

Realising the value of knowledge resources and capabilities: an empirical study

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Abstract

Purpose – Drawing upon the resource-based view of the firm, this paper aims to develop and empirically validate a model that examines the relationships between technical knowledge management infrastructure (TKMI), social KM infrastructure (SKMI) and competitive advantage provided by KM (CAPKM). The authors argue that KM process capabilities account for the direct effects of TKMI and SKMI on CAPKM.

Design/methodology/approach – The study used partial least squares—structural equating modelling (SEM) to empirically test the hypotheses using a sample of 251 firms from an emerging economy. The results were then confirmed using the bias-corrected bootstrap procedure. The study also conducted two robustness checks including examining a competing moderation model and performing fuzzy-set qualitative comparative analysis (fsQCA), a set-theoretic method that examines how causal conditions combine into all possible configurations of binary states to explain the desired outcome.

Findings – The findings show that TKMI and SKMI have positive effects on CAPKM. In addition, KM process capabilities mediate the direct effects of TKMI and SKMI on CAPKM.

Originality/value – This paper complements and advances previous research in several ways. Firstly, the paper develops a conceptual model that depicts the interrelationships between TKMI, SKMI, KM process capabilities and CAPKM. Secondly, this paper suggests the critical role of the “action” component (i.e. KM process capabilities) that capitalises on the KM resources in the creation of CAPKM.

Keywords Competitive advantage provided by knowledge management, KM process capabilities, Social knowledge management, Technical knowledge management

Paper type Research paper

1. Introduction

The knowledge management (KM) literature makes it clear that KM outcomes associated with competitive advantage are based on three separate but highly complementary factors. These factors include technical KM infrastructure (TKMI), social KM infrastructure (SKMI) and KM process capabilities. TKMI refer to technological resources that enable and support KM processes in an organisation. Leonard-Barton (1995) and Grant (1996) propose that the technological dimensions that are part of effective KM include business intelligence, collaboration, distributed learning, knowledge discovery, knowledge mapping, opportunity generation and security. Recent research on TKMI (Mills and Smith, 2011), however, recommend collaboration, distributed learning and knowledge mapping as the three major dimensions of TKMI. SKMI refers to the role of KM infrastructure elements from social perspectives that stimulate KM activities in an organisation. A broad range of these factors have been identified in the literature such as organisational structure, organisational culture, leadership, people and KM strategy (Gold *et al.*, 2001; Lee and Choi, 2003; Migdadi, 2005; Zheng *et al.*, 2010). KM process capabilities refer to the ability of firms in

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“acquiring knowledge, converting it into a useful form, applying or using it, and protecting it” (Gold *et al.*, 2001, p. 190). Various perspectives of KM processes identified in the literature include discover/generate/create/acquire, capture, codify, coordinate/collaborate, accumulate/integrate, transfer, store, share, access, represent, use/apply and deploy/exploit (Mageswari *et al.*, 2017; Pentland, 1995; Wu and Chen, 2014; Zaim *et al.*, 2007). However, there is growing consensus in the knowledge management literature that KM process capabilities is a composite construct that captures a firm’s ability in four facets: knowledge acquisition, conversion, application and protection (Gold *et al.*, 2001; Mills and Smith, 2011; Granados *et al.*, 2017).

Despite the theoretical and practical importance of KM resources (i.e. TKMI and SKMI) and KM process capabilities, the KM literature is limited in terms of two aspects. Firstly, previous research has largely focused on narrow conceptions of KM resources and capabilities and examined them in isolation focusing on either KM resources or KM capabilities (Gold *et al.*, 2001; Ashrafi and Mueller, 2015; Andreeva and Kianto, 2012; Byrd and Turner, 2001a, 2001b; Chuang, 2004; Lee and Choi, 2003). While resources may serve as the basic unit for analysing how firms achieve competitive advantage, firms’ competitive advantage result from their ability to integrate resources that complement one another to create organisational capabilities (Bharadwaj, 2000). Indeed, the RBV advocates that “resources are static, and the potential value of resources is realised by way of resource deployment competencies, which are how firms capitalise on resources to effect superior performance” (Ngo and O’Cass, 2012, p. 863). As such, in the current study, we propose that KM resources and capabilities may not contribute to firm performance in isolation but the performance impact of KM resources and capabilities rests on their complementarity.

Secondly, the extant literature seems to agree conceptually that KM resources (e.g. TKMI and SKMI) should contribute to a firm’s competitive advantage. However, empirical results provide only mixed support. For example, Powell and Dent-Micallef (1997) and Chuang (2004) find that TKMI is not significantly related to competitive advantage, but others find that TKMI and SKMI are positively related to competitive advantage (Andreeva and Kianto, 2012; Byrd and Turner, 2001a, 2001b). As such, resource-based view (RBV) researchers have raised doubts about the unquestioning focus that firms may place on their resources in that “strategic resources only have potential value, and that realizing this potential requires alignment with other important organizational elements” (Ketchen *et al.*, 2007, p. 962).

Thirdly, as most extant research on KM infrastructure, processes and capabilities has been conducted in Western developed countries such as the USA (Gold *et al.*, 2001; Zheng, 2005), Australia (Migdadi, 2005) and newly industrialised Asian economies such as Taiwan (Chuang, 2004), Hong Kong (Khalifa *et al.*, 2001; Khalifa and Liu, 2003) and Korea (Choi and Lee, 2002, 2003; Lee and Choi, 2003), the role of these factors in other contexts, such as transitional economies (e.g. Vietnam), is still unclear. Transitional economies experience unprecedented changes in their economic, social and legal system as a consequence of their transition from central systems to market systems (Child and Tse, 2001). Yet, given the limited research in this area, how KM resources and KM process capabilities work together towards achieving superior competitive advantage still remains largely unknown (Gimenez and Rincon, 2003). To examine the interrelationship among KM resources and KM process capabilities and their impact on competitive advantage, transitional economies (e.g. Vietnam) offer a unique opportunity to test the existing KM theories and to build new ones.

Our paper is structured as follows. In Section 2, by reviewing the extant literature, we establish the theoretical relationship between TKMI, SKMI, KM process capabilities and competitive advantage, and present the related hypotheses. Then, while Section 3 introduces the research methodology, Section 4 discusses the analytical procedure and report findings. Finally, we close by discussing the results in Section 5, and highlighting implications for managerial practice and conclusion in Section 6.

2. Theoretical background and model development

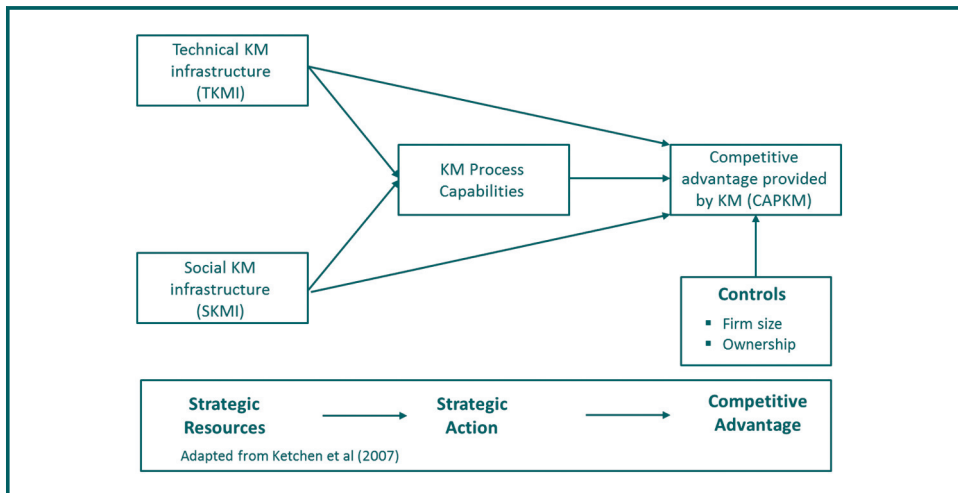
The RBV is a long-standing theory, which has its foundations in strategic management. RBV asserts that firms attain competitive advantage based on unique resources that remain valuable, rare, inimitable and non-substitutable by other resources (Barney, 1991; Conner, 1991; Schulze, 1992). The fundamental assumption underlying the RBV is that resources are heterogeneously dispersed across different firms and the differences between these firms based on the resources remain steady over time (Barney, 1991). Scholarly research on the RBV tends to define and classify resources broadly to include assets, knowledge, capabilities and firm processes (Bharadwaj, 2000). However, Grant (1991) distinguishes between resources and capabilities by classifying resources into tangible, intangible and human-based resources. While tangible resources refer to financial capital and assets such as equipment, plants and raw materials, intangible resources include firm reputation, brand image, as well as product quality. Human-based resources include technical know-how and other knowledge assets such as organisational culture and employee training.

While resources remain the basis for which competitive advantage may be achieved, competitive advantage can be created by firms based on their ability to integrate resources that complement one another to create organisational capabilities (Bharadwaj, 2000). Therefore, organisational capabilities involve firms' ability to integrate and use valuable resources which complement one another (Amit and Schoemaker, 1993; Russo and Fouts, 1997; Schendel, 1994). From this perspective of resources and capabilities, KM remains central to the identification of what resources are, and how their integration and utilisation as complement create organisational capabilities that can lead to competitive advantage (Hedlund and Nonaka, 1993).

The pivotal role of KM in facilitating competitive advantage from resources and capabilities include KM infrastructure and KM processes (Gold *et al.*, 2001). While KM infrastructure can be technical or social (Lee and Choi, 2003), social KM infrastructural resources may include organisational structure, organisational culture and people resources (Chuang, 2004; Lee and Choi, 2003). Gold *et al.* (2001) consider KM infrastructure to include organisational structure, organisational culture and technology resources. The conflicting considerations of the organisational structure, organisational culture and people and technical resources obfuscate the understanding of how these resources clearly relate to competitive advantage. This obfuscation suggests that although a consideration of how social and technical KM infrastructural resources affect competitive advantage as distinct constructs remains compelling, the *modus operandi* through which they contribute to competitive advantage cannot be discounted.

The extant literature on the role of KM process capability is equivocal and inconclusive. While some studies consider KM process capability as an independent variable (Gold *et al.*, 2001), others theorise this construct as a mediator (Tanriverdi, 2005), and moderator (Chuang, 2004), which makes it imperative to further clarify the role of KM process capability in the linkage between KM resources and competitive advantage. In the current study, we position KM process capability as the mediator in the relationship between KM resources and competitive advantage. We propose that KM process capability is the salient mechanism in transforming TKMI and SKMI into competitive advantage. Understanding how TKMI and SKMI are transformed into competitive advantage through KM process capabilities may shed light on salience of this mechanism. Our position is in line with an RBV framework in that Ketchen *et al* (2007, p. 962) suggest that resources “allow the firm to do a better job of taking strategic actions [e.g. capabilities] [...] that capitalise on the resources [to create] a competitive advantage”. We build our conceptual model based on this important argument (see Figure 1).

Figure 1 Theoretical framework



2.1 Knowledge management and competitive advantage provided by knowledge management

Competitive advantage is derived from the assets and resources that constitute a firm (Barney, 1991; Peteraf, 1993; Dierickx and Cool, 1989). However, while many executives concern themselves with acquisition, accumulation and aggregation of assets as a way to create competitive advantage, many forget the power that knowledge and information provide in the marketplace. In this respect, it has been shown information is a clear source of competitive advantage (Porter and Millar, 1985; Altinay et al., 2014). Despite that, competitive advantage is a complex, multidimensional construct that can be construed in many ways depending on context. Previous research has examined a construct, namely, competitive advantage provided by information systems (CAPIS) “to measure the contribution of all the IS to competitive advantage in an organization” (Byrd and Turner, 2001a, p. 22). In line with this stream of research, we examine competitive advantage provided by knowledge management (CAPKM). In particular, we draw upon that of Byrd and Turner (2001b), who posit competitive advantage includes four dimensions: innovativeness, market position, mass customisation and inimitability. For knowledge and information to provide competitive advantage, it is within reason that a firm’s knowledge management capabilities must also link with these four dimensions. Because of this, we look at the research by Chuang (2004) as one of the key relevant studies in which a four-item measure was developed to assess CAPKM based on the dimensions outlined by Byrd and Turner (2001b). The findings presented by Chuang (2004) indicate a clear link between a firm’s knowledge management and competitive advantage in the marketplace.

2.2 Technical knowledge management infrastructure capabilities and competitive advantage provided by knowledge management

Building upon the resource-based view, information technology (IT) alone does not generate sustainable competitive advantage owing to possible imitation by competitors (Ross et al., 1996; Powell and Dent-Micallef, 1997). To be strategically competitive, businesses must use technologies to leverage or exploit other firm-specific, intangible resources such as organisational leadership, culture, human resource and business processes (Clemons and Row, 1991; Henderson and Venkatraman, 1993). Using technology to leverage other resources in the organisation is deeply rooted in the firm’s ability to integrate IT resources that complement one another to create organisational

capabilities that lead to competitive advantage (Grant, 1991). For instance, previous research finds that the integration of IT practices of KM into organisational activities and systems has a direct relationship with firm competitive advantage (Andreeva and Kianto, 2012). Additionally, if such IT practices involve flexible IT infrastructure, it makes the organisation more responsive and agile and enhances the firm's capabilities to create competitive advantage (Byrd and Turner, 2001a, 2001b). The relationship between IT infrastructure and competitive advantage becomes even stronger when the firm assembles and develops high level IT personnel knowledge and skill (Byrd *et al.*, 2005). Accordingly, there is a reasonable justification to believe that TKMI will have a direct impact on firm competitive advantage provided by KM. Thus, we hypothesise the following:

H1. TKMI has a positive effect on CAPKM.

2.3 Social knowledge management infrastructure capabilities and competitive advantage provided by knowledge management

According to Lee and Choi (2003), organisations with strong social knowledge management resources, including culture, structure and people, are able to integrate the knowledge management and business planning processes more effectively, develop reliable and innovation applications that support the business needs of the firm faster than competition and predict future business needs of the firm and innovate valuable new product features before competitors. Gold *et al.* (2001) also posit that the social infrastructure of culture, structure and people typically evolve over long periods through the sustainability of organisational operations. While each of these resources is difficult to acquire and complex to imitate (Barney, 1991), firms that achieve competitive advantage through KM have also learned to combine their resources effectively to create overall social infrastructure capabilities (Grant, 1991). According to the RBV, when firms possess valuable resources which become difficult for other firms to imitate, it offers firms the capabilities to create a sustainable competitive advantage (Barney, 1991; Chuang, 2004). Thus, we hypothesise that:

H2. SKMI has a positive effect on CAPKM.

2.4 Knowledge management process capabilities and competitive advantage provided by knowledge management

Gold *et al.* (2001) conceptualise KM process capabilities as a composite construct that has four dimensions including knowledge acquisition, conversion, application and protection. Knowledge acquisition process involves an organisation's ability to accumulate relevant knowledge for its operational activities by recognising and obtaining such knowledge from both internal and external sources. Knowledge conversion, however, refers to the organisation's ability to sort, structure, synchronise and allocate knowledge according to common themes to reduce redundancy, increase consistency and boost efficiency in terms of usefulness. Knowledge application involves activities that enable the organisation to use knowledge effectively in creating value. Knowledge protection refers to the activities that enable the organisation to guard against illegal or inappropriate use of knowledge. The impact of KM processes on organisational performance outcomes remains well-established in the literature. In particular, previous research finds a positive relationship between KM processes, either as a multidimensional construct (Gold *et al.*, 2001; Zaim *et al.*, 2007) or unidimensional variables (Mills and Smith, 2011) and organisational performance. The current state of the literature is lacking because no detailed explanations are offered as to how and why KM process capabilities matter in the relationship between KM resources and competitive advantage.

The contribution of knowledge management processes in gaining and sustaining competitive advantage has been conceptually discussed in the extant literature. Chakravarthy *et al.* (2005, p. 305) posit that while "the characteristics of knowledge are

primarily valuable for defending existing advantages, the processes it uses to accumulate and leverage knowledge have greater implications for creating new sources of advantage". Each of the three knowledge management activities plays a distinctive role in providing firms a competitive advantage: knowledge leverage is necessary for growth, knowledge accumulation to ensure that this growth is profitable and knowledge protection to sustain this profitable growth. On the basis of the dynamic capability-based approach, [Nielsen \(2006\)](#) also demonstrates a connection between knowledge management processes with the three key dynamic capabilities of development, (re)combination and use of knowledge, enabling firms to achieve and sustain a competitive advantage in a dynamic marketplace ([Eisenhardt and Martin, 2000](#); [Hamel and Prahalad, 1996](#); [Powell and Snellman, 2004](#); [Verona and Ravasi, 2003](#); [Winter, 2003](#)).

For instance, [Tanriverdi \(2005\)](#) found that the infrastructure, strategy making processes, human resource management processes and vendor management processes, which constitute the IT relatedness of the firm's business units, enhance KM capabilities across the units of the firm and, in turn, lead to superior firm performance. Moreover, [Zheng et al. \(2010\)](#) find that KM effectiveness mediate between organisational structure, organisational culture and organisational strategy on one side and measures associated with firm's competitive advantage on the other side. Such findings on KM capabilities bear ample testimony of the potential mediation role of KM process capabilities between social and TKMI and firm competitive advantage.

From the perspective of technology assimilation, IT must be infused and diffused into business processes to enhance organisational performance ([Cooper and Zmud, 1990](#); [Fichman and Kemerer, 1997](#); [Khalifa and Liu, 2003](#)). In the context of KM, therefore, the technical infrastructure capabilities should become the enabler of process capabilities to improve its indirect effect on a firm's competitive advantage ([Nguyen and Neck, 2008](#)). The role of how IT enhances KM processes has been broadly discussed in the KM literature ([Alavi and Leidner, 2001](#); [Alavi and Tiwana, 2005](#); [Davenport and Prusak, 1998](#); [Khalifa and Liu, 2003](#); [Sher and Lee, 2004](#); [Zack, 1999](#)). Moreover, the ability of such an enhancement of KM processes by IT infrastructure and the impact of KM process capabilities on competitive advantage has been established in the literature ([Chuang, 2004](#); [Gold et al., 2001](#); [Tanriverdi, 2005](#)). Accordingly, we hypothesise the following:

H3. KM process capabilities mediate the relationship between TKMI and CAPKM.

[Gold et al. \(2001\)](#) argue that social capital theory stresses the importance of infrastructure elements, enabling maximisation of social capital by providing a mechanism for social interaction of individuals as the basis for KM. Knowledge, or intellectual capital, is created through the process of exchange and combination that occurs within this social network of an organisation ([Nahapiet and Ghoshal, 1998](#)). Closely tied to the theory of social capital, the knowledge-based theory of the firm also highlights the effective means of coordinating individuals' activities within the firm and integrating their knowledge ([Grant, 1996](#); [Lopez, 2005](#)). This is where the role of organisational infrastructure elements comes into play to effectively manage the firm's knowledge ([Gold et al., 2001](#)).

The ability of social knowledge infrastructure capabilities to stimulate and improve KM process capabilities has been supported by many researchers such as [Zander and Kogut \(1995\)](#), [Szulanski \(1996\)](#), [Hansen \(1999\)](#) and [Appleyard \(1996\)](#). Additionally, the impact of the improved KM process capabilities by SKMI capabilities on firm competitive advantage has been established in the literature by findings in various studies such as [Chuang \(2004\)](#), [Gold et al. \(2001\)](#), [Tanriverdi \(2005\)](#) and [Zheng et al. \(2010\)](#). Accordingly, a reasonable justification exists for us to believe that KM process capabilities will mediate the relationship between SKMI capabilities and firm competitive advantage. Therefore, we hypothesise the following:

H4. KM process capabilities mediate the relationship between SKMI and CAPKM.

3. Research methodology

3.1 Samples and procedure

To test our model, we collected data from firms in Vietnam. The Vietnamese economy has shown remarkable performance with its steady growth over the last ten years (Meschi *et al.*, 2016). As an emerging economy, Vietnam offers a rich setting to examine how knowledge resources and knowledge capabilities are capitalised into competitive advantage. We prepared the measurement instrument initially in English and then translated into Vietnamese. We checked it for accuracy by using back translation process (Brislin *et al.*, 1973). We used a sample of 1,000 firms selected randomly from a mailing list of the 2000 Business Directory issued by the Vietnamese Chamber of Commerce and Industry. The sampled firms were located in HoChiMinh City and Hanoi, the two biggest cities of Vietnam. These firms span diverse ownership types (e.g. state-owned, private, international joint venture and foreign wholly owned). With the help of a national research firm, we selected a senior manager (e.g. managing director, marketing manager, financial manager and R&D manager) in each firm in the sampled list as the key informant. A questionnaire packet, included cover letter, stamped return envelope and questionnaire was sent to 1,000 senior managers via mail, followed up by 2 reminders to increase the response rate. In the cover letter, we informed the respondents of the academic purpose of the research project, the confidentiality of their responses and promised them a summary report in return for their participation.

We applied pairwise deletion method of missing cases and received 251 useable responses, producing an acceptable response rate of 25.1 per cent and satisfying the minimum ratio of 5:1 between the number of cases and parameters in the study (Hair *et al.*, 2006; Kline, 1998). Table I shows the demographic profile of respondents. In total, 68.92 per cent of the respondents were male and 31.08 per cent were female, which reflects the male dominance in senior management positions of Vietnamese companies. Most respondents were in the ages of 31-to-40 (43.03 per cent), followed by 41-to-50 (23.11 per cent), less than 30 years of age (21.91 per cent) and older than the age of 50 (11.95 per cent). This pattern may imply a tendency of encouraging new blood in the management teams of Vietnamese companies. Most respondents had tenure ranging from 3-5 years (31.08 per cent) and 6-10 years (31.08), followed by 11-20 years (21.12 per cent), 1-2 years (10.36 per cent) and longer than 20 years (6.36 per cent). All respondents held at least a bachelor degree, of which 27.89 per cent were managing directors, 25.10 per cent were from marketing, 15.14 per cent were financial managers, 10.36 per cent were from R&D, 8.37 per cent were from production, 5.98 per cent from HR, 3.97 per cent from project management and 3.19 per cent from IT. The respondents' company profiles were analysed on their size, types of ownership and basic categories of industry. The largest proportion of participating firms were local private-owned (58.17 per cent), employing less than 300 employees (81.27 per cent) and operated in the service industry (62.15 per cent). Only a small percentage was international joint-venture and foreign wholly owned enterprises (8.37 and 7.1. per cent, respectively). The result of cross-tabulation analysis shows that a majority of the state-owned companies were of larger size and operated in the manufacturing sector, while the service industry consisted of smaller-sized and private-owned companies.

3.2 Measures of constructs

We used previously developed and well-established scales to measure the focal constructs of the proposed theoretical model. All multi-item constructs were measured with a seven-point Likert scale (1 – strongly disagree; 7 – strongly agree), as shown in Table II. We measured TKMI as a formative first-order construct with a four-item scale, borrowed from Mills and Smith (2011). We asked managers to respond to the use of technology in operational activities throughout the firms. Following Gold *et al.* (2001), McDermott and O'Dell (2001) and Lee and Choi (2003), we measured SKMI as a formative first-order, reflective second-order construct with a

Table I Demographics of the respondents

<i>Demographics</i>	<i>Frequency (n = 251)</i>	<i>(%)</i>
<i>Gender</i>		
Male	173	68.92
Female	78	31.08
<i>Age</i>		
<30	55	21.91
31-40	108	43.03
41-50	58	23.11
>50	30	11.95
<i>Job title</i>		
Managing director	70	27.89
Financial manager	38	15.14
Marketing manager	63	25.10
Production manager	21	8.37
R&D manager	26	10.36
IT manager	8	3.19
HR manager	15	5.98
Project manager	10	3.97
<i>Education</i>		
Bachelor's degree	180	71.71
Master's degree	58	23.10
Doctor's degree	13	5.179
<i>Tenure</i>		
1-2 years	26	10.36
3-5 years	78	31.08
6-10 years	78	31.08
11-20 years	53	21.12
>20 years	16	6.36
<i>Ownership</i>		
State-owned	62	24.70
Private	146	58.17
International joint venture	21	8.37
Foreign wholly owned	18	7.17
Other	4	1.59
<i>Firm size (number of employees)</i>		
<50	45	17.93
50-199	112	44.62
200-299	47	18.73
300-499	17	6.77
>500	30	11.95
<i>Sector</i>		
Manufacturing	95	37.85
Service	156	62.15

16-item scale, reflecting 3 dimensions – structural infrastructure (7 items), cultural infrastructure (4 items) and people infrastructure (5 items). On the basis of [Gold et al. \(2001\)](#) and [Inkpen \(1996\)](#), we measured KM process capabilities as a formative first-order, reflective second-order construct with a 26-item scale, reflecting four dimensions – acquisition process (6 items), conversion process (6 items), application process (7 items) and protection process (7 items).

Competitive advantage provided by knowledge management (CAPKM) was captured by a four-item scale based on the work of [Byrd and Turner \(2001b\)](#) and [Chuang \(2004\)](#). Four single

Table II Scale items and latent variable evaluation

<i>Construct and items</i>	<i>Weight</i>
<i>Technical KM infrastructure (TKMI)</i>	
My organisation uses	
technology that allows employees to collaborate with other persons outside the organisation	0.13
technology that allows people in multiple locations to learn as a group from a single source or at a single point in time	0.29
technology that allows people in multiple locations to learn as a group from a multiple source or at multiple points in time	0.09
technology that allows it to map the location (e.g. an individual, specific system or database) of specific types of knowledge	0.86
<i>Social KM infrastructure (SKMI)</i>	
<i>Structural infrastructure (SI)</i>	
My organisation ('s)	
structure facilitates the discovery of new knowledge	0.21
structure facilitates the creation of new knowledge	0.06
bases our performance on knowledge creation	0.09
has a standardised reward system for sharing knowledge	0.09
designs processes to facilitate knowledge exchange across functional boundaries	0.01
managers frequently examine knowledge for errors/mistakes	0.60
structure facilitates the transfer of new knowledge across structural boundaries	0.23
<i>Culture infrastructure (CI)</i>	
In my organisation,	
employees understand the importance of knowledge to corporate success	0.41
high levels of participation are expected in capturing and transferring knowledge	0.24
on-the-job training and learning are valued	0.29
senior management clearly supports the role of knowledge in our firm's success	0.34
<i>People infrastructure (PI)</i>	
My organisation's members	
can understand not only their own tasks but also others' tasks	0.14
can make suggestions about others' tasks	0.14
can communicate well not only with their department members but also with other department members	0.38
are specialists in their own field of expertise	0.59
can perform their own task effectively without regard to environmental changes	0.06
<i>KM process capabilities (KMPC)</i>	
<i>Acquisition process (AP)</i>	
My organisation	
has processes for acquiring knowledge about our customers	0.38
has processes for generating new knowledge from existing knowledge	0.30
has processes for acquiring knowledge about our suppliers	0.11
has processes for distributing knowledge throughout the organisation	0.37
has processes for acquiring knowledge about new products/services within our industry	0.08
has processes for exchanging knowledge between individuals	0.44
<i>Application process (APP)</i>	
My organisation	
has processes for using knowledge in development of new products/services	0.31
has processes for using knowledge to solve new problems	0.10
matches sources of knowledge to problems and challenges	0.17
uses knowledge to improve efficiency	0.03
uses knowledge to adjust strategic direction	0.21
is able to locate and apply knowledge to changing competitive conditions	0.13
takes advantage of new knowledge	0.41

(continued)

Table II

<i>Construct and items</i>	<i>Weight</i>
<i>Conversion process (CP)</i>	
My organisation	
has processes for filtering knowledge	0.33
has processes for transferring organisational knowledge to individuals	0.25
has processes for absorbing knowledge from individuals into the organisation	0.25
has processes for integrating different sources and types of knowledge	0.03
has processes for organising (store/file) knowledge	0.03
has processes for replacing outdated knowledge	0.43
<i>Protection process (PP)</i>	
My organisation	
has processes to protect knowledge from inappropriate use inside the organisation	0.38
has processes to protect knowledge from inappropriate use outside the organisation	0.05
has processes to protect knowledge from theft from within the organisation	0.16
has processes to protect knowledge from theft from outside the organisation	0.05
has extensive policies and procedures for protecting trade secrets	0.02
values and protects knowledge embedded in individuals	0.19
clearly communicates (create awareness of) the importance of protecting knowledge	0.47
<i>Competitive advantage provided by KM (CAPKM)</i>	
My organisation often uses knowledge-based innovation	0.61
My organisation's market position can strong barriers to entry for other firms	0.03
My organisation uses knowledge management to widen the array (line/range) of products without increasing costs	0.31
The knowledge management capability in my organisation would be difficult and expensive for rivals to duplicate	0.33
Notes: KM – knowledge management; TKMI and CAPKM are formative first-order constructs; SKMI and KMPC are formative first-order, reflective second-order constructs (Type III model)	

items associated with innovativeness, market position, mass customisation and being difficult to duplicate. Despite its drawbacks (Hair *et al.*, 2010), the use of single-item indicators in structural equation models (SEM) in marketing research is not uncommon (Petrescu, 2013). Previous research recommends the use of single-item indicators when multiple items cannot be obtained. Innovativeness is “internally-focused and competitive-advantage seeking as it encourages openness to new ideas and cultivates internally-based capabilities to adopt new ideas, processes, or products successfully” (O’Cass and Ngo, 2007, p. 870). Relative market position is also of paramount importance for competitive advantage. Firms can erect strong barriers to entry for their rivals by building and deploying knowledge into favourable market position (Hult *et al.*, 2006). Mass customisation is another important dimension of competitive advantage. Indeed, firms competing in rapidly changing business environments should be able to use and integrate KM system for recognising the customers’ preference timely and design the products and services accordingly (Gu *et al.*, 2017; Kotha, 1995). Finally, building KM systems that are rare, valuable, non-substitutable and imperfectly imitable is essential for competitive advantage. Such KM systems make it difficult and expensive for rivals to duplicate (Byrd and Turner, 2001b; Table III).

Table III Construct means, standard deviations and correlations

<i>Research constructs</i>	<i>Mean</i>	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>
Technical KM infrastructure (TKMI)	4.84	1.01			
Social KM infrastructure (SKMI)	5.37	0.75	0.49		
KM process capabilities (KMPC)	5.49	0.77	0.43	0.72	
Competitive advantage provided by KM (CAPKM)	5.26	1.00	0.30	0.60	0.71
Note: Correlation is significant at the 0.01 level (two-tailed <i>t</i> -test)					

4. Analysis and results

4.1 Common method bias

In the current study, we used cross-sectional data to test the proposed theoretical model using a single-informant approach. As such, common method bias effects may lead to spurious relationships among the variables (Podsakoff *et al.*, 2003). Therefore, we applied the following statistical remedies to test for common method bias. We conducted the marker variable technique (Lindell and Whitney, 2001), using gender as a marker variable. The average absolute correlation between gender and all other constructs in our model was 0.05 (*rm*). The average difference between the correlations among all constructs in the model after partialing out the effect of *rm* was 0.02 and the inter-correlations between all the constructs in our model remained significant after partialing out the effect of *rm*. This suggests that “the results cannot be accounted for by common method variance” (Lindell and Whitney, 2001, p. 118). We also examined the correlations between TKMI, SKMI, KM process capabilities and competitive advantage, and calculated their corresponding variance inflation factor (VIF) values to ensure no multicollinearity problem. We found no evidence of multicollinearity because the VIF scores ranged between 1.20 and 3.08, which were far below the critical value of 5 (Hair *et al.*, 2014).

4.2 Hypothesis testing

We conducted the hypothesis testing through a three-stage process. Firstly, we used partial least squares analysis (PLS) with SmartPLS 3.0 software (Ringle *et al.*, 2015) to test the proposed hypotheses. PLS-SEM is a non-parametric approach, which “draws on composites formed from the indicators and applies a series of ordinary least squares regressions to estimate partial model structures with the objective of minimising the error terms of the endogenous constructs” (Hair *et al.*, 2017, p. 4). Secondly, we supplemented this analysis with the PROCESS macro, a bootstrapping technique recommended by Preacher and Hayes (2008). PROCESS is a computational tool available for SPSS and SAS that simplifies the implementation of mediation, moderation and conditional process analysis with observed variables (Hayes, 2013; Hayes *et al.*, 2017). PROCESS has become especially popular in business and management as evidenced by its appearance in previous research (Cameron and Stone, 2010; Van Den Hooff *et al.*, 2012). Thirdly, we checked the robustness of the main findings by conducting fuzzy-set qualitative comparative analysis (fsQCA). fsQCA is a novel methodology, which is based on the idea that causal relations are frequently better understood in terms of set-theoretic relations rather than correlations (Ragin, 2008; Fiss, 2011).

4.2.1 Partial least squares analysis–structural equation modelling. As shown in Table IV, TKMI positively influences competitive advantage (Model 1, $\beta = 0.14$, $t = 2.15$); thus, *H1* is supported. In the same vein, SKMI positively influences competitive advantage (Model 1,

Table IV Hypothesis testing		Model 1			Model 2			
Dependent variable	Independent variable	β	t-value	R ²	β	t-value	R ²	
CAPKM	Technical KM infrastructure	0.14	2.15	0.49	0.04	0.80	0.62	
	Social KM infrastructure	0.62	13.12	–	0.19	2.54	–	
	KM process capabilities	–	–	–	0.64	7.60	–	
	<i>Control</i>							
	Firm size	0.03	0.65	–	0.03	0.74	–	
	Ownership	0.08	1.82	–	0.06	1.31	–	
KM process capabilities	Technical KM infrastructure	–	–	–	0.26	4.63	0.67	
	Social KM infrastructure	–	–	–	0.68	13.81	–	

Notes: CAPKM = competitive advantage provided by KM; KM = knowledge management

$\beta = 0.62$, $t = 13.12$), and thus, $H2$ is supported. In $H3$, we predicted that the KM process capabilities mediate the relationship between TKMI and competitive advantage. As shown in Model 2, TKMI positively influences KM process capabilities (Model 2, $\beta = 0.26$, t -value = 4.63), which, in turn, positively influences competitive advantage (Model 2, $\beta = 0.64$, t -value = 7.60). We compared Models 1 and 2, and found that the positive effect of TKMI on competitive advantage in Model 1 became insignificant in Model 2 ($\beta = 0.04$, t -value = 0.80). By calculating the variance accounted for (VAF), we sought to determine the size of the indirect effect in relation to the total effect, which was 0.81. That is, 81 per cent of the total effect of TKMI on competitive advantage was indirect, so KM process capabilities fully mediates the effect of TKMI on competitive advantage, in support of $H3$.

In $H4$, we predicted KM process capabilities mediate the relationship between SKMI and competitive advantage. As shown in Model 2, SKMI positively influences KM process capabilities (Model 2, $\beta = 0.68$, t -value = 13.8), which, in turn, positively influences competitive advantage (Model 2, $\beta = 0.64$, t -value = 7.60). We compared Models 1 and 2, and found that the positive effect of TKMI on competitive advantage in Model 1 became weaker in Model 2 ($\beta = 0.19$, t -value = 2.54). By calculating the VAF, we sought to determine the size of the indirect effect in relation to the total effect, which was 0.70. That is, 70 per cent of the total effect of SKMI on competitive advantage was indirect, so KM process capabilities partially mediates the effect of SKMI on competitive advantage, in support of $H4$. We also controlled for firm size and ownership type, which had no significant relationships with competitive advantage.

For our robustness check, we examined a competing model with KM process capabilities as a moderator between TKMI and competitive advantage, and between SKMI and competitive advantage, rather than as a mediator. However, the moderating effects were insignificant ($p = 0.01$, $p = 0.02$, respectively). This provides greater evidence for the mediation model as opposed to the moderating model. In addition, we also found that the interaction between SKMI and TKMI had no significant effect on competitive advantage.

4.2.2 Process macro. To provide further support for the mediating effect of KM process capabilities, we followed Preacher and Hayes' (2008) mediation analysis procedure. In particular, we used the PROCESS macro Model 4 (Hayes, 2013), which provides bootstrap estimates with bias corrected confidence intervals of the indirect effects. The mediation effects were significant ($H3$: TKMI \rightarrow KM process capabilities \rightarrow competitive advantage, $b = 0.30$, $CI = 0.22$ - 0.41 ; and $H4$: SKMI \rightarrow KM process capabilities \rightarrow competitive advantage, $b = 0.56$, $CI = 0.40$ - 0.77).

4.2.3 Fuzzy-set qualitative comparative analysis. We reanalysed the hypotheses using fuzzy-set qualitative comparative analysis (fsQCA) to enhance the robustness of our finding. fsQCA is complementary to SEM, which examines predetermined relationships (Woodside, 2013). In this study, we used a three-stage approach recommended by Fiss (2011) and Ragin (2008) to conduct fsQCA. Firstly, we transformed the measures of constructs in the model into fuzzy-set membership scores. Specifically, we calibrated all the independent and dependent variables of our study, which involves classifying values of each variable into full membership (covering 95 per cent of the data values), cross-over (covering 50 per cent of the data values) and full non-membership (covering 5 per cent of the data values). Secondly, we constructed and refined the truth table that presents all possible configurations of causal conditions of the desired outcome by selecting a frequency threshold and a consistency threshold. Frequency refers to the minimum number of cases required for a configuration to be considered (Fiss, 2011). We set the frequency threshold at 30 to ensure that the configurations selected captured at least 80 per cent of cases. Consistency refers to the degree to which the cases sharing a given configuration of attributes exhibit the desired outcome (Fiss, 2011). We set the consistency threshold at 0.87, which is above the minimum consistency threshold of 0.80 (Ragin, 2008). Thirdly, we used the Quine–McClusky algorithm to logically reduce the truth table rows to simplified

configurations. The fsQCA results in [Table V](#) show that TKMI, SKMI and KM process capabilities are all significantly associated with competitive advantage (raw coverage = 0.67; consistency = 0.87). This indicates that none of the conditions is sufficient to increase competitive advantage; yet, the combination of TKMI, SKMI and KM process capabilities is required to achieve competitive advantage. Thus, we provide greater robustness to our findings by illustrating that TKMI, SKMI and KM process capabilities are important elements of a complex causal combination in explaining variance in competitive advantage.

5. Discussion

This paper set out to examine the role of technical and social knowledge management infrastructure within a firm and their effect on competitive advantage. Specifically, the primary objective was to determine whether TKMI and SKMI are determinants of a firm's knowledge management process capabilities (KMPC) and whether KMPC mediates the relationship between TKMI, SKMI and competitive advantage. The results support current research and confirm that both TKMI and SKMI have direct effects on competitive advantage. In addition, the findings extend existing theory and show that KMPC acts as a mechanism between both TKMI and SKMI and a firm's competitive advantage.

The acquisition, management and application of knowledge within a firm can have a powerful influence on an organisation's competitive advantage. To conduct such activities, firms must use an assortment of technical infrastructure and social capital to achieve strategic outcomes. However, for these technical and social assets to fully achieve their desired aim, a range of supporting processes must be in place to bring them to life.

In this instance, the technological KM infrastructure provides the network capabilities that allow organisational members to locate and make use of knowledge resources. At the same time, the SKMI provides the organisational culture where employees and managers understand theirs and each other's roles in knowledge management. Together, the technological and social infrastructures create a suite of process capabilities that formalise knowledge management within the organisation. Ultimately, it is these KMPCs that determine a firm's competitive advantage.

Such a system eventually challenges typical RBVs of competitive advantage ([Barney, 1991](#); [Conner, 1991](#)), where organisational resources are considered to positively influence competitive advantage because they are unique, not substitutable and relatively finite within a given market. However, many CIOs are likely to attest that technical infrastructure is readily substitutable and can easily be copied by other firms. That is not to say that the value of technical infrastructure is in any way diminished. In fact, the current research provides compelling evidence that technical resources provide the foundation for competitive advantage, which is consistent with theory put forward by [Amit and Schoemaker \(1993\)](#) and [Russo and Fouts \(1997\)](#).

Table V fsQCA Configurations results

Complex solution			
Model: CAPKM = f (TKMI, SKMI, KMPC)			
Algorithm: Quine–McCluskey			
Frequency cut-off: 30.000000			
Consistency cut-off: 0.865672			
<i>Causal combination</i>	<i>Raw coverage</i>	<i>Unique coverage</i>	<i>Consistency</i>
TKMI*SKMI*KMPC	0.673561	0.673561	0.865672
Solution coverage: 0.673561			
Solution consistency: 0.865672			
Notes: CAPKM = competitive advantage provided by KM; TKMI = technical KM infrastructure; SKMI = social KM infrastructure; KMPC = KM process capabilities			

Along with this, the current study demonstrates and confirms the theory of [Bharadwaj \(2000\)](#) that integration of resources is critical for developing organisational capabilities. There is a large body of research ([Andreeva and Kianto, 2012](#); [Byrd and Turner, 2001a, 2001b](#); [Chuang, 2004](#); [Granados et al., 2017](#); [Grant, 1991](#)) that define resources in a number of ways, including technical, social, cultural or tangible/intangible. However, there is a distinct lack of cohesion in how these resources are combined to create competitive advantage. In real-world, live scenarios this can be highly problematic for two closely related reasons. Firstly, TKMI investment not only has the potential to demand large capital outlays but also typically requires long lead times from planning to deployment. Secondly, even the best TKMI has the potential to be underutilised or lie dormant if the requisite social and cultural infrastructure is not deployed to make use of the technology. As such, if organisations, project teams and managers do not adequately plan the integration of technical and social resources, any investment in TKMI is likely to be costly and have limited influence on sustainable competitive advantage ([Gold et al., 2001](#)). Despite that, simply possessing TKMI and SKMI resources is not the proverbial silver bullet that will ensure ongoing competitive advantage. Instead, it is the way these resources combine to form a range of process capabilities that will ultimately deliver lasting competitive advantage.

The knowledge management processes in place within an organisation are critical determinants in both developing and sustaining new sources of competitive advantage ([Chakravarthy et al., 2005](#)). However, previous research has typically focused on the effects of TKMI and SKMI on competitive advantage in isolation. Rather, the current study has looked at how TKMI and SKMI simultaneously influence competitive advantage. As such, it appears to be the first evidence that KMPC is the mechanism that influences the relationship between TKMI and SKMI as independent variables and competitive advantage as the primary dependent variable. From a theoretical perspective, the findings provide empirical support for the propositions forwarded by [Nguyen and Neck \(2008\)](#) that TKMI (and, by association SKMI) should be the “enabler” of process capabilities, which then provide an indirect route to competitive advantage. From a managerial perspective, such evidence provides a mandate for internal policy development covering each step in the knowledge management process.

Building on this, the current research has demonstrated that managers need to put in place programmes that will allow the organisation to develop its knowledge management process capabilities. More specifically, programmes that link with the four dimensions of knowledge management outlined by [Gold et al. \(2001\)](#) – acquisition, conversion, application and protection – must be managerial priorities to build process capabilities. This is because a firm’s knowledge management process capabilities allow the technical and social knowledge management infrastructure to come to life. Ultimately, this is how ongoing competitive advantage is developed and maintained.

To acquire knowledge, firms need to engage in two key activities. The first is benchmarking of their own knowledge management practices against industry and global standards. The second is to develop a culture of collaboration, in which employees are willing to collaborate and share knowledge internally, as well as externally within a firm’s network of partners ([Gold et al., 2001](#)). This collaboration then allows the aggregation and accumulation of knowledge that can be harvested for strategic and operational purposes.

Being able to harvest knowledge contained within an organisation is dependent on established conversion mechanisms. In this respect, managers must look to formalise a set of rules or directives, whereby individuals can easily tap into existing knowledge or have access to other employees in procedures that mandate group decision-making.

For effective use and application of knowledge, guidelines and policies must then be developed that situate organisational knowledge not as a static asset, but as a constantly evolving, dynamic open-source entity. While the application of knowledge has some clear

overlap with conversion, organisational culture is sure to have a major impact on how readily members share – or search for – information. Because of this, there is likely to be an ongoing tension between the need for immediate, short-term gains obtained through formal procedures to share information and longer-term gains that emanate from a culture of knowledge sharing. As a result, managers must look to develop an organisational culture in which knowledge sharing becomes accepted, automatic and habitual (He and Wei, 2009). In this manner, managers can ensure formal knowledge management processes are complemented by informal, socially led knowledge sharing (Granados *et al.*, 2017).

The final piece in the puzzle that is a firm's process capabilities is knowledge protection. The protection of knowledge is a complex, difficult task for any organisation. No doubt, firms can use patents or copyright to protect knowledge assets. However, this is an area for future research, in which protection of knowledge needs to be examined away from the typical frameworks that position legal or technical IT provisions as the only available powers.

Apart from these managerial necessities, the current research has redefined the antecedents of competitive advantage as independent and mediator variables, thereby challenging what has been found in previous research, namely, that knowledge management is presented as a single construct when considering its influence on organisational performance outcomes (Zack *et al.*, 2009). By contrast, the current study demonstrates that although performance implications of KM depend on KM practices, such KM practices include TKMI and SKMI forming the basis of KM activities, in which KMPC operates as a key facilitator of organisational performance outcomes. Additionally, the findings on the antecedents of competitive advantage offer significant theoretical implications for existing models that consider single dimensions of multidimensional constructs as either independent or mediator variables for organisational performance outcomes (Mageswari *et al.*, 2017; Tseng, 2016, 2010). What's more, the findings of this study provide evidence that knowledge conversion and organisational culture operate both independently (as mediator and independent variable, respectively) and jointly (in which each variable forms part of a multidimensional construct) as determinants of organisational performance. Specifically, where organisational culture contributes to SKMI and knowledge conversion contributes to KMPC.

The findings from the current study provide evidence for KMPC as a mediator between KM infrastructure and competitive advantage. When viewed against previous research in which organisational performance outcomes are seen as directly dependent on KM infrastructure and KMPC (Mills and Smith, 2011; Zaim *et al.*, 2007), the current study appears to extend existing theory. For example, although Mills and Smith (2011) found no significant direct effect of technology infrastructure and organisational culture on organisational performance, future research may look at the role of KMPC as a mediator in the model. Additionally, the mediation role of KMPC implies that although organisational performance directly depends on both KM infrastructure and KM processes, as found by Zaim *et al.* (2007), there is also a significant indirect relationship between KM infrastructure and organisational performance through the mediation of KMPC.

The current theory from existing KM research (Wu and Chen, 2014) suggests KMPC has no direct relationship with organisational performance outcomes unless the relationship is mediated by business process capability. However, the present study challenges assertions by Wu and Chen (2014), by demonstrating a significant, direct link between KMPC and competitive advantage. Thus, although business process capabilities may intervene in the relationship between KMPC and organisational performance, such an intervention does not invalidate a direct relationship between KMPC and organisational performance. Future research may be required to further test this relationship.

In addition to the theoretical and managerial contributions outlined, the current study has answered the call by Gimenez and Rincon (2003) for additional research investigating the role of KM in less-developed countries. For this study, Vietnam was used as the referent

country given it has been identified as a developing nation (United Nations, 2016). Previous research has examined individual countries to develop and test generalizable theory (Nguyen *et al.*, 2003; Van Vu *et al.*, 2016; Zhou, 2017), so the use of a single country as the context for the current study is in keeping with extant literature. That being said, this means there is still substantial scope for future research to ensure the findings hold in other developing nations, particularly those that lie outside Asia.

Less developed countries, such as Vietnam, are likely to have less TKMI resources than more developed nations. Likewise, there is the potential for less-developed nations to have lower levels of SKMI resources as the existing human capital within the labour force is also still in a developmental phase. By extension, it is plausible this would also lead to less formal KM processes given KM may still be in its infancy. Regardless, the findings from the current study indicate existing theory developed in more advanced nations is applicable in less-developed countries and vice-versa. This is an exciting development, both theoretically and managerially. It indicates the absolute values of each variable are not as relevant as the relationships between them. As a result, irrespective of the actual expenditure on TKMI and SKMI, if managers can put in place processes to harness the power within the organisation's KM resources, ongoing sustainable competitive advantage is a viable, obtainable outcome.

Apart from the organisational or economic advantages that may be derived from knowledge management, there may also be a range of positive social implications. Based on the premise that "knowledge is power", it may be that knowledge management and process capabilities can be used at the regional, national or transnational levels to effect change that will have positive social, environmental and economic outcomes (Laszlo and Laszlo, 2002). For example, knowledge management and information sharing have been shown to significantly influence the management of poverty and disability (Buettgen *et al.*, 2012). Likewise, the ability for stakeholders to share knowledge and engage in an informed discourse was a key driver in Iceland's response to the global financial crisis of the 2000s (Duffy *et al.*, 2017). If such macro-level knowledge management practices continue to evolve, it is possible we will see the continual development of "knowledge cities" (Ergazakis *et al.*, 2004). This would be particularly beneficial for developing nations, such as Vietnam, where the development of knowledge and KM abilities could result in increased investment from international firms.

Despite the significant theoretical and managerial implications of the present study, it has several limitations, which also offer avenues for future research. Firstly, because the present study uses a cross-sectional survey, the relationships between variables are associative rather than predictive. Thus, future research may adopt a longitudinal approach to examine the present model. Secondly, KMPC as a mediator in the present study's model offers a novel and important contribution to scholarly research in KM. However, the data for testing the model emanated from a developing country (i.e. Vietnam). Therefore, future research will be required to test the model in more advanced countries to compare the extent of consistency or variation in the model across contexts. Thirdly, the present study's model examines the outcome of KM infrastructure and KMPC on organisational performance with respect to competitive advantage. However, other outcomes of KM infrastructure and KMPC on organisational performance can be financial performance, employee engagement/attrition, innovation among others (Tseng, 2010, 2016; Mageswari *et al.*, 2017; Zack *et al.*, 2009). Future research may examine the impact of SKMI, TKMI and KMPC on KM outcomes other than competitive advantage. Finally, the current research sought to identify the relationships between the different knowledge management dimensions. However, how these dimensions interact in different strategic contexts is clearly an area for future research. While people and organisational culture are key ingredients for successful knowledge management initiatives (Rubenstein-Montano *et al.*, 2001), an organisation's strategic context will influence selection of the most appropriate initiatives that link with

overall corporate objectives (Zack, 1999). What's more, the current research involved firms from a range of industries. In future, it may also be beneficial to examine the differences and commonalities in knowledge management processes that exist between firms that have similar strategic contexts but operate in different industries.

6. Conclusion

In the modern business environment, knowledge is a highly valuable commodity that can offer significant competitive advantage. This paper has examined the relationships between technical KM infrastructure, social KM infrastructure, KM process capabilities and competitive advantage. Moving away from the typical RBV of competitive advantage, this study provides an objective picture of knowledge and its movement through the KM network from acquisition, through to conversion. In turn, viewing the route knowledge takes to influence competitive advantage sheds light, not only on the mechanisms at work within the network, but also on the managerial responsibilities for ensuring KM processes are in place and clearly linked to the requisite organisational outcomes. The findings from this research indicate that senior management cannot assume expenditure on technical KM infrastructure alone will result in increased competitive advantage. Instead, chief knowledge officers must ensure KM infrastructure is matched with KM process capabilities that will facilitate the acquisition, conversion, application and protection of knowledge.

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