures (Ang et al., 2007); behavioral CI demonstrates verbal and nonverbal behaviors other than emotional and psychological factors to interact with colleagues in a multicultural context (Ang et al., 2007; Earley & Ang, 2003).

With the deepening of globalization, CI tends to become one of the key driver of successful KM of MNCs, and its positive relationship with KM processes is widely accepted in KM literature. Chin et al. (2021) put forward that metacognitive CI is a prerequisite for creating universally accepted cultural commonalities and the key to obtaining and developing humanitarian knowledge under the current global health crisis. Meta-cognitive CI enables individuals to understand different cultures and verify the accuracy of cultural knowledge; the cultural knowledge reflected by cognitive CI helps individuals understand the international environment more quickly and effectively; motivational CI that brings employees enjoyment in the workplace when interacting with people from different cultures tends to promote sharing knowledge; behavioral CI leads individuals to properly use cross-cultural communication skills, and it is conducive to knowledge acquisition (Ang et al., 2007; Charoensukmongkol, 2016; Chen & Lin, 2013). For knowledge sharing, the positive effect of CI on it has been recognized and confirmed by many studies (e.g., Berraies 2019; Chen

& Lin, 2013; Li et al., 2021a, b; Stoermer et al., 2021). In addition, it was found that all CI dimensions can affect conventional and reverse knowledge transfer positively (Vlajčić et al., 2019), and it can also mitigate the positive influence of language exclusion on knowledge hiding and hoarding so as to implement better knowledge practices (Albana & Yeşiltaş, 2021).

The fixed, continuous and interacting models

Through our literature review, it can be said that the vital roles of EI and CI in the research of knowledge have aroused rich discussions based on the assumption that the influence of dispositional variables is fixed. EI and CI are basic personality traits and are difficult to improve in a specific situation or a certain period though there are courses and training programs for the improvement of learning and acquired abilities (Decker et al., 2009). Based on the convincing empirical results by Lan et al. (2020), we anticipate important implications from the effects of EI and CI on each dimension of KM processes in those dispositional traits will make dynamic predictors over time under various cultural conditions. In fact, some longitudinal studies in recent years on EI have touched on this view. Gupta et al. (2017) recorded the medical students' EQ at time 1, and measured perceived stress at both time 1 and time 2, and found that self-reported EI was a significant negative predictor of perceived stress over time. Similarly, Levillain et al. (2021) collected athletes' sport emotions (anger, anxiety, dejection, excitement, happiness) in competition at three points of time whereas the EI was measured only at time 1. They concluded that different levels of EI corresponded to different emotional fluctuation trajectories. There are fewer such studies on CI, but Takeuchi et al. (2019) investigated expatriates working in the cross-cultural context and found that the previous work experience (e.g., international experience) was the significant predictor of expatriate performance fluctuating at four points of time.

The above longitudinal studies provided a crucial implication that the characteristics of the initial period would have an unstable impact on the outcomes in different periods. Appealing to the rethinking of dispositional traits' roles to clarify the unclear mechanism, Lan et al. (2020) systematically and innovatively proposed a new method of "Fixed Model, Continuous Model and Interacting Model" to illustrate the logic both behind the theory and statistics. Upon examining the effects of four concrete constructs involving gender, age, education level, and organizational tenure and four abstract traits involving happiness, sadness, depression, and disgust on task satisfaction, they found that (i) the effects of trait depression and disgust on job satisfaction fit the assumption of the Fixed Model; (ii) the effects of age, trait happiness, and trait sadness on job satisfaction fit the assumption of the Continuous Model; (iii) the effects of organizational tenure on job satisfaction fits the assumption of Interacting Model. To find the effects of EI and CI as key personality traits of employees of MNCs on KM processes in different time waves, the relationships in three models are proposed and assumed specifically.

As the traditional and universal model (Lan et al., 2020), the Fixed Model reports the steady effects of dispositions on outcomes over time. If the relationship between EI/CI and a dimension of KM process (i.e., knowledge creation, knowledge capture

and storage, knowledge sharing, and knowledge application and use) fits the Fixed Model, the impact of EI/CI would be consistent over time. Statistically, when EI/CI and a KM process at time 1 are tested as independent variables for regression analysis with the KM process at time 2, EI/CI will have a non-significant predictive effect on the outcome in time 2. That indicates that the full mediation of the KM process at time 1 supports the Fixed Model. Figure 1 shows the specific Fixed Model of this study.

The Continuous Model argues that if a dispositional construct causes different reactions between two periods, it will have both indirect and direct effects on outcomes at time 2 (Lan et al., 2020). For example, at time 1, employees' EI/CI should promote the sharing and dissemination of knowledge. However, the EI/CI measured at time 1 may strengthen or weaken the behavior or willingness of employees to share

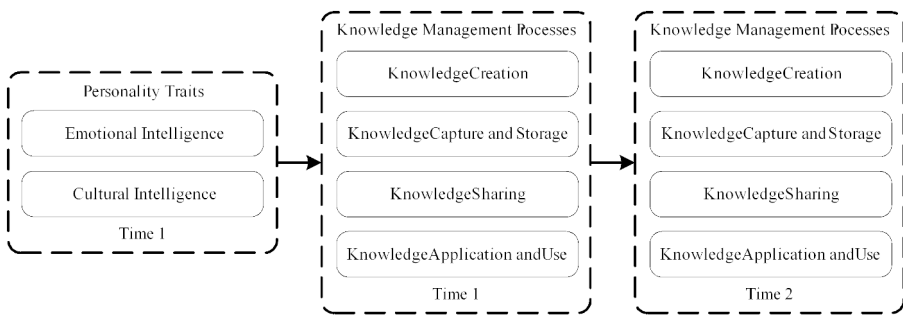


Fig. 1 Fixed Model of EI, CI and KM processes

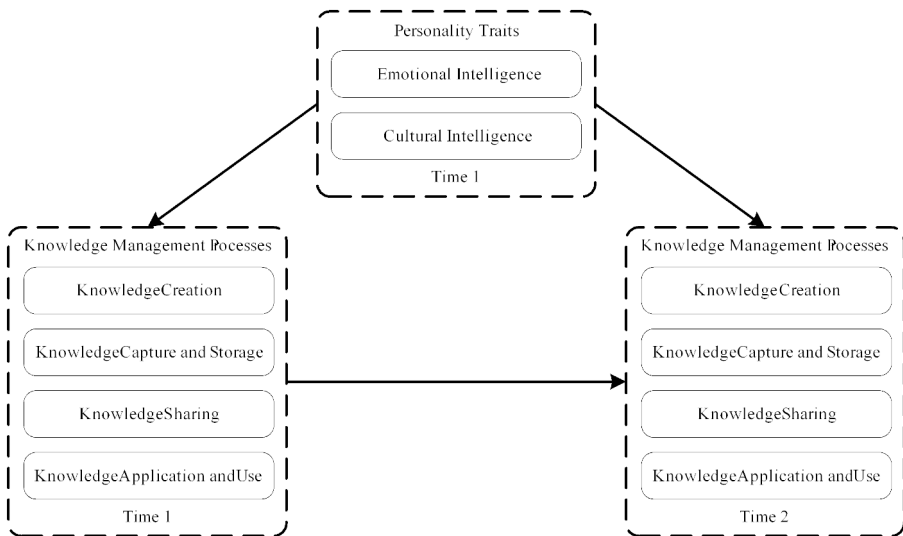


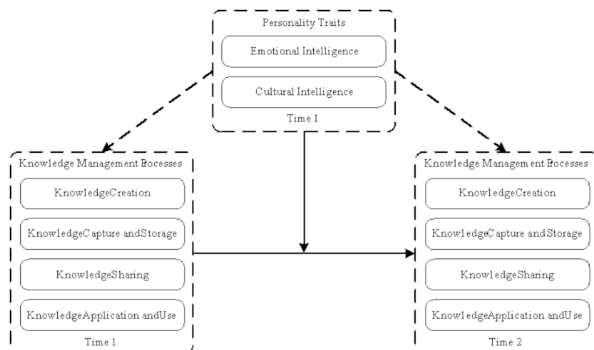
Fig. 2 Continuous Model of EI, CI and KM processes

knowledge at time 2 over time. Moreover, based on the affective event theory (Weiss & Cropanzano, 1996) or event systems theory (Morgeson et al., 2015), the effectiveness of EI/CI on shared knowledge at time 2 may be influenced by factors such as adaptation, reward or psychological pressure brought by COVID-19. Therefore, there would be significant and different relations between EI/CI and outcomes at time 1 and time 2 statistically. In this case, EI and CI have varying degrees of impacts on a dimension of KM processes at both two times, in which the outcome at time 1 plays a partial mediating role. Figure 2 shows the specific Continuous Model of this study.

In the Interacting Model, the dispositional variable may moderate the relationship between outcome variables over time (Lan et al., 2020). In this model, a certain KM process at time 2 will be affected by the interaction between EI/CI and the process at time 1. For instance, employees' EI/CI may be able to promote both the application of knowledge at time 1 and time 2 to different extent and certain degree, and the implementation of knowledge at time 1 will make it easier for employees with high-level EI and CI to use knowledge at time 2 in particular. This suggests that the interaction of EI/CI and knowledge application at time 1 will be significantly associated with knowledge application at time 2 in statistics. The specific Interacting Model of this study is shown in Fig. 3.

To sum up, in view of the inconsistent results or insignificant relationships of research related to enhancing the implementation of KM, this study questions the traditional assumption of the stable effects of dispositional constructs and puts forward a bold assumption that employees' EI and CI can affect longitudinally the implementation of KM processes of MNCs at different points of time. The above three models were originally built to see whether the relationship between EI/CI and a dimension of KM processes is fixed, continuous or interactive to explore the long-neglected dynamic effects of dispositional traits over time.

Fig. 3 Interacting Model of EI, CI and KM processes



Method

Procedure and samples

The samples include a selection of companies headquartered in China with subsidiaries in Malaysia, Pakistan, the Philippines, Thailand and Vietnam; all of them are part of the countries under the One Belt and Road Initiatives. The demographic population comprises the employees from MNCs, multinational organizations (MNOs), and transnational corporations (TNCs) in industries involving manufacturing, construction, communications and transportation, and business services sector according to the classification set by the National Bureau of Statistics (NBS) of China (www.stats.gov.cn/).

Due to the COVID-19 pandemic, original data was collected for analysis by questionnaire via the standardized online platform Microsoft Forms (www.microsoft.com/zh-cn/microsoft-365/online-surveys-polls-quizzes). With the assistance of the Chinese Chamber of Commerce directories, Ministry of Commerce of the People's Republic of China and the International Business Cooperation Office of Yunnan Commerce Department, there were a total of 26 corporate participants in the survey. We investigated mainly three categories of respondents: (i) parent-country nationals (PCNs) who are citizens of the country where the headquarters are located; (ii) host-country nationals (HCNs) coming from the regions or countries where the international subsidiary is managing; (iii) third-country nationals (TCNs) who are citizens of countries other than the country where the company's headquarters are located and the host country.

Before filling out the questionnaire, participants were instructed that individuals who participate in any courses or training related to EI, CI, social ability and cross-cultural interaction in the following 6 months should not take part in the survey to avoid any tampering with the results. Moreover, because of the difference between EI and CI, we understood that EI did not involve cultural factors, and decided that the participants mentioned in EI were to be set to have the same cultural background when responding to the survey. The data was measured in two waves with six-month intervals. This mainly served to minimize common method variance concerns, and a six-month lag was found to be appropriate in cross-cultural research (He et al., 2019; Şahin et al., 2014).

For data collection in the first wave, a total of 382 participants were investigated through the questionnaire link provided by the supervisors, which included all the basic features of demographic characters, with EI and CI at the individual level, and the implementation of KM processes at the organizational level. For the second wave six months later, the participants who previously completed the first survey were asked to rate KM processes again. 216 valid responses were collected at the end containing complete answers to both surveys, and the response rate was 56.54%.

Of the total 216 respondents, 72.2% were male and 27.8% were female; the majority belonged to the age group between 30 and 49 (70.8%); 19.9% had a degree below undergraduate, 44.9% had a bachelor degree, and 35.2% had a graduate degree or above; and most of them had been working for more than 1 year in their present jobs (92.6%); most of them had previous overseas experiences for more than 1 year

(88%). The demographic structure was adequate and met the requirements of the study.

Measures

The existing scales from the literature were utilized to measure EI, CI, and KM processes through a scale of 5-point Likert-type from strongly disagree (coded as 1) to strongly agree (coded as 5). All the scales can be found in an additionally provided appendix.

EI was measured with the 16-item scale developed by Wong & Law (2002). The scale contains 4 dimensions, namely self-emotion appraisal, others' emotion appraisal, regulation of emotion and use of emotion. Each dimension included 4 items. A sample item was "I am able to control my temper and handle difficulties rationally." The Cronbach's alpha reliability was 0.977.

CI was measured with the 20-item scale advanced by Ang et al. (2007). The scale contained 4 dimensions in which 4 items for meta-cognitive CI, 6 items for cognitive CI, 5 items for motivational CI and 5 items for behavioral CI. A sample item was "I check the accuracy of my cultural knowledge as I interact with people from different cultures." The Cronbach's alpha reliability was 0.949.

KM processes were measured with the 21-item scale developed by Al Ahababi et al. (2019). The scale contained 4 dimensions in which 4 items for knowledge creation, 5 items for knowledge capture and storage, 4 items for knowledge sharing and 4 items for knowledge application and use. A sample item was "Employees are encouraged to frequently participate in informal discussions to share knowledge" The Cronbach's alpha reliability of these 4 dimensions were 0.944, 0.951, 0.917 and 0.966 for the measurement at time 1; 0.945, 0.953, 0.948 and 0.946 for time 2.

Some traits were controlled to ensure the reliability of EI and CI as the key antecedents at the individual level of knowledge outcomes. First, we took employees' age, gender, education level and organizational tenure as typical dispositional traits under control (Lan et al., 2020), which had been shown to have some impact on the implementation of knowledge practices such as knowledge transferring and sharing (Bader et al., 2018; Haas & Cummings, 2015), along with cross-cultural adaptation (Ang et al., 2007; Templer et al., 2006). Then, considering the cross-cultural background of this study, previous overseas experience (i.e., number of years to be in cross-border work) was also controlled to eliminate interference with the role of CI in knowledge outcomes (Nguyen et al., 2019). Responses were coded as: gender (1 = "Male", 2 = "Female"); age (1 = "< 30", 2 = "30–39", 3 = "40–50", 4 = "> 50"); education level (1 = "Below undergraduate", 2 = "Undergraduate", 3 = "Postgraduate and above"); organizational tenure (1 = "< 1", 2 = "1–5", 3 = "6–10", 4 = "> 10"); previous overseas experience (1 = "< 1", 2 = "1–5", 3 = ">5").

At the corporate level, the firm's size was controlled, as the scale of enterprise would likely reflect a company's maturity and its attainment of KM concepts and processes (Chen et al., 2014; Donate & de Pablo, 2015). The next control factor was industry type as it would have an impact on KM. High-tech manufacturing enterprises and information service industries were our target groups due to the fact that they tended to prioritize the management of information flow inside and outside the

company (Donate & de Pablo, 2015; Li et al., 2021a, b). Responses were coded as: firm size (1 = “< 500”, 2 = “500–999”, 3 = “1000–5000”, 4 = “> 5000”); industry type (1 = “Manufacturing”, 2 = “Construction”, 3 = “Communications and transportation”, 4 = “Business services”, 5 = “Others”).

Table 1 Cultural distance between countries

Country	Malaysia	Pakistan	The Philippines	Thailand	Vietnam
Cultural distance	1.31	1.50	1.41	1.99	0.65

Table 2 Demographic information and control variables

Background Variables		Frequency	Percent
Gender	Male	156	72.2
	Female	60	27.8
Age	<30	41	19
	30–39	88	40.7
	40–50	65	30.1
	>50	22	10.2
Education level	Below undergraduate	43	19.9
	Undergraduate	97	44.9
	Postgraduate and above	76	35.2
Organizational tenure	<1	16	7.4
	1–5	69	31.9
	6–10	74	34.3
	>10	57	26.4
Previous Overseas Experience	<1	26	12
	1–5	114	52.8
	>5	76	35.2
Firm Size	<500	20	9.3
	500–999	41	19
	1000–5000	87	40.3
	>5000	68	31.5
Industry Type	Manufacturing	68	31.5
	Construction	49	22.7
	Communications and transportation	27	12.5
	Business services	53	24.5
	Others	19	8.8
Cultural Distance	1.31 (Malaysia)	90	41.7
	1.50 (Pakistan)	37	17.1
	1.41 (The Philippines)	25	11.6
	1.99 (Thailand)	37	17.1
	0.65 (Vietnam)	27	12.5

Apart from the above, the cultural distance at the national level was also controlled, as the inevitable cultural differences between the parent company and its subsidiaries in different regions may affect knowledge practices (i.e., knowledge transferring) of multinational enterprises (Phookan & Sharma, 2021). Cultural distance was used to measure the cultural differences between the host countries and the home countries (Hofstede, 2001; Zhang, 2013; Zhang & Oczkowski, 2016; Zhang et al., 2021b). It included six dimensions, namely power distance, individualism, masculinity, uncertainty, avoidance, long-term orientation and indulgence. The corresponding index could be calculated to measure the cultural distance between countries (Kogut & Singh, 1988). In this study, taking China as the anchor where the headquarters were located, the cultural distance between the two countries was calculated based on the following concrete algebraic formula:

$$CD_j = \sum_{i=1}^6 \{(I_{ij} - I_{ic})^2 / V_i\} / 6$$

where CD stands for cultural distance, I_{ij} stands for the index for the i th cultural dimension and j th host country, V_i is the variance of the index of the i th dimension, c indicates China, and CD_j is the cultural difference of the j th country from China. Given the countries in the sample of this study, the relevant cultural distances are shown in Table 1:

All the cultural indices of each country were obtained from Hofstede's cultural dimension website (www.hofstede-insights.com/product/compare-countries/). Responses of cultural distance were coded as 1 = "1.31 (Malaysia)", 2 = "1.50 (Pakistan)", 3 = "1.41 (the Philippines)", 4 = "1.99 (Thailand)", 5 = "0.65 (Vietnam)". More details are shown in Table 2.

Analytical Strategy

Aiming at exploring the long-neglected dynamic effects of dispositional traits over time, a key method, namely the three-step approach proposed by Lan et al. (2020), was employed in this study to verify the assumptions of Fixed Model, Continuous Model and Interacting Model. Due to the particularity and complication of the Interaction Model, the interacting effects between EI/CI and KM processes at time 1 on KM processes at time 2 were checked firstly. If the effect of interaction is significant, it indicates that the data supports the Interacting Model and we should stop at this Step 1 and accept the Interacting Model as is. If the effect of interaction is not significant, the assumptions of Continuous Model and Fixed Model should be tested by the next two steps. It's important to note that there is a precondition that there exist significant correlations between EI/CI and KM processes at time 1 and time 2 before proceeding to Step 2. If the precondition is met, EI/CI and KM processes at time 1 as independent variables should be regressed with the outcomes at time 2. If the dispositional construct and time 1 outcome are effective predictors, the assumption of the Continuous Model is then supported. However, if the precondition is not met, Step

3 that is to examine the direct relation between EI/CI and the KM process at time 2 should be conducted to accept or reject the Fixed Model.

Results

The correlations among the variables were tested by software named Statistical Product and Service Solutions (SPSS). The results have shown that EI and CI strongly correlated with most of the dimensions of KM, but there were no significant correlations between EI and knowledge creation at time 1 ($\beta=0.043$, $p=0.533$), knowledge creation at time 2 ($\beta=0.055$, $p=0.418$), similar was the case for CI and knowledge application and use at time 1 ($\beta=0.058$, $p=0.400$). More details such as means, standard deviations and correlations of all the variables are displayed in Table 3.

Following the three-step method, the relationships between EI/CI and four dimensions of KM processes were tested across the three models. First, we examined the interacting effects related to EI/CI and knowledge creation (KC) at time 1. In step 1, through the regression analysis of three independent variables (EI/CI, KC at time 1 and their interaction term) and KC at time 2 as the dependent construct, the results showed that there was a significant negative effect of the interaction of CI and KC at time 1 on KC at time 2 ($\beta = -0.632$, $p < 0.05$), that fitted the Interacting Model. Then, we found that EI's effect on KC didn't fit Interacting Model as the interacting effect was non-significant ($\beta = -0.258$, $p = 0.21$). Given the non-significant correlations between EI and KC at both time 1 and time 2 (see Table 3), and the required preconditions of Continuous or Fixed models, the relationship between EI and KC was found to fit none of the three models. More details are displayed in Table 4.

For knowledge capturing and storing (KCS) as the dependent construct, in step 1, we tested the effects of three independent variables (EI/CI, KCS at time 1 and their interaction term) on KCS at time 2, and found that there was no significant interacting effect of EI and KCS at time 1 on KCS at time 2 ($\beta = -0.019$, $p = 0.943$), and this finding rejected the Interacting Model; the same was true for CI ($\beta = 0.095$, $p = 0.744$). Given that EI/CI was positively correlated with KCS at time 1 and time 2 (see Table 3), which fitted the preconditions of Continuous or Fixed models, we found that CI and KCS at time 1 were positively related with KCS at time 2 in step 2 ($\beta = 0.278$, $p < 0.000$; $\beta = 0.545$, $p < 0.000$), which fell well into the Continuous Model. However, there was no significant relationship between EI and KCS at time 2 in step 2 ($\beta = 0.126$, $p = 0.064$). Proceeding to step 3, KCS at time 1 was positively related to KCS at time 2 ($\beta = 0.681$, $p < 0.001$), which fitted the Fixed Model. More details are displayed in Table 5.

For knowledge sharing (KS) as the dependent construct in step 1, we tested the effects of three independent variables (EI/CI, KS at time 1 and their interaction term) on KS at time 2, and found that there was no significant interacting effect between EI and KS at time 1 on KCS at time 2 ($\beta = -0.421$, $p = 0.089$), this finding rejected the Interacting Model; and the same was true for CI ($\beta = -0.169$, $p = 0.49$). Given that EI/CI was positively correlated to KS at time 1 and time 2 (see Table 3), meeting the preconditions of Continuous or Fixed models, we discovered that CI and KS at time 1 were positively related to KS at time 2 in step 2 ($\beta = 0.41$, $p < 0.000$;

Table 3 Means, standard deviations, and correlations

Variable	GEN	AGE	EDU	TEN	POE	FS	IT	CD	EI	CI	KC1	KCS1	KS1	KAU1	KC2	KCS2	KS2	KAU2	
1	1																		
2	-0.068	1																	
3	0.097		1																
4				1															
5					1														
6	-0.093	0.067	0.055	0.067	0.138*	1													
7	0.061	-0.073	0.043	-0.045	-0.048	0.034	1												
8	0.077	-0.04	0.036	-0.085	-0.019	-0.049	0.007	1											
9	0.035	0.167*		0.051	0.034	-0.043	0.027	0.058	1										
10	0.095			0.121	0.123	-0.088	-0.032	0.085		1									
11	-0.004	-0.016	0.037	-0.038	-0.04	-0.127	-0.011	-0.093	0.043		1								
12	0.13			0.099	0.093		-0.078	0.042				1							
13	0.097	0.161*		-0.025	0.025	-0.059	-0.021	0.012			0.167*		1						
14	-0.021	0.08		-0.091	-0.101	-0.04	0.023	-0.051	0.058	0.067				1					
15	0.065	0.036	-0.014	-0.016	-0.043	-0.119	-0.015	0.028	0.055					0.035	1				
16	0.054				0.167*	-0.068	-0.027	-0.006								1			
17	0.009			0.066	0.078		-0.057	-0.039						0.134*			1		
18	-0.043	0.108		-0.011	-0.031	-0.05	-0.005	0.049	0.143*	0.081				0.065			0.171*	1	
Mean	1.278	2.315	2.153	2.796	2.232	2.940	2.565	2.417	3.064	2.973	2.977	2.889	2.879	3.038	2.923	2.942	3.075	2.875	
S.D.	0.449	0.896	0.728	0.918	0.649	0.936	1.379	1.476	0.977	0.782	1.006	1.108	1.018	1.130	1.017	1.127	1.080	1.145	

Note: n=216. *p<0.05; **p<0.01. GEN=Gender; EDU=Education; TEN=Tenure; POE=Previous Overseas Experience; FS=Firm Size; IT=Industry Type; CD=Cultural Distance; EI=Emotional Intelligence; CI=Cultural Intelligence; KC1=Knowledge Creation at Time 1; KCS1=Knowledge Capture and Storage at Time 1; KS1=Knowledge Sharing at Time 1; KAU1=Knowledge Application and Use at Time 1.

Table 4 The results of regression analysis (KC2 as dependent variable)

variable	step1		step2		step3	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
EI	0.172	0.227				
KC1	0.845	0				
EI*KC1	-0.258	0.21				
CV	yes					
R2	0.456					
CI	0.514	0.001				
KC1	0.976	0				
CI*KC1	-0.632	0.02				
CV	yes					
R2	0.490					

Note: n=216. EI=Emotional Intelligence; CI=Cultural Intelligence; KC1=Knowledge Creation at Time 1; KC2=Knowledge Creation at Time 2; CV=Control Variables.

Table 5 The results of regression analyses (KCS2 as dependent variable)

variable	step1		step2		step3	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
EI	0.135	0.347	0.126	0.064		
KCS1	0.605	0.001	0.594	0	0.681	0
EI*KCS1	-0.019	0.943				
CV	yes		yes		yes	
R2	0.517		0.517		0.509	
CI	0.234	0.112	0.278	0		
KCS1	0.483	0.016	0.545	0		
CI*KCS1	0.095	0.744				
CV	yes		yes			
R2	0.564		0.563			

Note: n=216. EI=Emotional Intelligence; CI=Cultural Intelligence; KCS1=Knowledge Capture and Storage at Time 1; KCS2=Knowledge Capture and Storage at Time 2; CV=Control Variables.

Table 6 The results of regression analysis (KS2 as dependent variable)

variable	step1		step2		step3	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
EI	0.237	0.096	0.012	0.818		
KS1	0.894	0	0.599	0	0.601	0
EI*KS1	-0.421	0.089				
CV	yes		yes		yes	
R2	0.484		0.476		0.476	
CI	0.491	0	0.41	0		
KS1	0.532	0.002	0.42	0		
CI*KS1	-0.169	0.49				
CV	yes		yes			
R2	0.600		0.599			

Note: n=216. EI=Emotional Intelligence; CI=Cultural Intelligence; KS1=Knowledge Sharing at Time 1; KS2=Knowledge Sharing at Time 2; CV=Control Variables.

$\beta=0.42, p<0.000$), which went along well with the Continuous Model. However, there was no significant relationship between EI and KS at time 2 in step 2 ($\beta=0.012, p=0.818$). Proceeding to step 3, KS at time 1 was found to be positively related to KS at time 2 ($\beta=0.601, p<0.001$), which again suited the Fixed Model. More details are displayed in Table 6.

For knowledge application and use (KAU), we conducted the regression analysis of three independent variables (EI/CI, KAU at time 1 and their interaction term) and KAU at time 2 as the dependent construct. The results have shown that there was a significant positively interacting effect of EI and KAU at time 1 on KAU at time 2 ($\beta=0.366, p<0.05$), which fitted the Interacting Model. In spite of that, we realized that the interacting effect of CI and KAU at time 1 on KAU at time 2 was not significant. Given the non-significant correlation between CI and KAU at time 1 ($\beta=0.058, p=0.400$), and the required preconditions of Continuous or Fixed models, the relationship between CI and KAU was found to fit none of the three models. More details are displayed in Table 7.

Discussion

That the past research had assumed the effect of dispositional variables such as personality traits on outcomes as stable over time was clearly a critical omission of longitude studies. In order to explore the dynamic effects of traits over time, based on the KBV (Grant, 1996) and the recommendation by Lan et al. (2020), this study conducted a longitudinal survey by building three models (i.e., Fixed Model, Continuous Model and Interacting Model) and found that EI and CI as personality traits did have the unconventional and non-fixed impacts on KM processes measured at time 1 and time 2, which was overlooked in the past.

Table 7 The results of regression analysis (KAU2 as dependent variable)

variable	step1		step2		step3	
	β	<i>p</i>	β	<i>p</i>	β	<i>p</i>
EI	0.249	0.014				
KAU1	0.323	0.005				
EI*KAU1	0.366	0.046				
CV	yes					
R2	0.791					
CI	0.087	0.447				
KAU1	0.816	0				
CI*KAU1	0	0.999				
CV	yes					
R2	0.697					

Note: $n=216$. EI=Emotional Intelligence; CI=Cultural Intelligence; KAU1=Knowledge Application and Use at Time 1; KAU2=Knowledge Application and Use at Time 2; CV=Control Variables.

Theoretical implications

First, EI and CI were selected as the key dispositional traits of individuals within cross-border tasks in a restrictive context of COVID-19 and under the continuous trend of economic globalization. Elements of such enriched our research related to the non-fixed effects of dispositional constructs. Although EI and CI have indeed been studied as a developable capability by many researchers (e.g., Li et al., 2021a, b; Shafait et al., 2021a, b; Stoermer et al., 2021), it should be noted that dispositional constructs such as personality traits have both stable and developable sides. To be specific, with the development of information technology and the openness of today's world, many abilities related to basic established characteristics of individuals can still be enhanced through learning and training, but the inherent stable sides of EI and CI that do not necessarily change in a short period of time (Decker et al., 2009). Thus, this study has confirmed the non-fixed impacts of EI/CI's trait side and supported the longitudinal view on events happening and changing over time.

Second, in order to verify the neglected effects of dispositional constructs, EI was investigated to examine its longitudinal impact on each KM process of MNCs to contribute to the overall EI and KM literature. This study found that the longitude effects of EI on knowledge capturing, storing and sharing fitted the Fixed Model, which was an indication that the roles of EI in the two knowledge practices were quite stable in time waves, thus consistent with previous studies (e.g., Rivera-Vazquez et al., 2009; Shariq et al., 2019; Tuan, 2016). However, EI was also found to moderate positively the relationship between knowledge application and use at time 1 and time 2. Part of the reason was that the successful application of knowledge helped to consolidate existing processes and systems, and encouraged employees to apply useful proposals/ideas to solve problems (Al Ahbabi et al., 2019). While individuals with higher EI may drum up greater encouragement to draw on experiences after the successful application of knowledge, it in return contributes to the degree of knowledge use in the later stage.

Third, within the context of complex cross-cultural scenarios, this study also investigated the relationships between CI and each KM process measured in two points of time to fill up the gap of longitudinal research of CI and KM. This study came up with the finding that the longitude effects of CI on knowledge capturing, storing and sharing fitted Continuous Model. That is, although CI was conducive to recognizing, capturing, and sharing information (e.g., Berraies 2019; Charoensukmongkol, 2016; Chen & Lin, 2013), the context between the two-time waves caused fluctuations in the role of CI, leading to different but significant effects of CI on knowledge capture, storage and sharing at various times. Consequently, CI moderated negatively the relationship between knowledge creation at time 1 and time 2. The reason for the unexpected negative moderating effect may lie in the fact that individuals with a higher level of CI which facilitates better adaption to a new culture (Ang et al., 2007), will decrease the probability of the emergence of innovative and creative ideas to some extent, thus weakening the positive relationship between the creation and implementation of knowledge at the two-time points.

Practical implications

This study has several practical contributions as follows. Firstly, for academic researchers, this study has provided empirical supports and a method of building Fixed, Continuous and Interacting Models to re-examine the effects of dispositional constructs over time. Although there have been longitudinal empirical studies on personality traits such as measuring EI at first and the outcomes at other times (e.g., Cheng et al., 2012; Gupta et al., 2017; Levillain et al., 2021), there are few conclusive discussions to clarify the specific impact mechanism. This survey suggested that researchers, especially of applied psychology and management, should be more careful in conceptualizing the impact of a dispositional variable on individual attitude or behavior. Later scholars can leverage on these three models to further our understanding of the multi-stage relations or clarify the mixed results. Managers of MNCs should be aware that the role of employees' EI/CI measured at a fixed time (e.g., at the time of recruitment) in promoting KM practices and even task performance may change over time and in any given situation. Thanks to the positive fixed effects of EI on knowledge capture, storage and sharing, managers of MNCs should pay attention not only to the selection of higher-level EI personnel but also to their training.

Secondly, the continuous relationships between CI and knowledge capture, storage and sharing at two times reflect that the role of CI will change over time due to the fluctuation or the impact of organizational contexts and situations. Managers should pay attention to the psychological changes of employees over time, and other interference factors such as salary increase and reward (Lan et al., 2020), and even the pressure and insecurity caused by COVID-19. In addition, more pre-departure training is needed for individuals participating or assigned from low to high cultural distance contexts to circumvent the potential influence of culture shock.

Thirdly, EI is beneficial to the application of knowledge at the later stage promoted by using knowledge in the first stage, while CI is not conducive to sustainable knowledge creation, meaning that executives ought to allocate adequate resources according to the current knowledge management practices required by enterprises.

Last, the relationships between EI and knowledge creation as well as CI and knowledge use fitted none of the three models, the reason might be that the changing working environment or context can strengthen, weaken, or disturb these relations over time. As such, enterprises would better promote these KM practices through other channels to avoid possible failure or higher costs of cross-border tasks.

Limitations and future directions

This study only discussed the effects of EI and CI without considering the combined impact of the two. For instance, Takeuchi et al. (2019) discussed the impact of the combination of different degrees of international, job and organizational experience of expatriates on their performance at different times. Future research can further investigate a four-quadrant combination of EI and CI involving high EI – high CI, high EI – low CI, low EI – high CI and low EI – low CI. In addition, more dispositional constructs such as the more stable Big Five personality (Barrick & Mount,

1991) or adversity quotient (AQ) (Stoltz, 1997), can be considered for future research to explore whether the unfixed impact of these traits is universal.

There were only two points of time set in this longitudinal survey, which may raise questions about the stability of dispositional traits and the accuracy of their longitudinal effects. There were studies involving measurement of the outcomes in three times (Levillain et al., 2021), or even four times (Takeuchi et al., 2019). Therefore, future research can extend the time of longitudinal investigation, increasing the number of measurements of outcomes, assessing the relationships in multiple stages to come to more accurate conclusions.

This paper demonstrated whether the unfixed roles of EI and CI in KM processes match the Fixed, Continuous or Interactive Models, but did not elaborate which contexts affect the strengths or weaknesses of these relations. Salary, kudos, rewards, task-related changes may very likely affect the individual's attitude and behavior (Lan et al., 2020) and psychological stress, depression and insecurity caused by COVID-19 may also be part of the factors. Future research and investigations can further clarify the contexts or backgrounds to elaborate the influence mechanism.

Conclusions

Aiming at exploring whether the effects of dispositional constructs on the outcomes measured at different times are stable, this study established Fixed, Continuous and Interacting Models based on KBV to investigate longitudinal impacts of EI and CI as the key personality traits on different dimensions of KM processes, and found that EI and CI as dispositional variables had the unconventional and non-fixed impacts on KM practices over time. Specifically, we found EI - knowledge capture and - knowledge sharing fitted Fixed Model; CI - knowledge capture and - knowledge sharing fitted Continuous Model; EI – knowledge application and CI – knowledge creation fitted the Interacting Model. All these findings led us to a conclusion that the traditional assumption of conceptualizing the effects of dispositional variables as fixed should be re-examined and also, they provided empirical and statistical evidences for future scholarly research as well as management suggestions for the MNCs implementing KM practices.

Funding This study was supported by the National Natural Science Foundation of China (Award Nos.: 71,762,033, 72,071,176 and 71,663,058) and the National Social Science Foundation of China (Award No.: 17BGJ036). The assistance of Elizabeth Dunlop from CSU of Australia, Dr. Li Shen from Juniata in America and Professor Kostis Konstantinos from the University of Greenwich in the UK is gratefully acknowledged.

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