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ORIGINAL ARTICLE

A systematic literature review of big data adoption in internationalization

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Abstract
The internationalization process has been constantly moving with an exceptional transformation led by the digital era. In order to face the challenges of the internationalization, enterprises need to understand thoroughly the new business environment, including foreign markets and customer insights to offer innovative products and services. Indeed, big data as the new source of knowledge helps enterprises convert business information into competitive advantages in the global market. Although the topic of big data receives much attention from researchers, the adoption of big data in internationalization is still an emerging research interest, especially in small and medium-sized enterprises (SMEs). The purpose of this paper is to provide a concept-centric literature review that synthesizes and evaluates recent studies to examine the current state and future research directions of big data adoption in the internationalization process. The result of this paper indicates the status and future research directions of big data adoption in internationalization with the focus on international marketing. The paper finds out that the adoption of big data in international marketing is still in the early stage of maturity. Future research directions are also proposed based on the identified research gaps and the analysis of literature review.

Keywords Internationalization · Big data · Data-driven marketing · International marketing · Data analytics · SMEs

Introduction

Nowadays, enterprises are under huge pressures of competitiveness and innovativeness to gain a footstep into new foreign markets (Knight and Liesch 2016). There is a need to adopt a new source of data, called big data, which is defined as extremely large data sets in volume, velocity, variety, and veracity (Chen et al. 2012; McAfee et al. 2012). Big data can be acquired from diverse sources such as web logs, CRM systems, social media, competitors' websites, household hierarchies, e-commerce sites, government sites, customer reviews, click stream, and other open sources (Chen et al. 2012; Fan et al. 2015; Liang and Liu 2018). However, enterprises, especially in SMEs (small and medium-sized enterprises), are often incapable of acquiring and applying knowledge from big data in the decision-making process regarding choosing the right market as well as the appropriate internationalization strategy (Ahi et al. 2017). This paper focuses on big data that enterprises, in particular SMEs, can easily access to approach foreign markets such as social media, e-commerce sites, government sites, and open data.

As a matter of fact, the big data movement could help enterprises collect data and convert it into competitive advantages in the global market (Côrte-Real et al. 2017; McAfee et al. 2012; Sivarajah et al. 2017). The study by LaValle et al. (2011) indicates that enterprises using data analytics outperform their competitors. The adoption of big data undeniably helps managers have a deeper understand of their businesses in order to measure their business performance as well as to improve the decision-making process (Pauleen and Wang 2017; Weinberg et al. 2013). The in-depth literature review on big data from the study of Chen et al. (2012) reveals that the adoption of big data in e-commerce and market intelligence catches the most attention with top five topics on competitive advantage, big data, data warehousing, decision support, and customer relationship management.

However, very little research has been conducted to examine how enterprises engage with big data in internationalization (Chen et al. 2012; Sena et al. 2017). Particularly, there is a strong need to examine the theoretical and practical

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implications of big data on the internationalization process (Sena et al. 2017). Regardless the significantly increasing amount of big data, enterprises are still in the initial stage of analyzing and interpreting knowledge from big data due to limited techniques, tools, methods, and technologies (Chen and Zhang 2014; Sena et al. 2017).

For this reason, the objectives of this paper are to synthesize and to evaluate recent studies to examine the current state of literature in big data adoption in internationalization with the focus on international marketing in the context of SMEs and suggest some future directions. Moreover, research gaps and trends are also identified and forecasted in order to identify the barriers to big data adoption in international enterprises. This paper aims at responding to the following research question: "What is the current state of big data adoption in internationalization?" The remainder structure of the paper is as follows: the methodology is presented in next section along with the integrated framework and thus followed with the literature review. Then in-depth analysis of the literature review is discussed. Based on this discussion, the future research directions are proposed. The last section of the paper is the conclusion with the focus on relevant contributions.

Methodology and proposed framework

Methodology

This study examines the current state and research directions of big data adoption in internationalization with a focus on studies over the past decade. The research methodology starts with the search process and ends with the systematic review process.

During the search process, reliable databases, journals, keywords, timespan, and the forward and backward techniques are determined and applied (Levy and Ellis 2006; Webster and Watson 2002). In this research, all contemporary articles from highly ranked journals that have appeared in top journals over the past decade are reviewed. In the field of internationalization, the articles are collected from top marketing journals and management journals with topics in marketing such as Journal of Marketing, Journal of International Marketing, Harvard Business Review, MIT Sloan Management Review, Journal of International Business Studies, Journal of the Academy of Marketing, Management Science, and International Journal of Research in Marketing (Samiee and Chabowski 2012). In terms of information systems, articles from top scientific journals are synthesized such as MIS Quarterly, Journal of Management Information Systems, Journal of AIS, Information and Management, Decision Support Systems, Communications of the ACM, Decision Sciences, and Journal of Information Systems (Levy and Ellis 2006). All the selected journals in marketing and information systems are listed in the Scimago Journal & Country Rank. Different keywords such as "internationalization", "big data", "data-driven marketing", "international marketing", "data analytics", and "big data adoption" are applied to search for articles from reliable databases (Ebscohost, ProQuest, Emerald, Google Scholar) (Levy and Ellis 2006; Webster and Watson 2002). In particular, Google Scholar with a wide range of search power has enabled access to various databases; thus, it can give an overview of the current status and trends in the research domain (Oliver and Vayre 2015). To ensure the validity and reliability of the literature search process, the forward and backward search techniques are conducted to avoid missing relevant keywords and articles (Webster and Watson 2002). From the backward search approach, reference and keywords of related articles are also reviewed (Levy and Ellis 2006; Webster and Watson 2002). As far as the forward search approach is concerned, additional articles, which cite the key relevant articles, are also examined (Levy and Ellis 2006; Webster and Watson 2002). Therefore, the chosen keywords and articles deem to comprehensively cover the research topic. Only articles published during the period of over a decade are chosen because big data is a new trend, and this period is broad enough to review any significant changes in internationalization, both in terms of research methodologies and practices.

After screening about 800 articles based on the abstracts, the entire content, and structure, 73 articles big data and/or internationalization are selected and analyzed in detail. As these 73 articles are the most cited and identified by the forward and backward techniques from the included articles (Webster and Watson 2002), analyzing these articles would reveal the current state of big data adoption in internationalization as well as discover the research gaps for future studies. Figure 1 categorizes all these articles in specific years.

From Fig. 1, it can be seen that the number of articles has grown between 2004 and 2018. Few articles

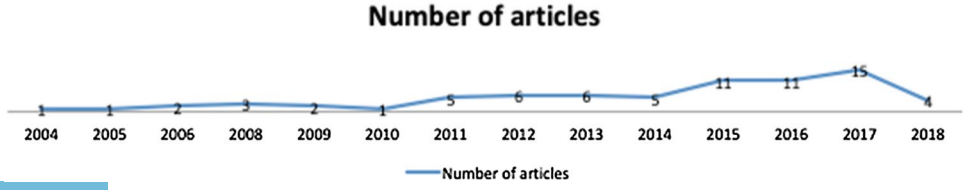

Fig. 1 Articles related to internationalization and big data

were published before 2010. It can be seen that there is a substantial increase from 2014 to 2017. This indicates the importance and interest of big data adoption in internationalization.

In the systematic review process, selected articles will be classified according to categories based on the integrated framework for internationalization (see Table 1 for results). The integrated framework is based on the knowledge management framework by Alavi and Leidner (2001) and the Uppsala internationalization model proposed by Johanson and Vahlne (2009). Accordingly, the main concepts covering knowledge management and internationalization are used to classify the selected articles and find out the interrelationships. A table is compiled to summarize all the articles and highlight the degree of intensity of coverage.

A framework for internationalization and big data research

Theoretical and empirical background

The foundation of this study is based on the resource-based theory by Barney (1991) as this theory well explains the key to success in internationalization, especially with a focus on the early years of internationalization as well as the speed of internationalization (Cavusgil and Knight 2015; Wu and Zhou 2018). The resource-based theory catches attentions of many scholars in studying internationalization due to its emphasis on resources and capabilities to succeed in international markets (Navarro-García et al. 2016; Wu and Zhou 2018). Resources, including "all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc." (Barney 1991), enable enterprises to come up with strategies for better performance in internationalization (Prange and Verdier 2011). Many researchers adopt the resource-based theory in explaining internationalization because it not only considers the importance of resources but also highlights the capabilities to exploit them and turn them into sustainable competitive advantages (Knight and Cavusgil 2004; Raymond et al. 2014). With that regard, knowledge from big data related to internationalization is considered as significant resources, which help enterprises improve the service/product quality and innovate new products; thus, enterprises can benefit from sales growth and profitability (Hult 2012; Navarro-García et al. 2016). In order to exploit knowledge from big data to support internationalization, enterprises need to build capabilities in knowledge management (Navarro-García et al. 2016; Sousa et al. 2010). The required capability to manage knowledge from big data and the consideration of big data as a great resource for enterprises rationalize and set the foundation of the resource-based theory by Barney (1991) on this paper.

Big data and knowledge management

To link the studies related to big data and internationalization, the knowledge-based view is adopted as for following reasons. Firstly, knowledge management frameworks from the knowledge-based view are able to help enterprises capture, integrate, apply, and amplify knowledge (Grant 1996; Nonaka 2000). Secondly, big data is considered as a diverse source of knowledge in terms of volume, velocity, and variety (Chen et al. 2012; McAfee et al. 2012). From the resource-based theory (Barney 1991), knowledge from big data is a great resource for enterprises to exploit. Finally, both big data and knowledge management lay their foundation on the knowledge-based view, which perceives knowledge as a primary source of competitive advantage (Davenport 2006; Pauleen and Wang 2017). Due to the ability to reinforce and advance different sources (Grant 1996; Nonaka 2000), knowledge management is expected to enhance the capability to acquire, assimilate, share knowledge from big data and thus leverage the values of big data (Alavi and Leidner 2001; Chen et al. 2012; Davenport 2006; Le Dinh et al. 2013). Knowledge management plays the principal role in managing and applying big data in organizational settings (Pauleen and Wang 2017; Intezari and Gressel 2017). There is a strong connection between big data and knowledge management in uncovering and especially in transferring insights from big data and enhancing the decision-making process (Rothberg and Erickson 2017; Uden and He 2017). On the other hand, big data also facilitates and improves the process of knowledge management through data visualization and analytics (Khan and Vorley 2017). Predictive knowledge generated from big data, which explains what happened in the past, is useful to improve the knowledge management system (Sumbal et al. 2017). Therefore, this study will be based on the knowledge management framework proposed by Alavi and Leidner (2001) to manage and amplify knowledge from big data. Alavi and Leidner's (2001) knowledge management framework is widely adopted by several researchers to enable organizations to manage and apply knowledge into the decision-making process within organizations (King and Ko 2001; Tian 2017). This framework consists of four processes: Knowledge Creation, Knowledge Storage, Knowledge Transfer, and Knowledge Application (Alavi and Leidner 2001). The studies of many authors (Nonaka 2000; Alavi and Leidner 2001) indicate knowledge with different forms (such as explicit documents, tacit knowledge) should be created from various internal and external sources. According to Alavi and Leidner (2001), knowledge should be created, stored, and updated through a planned knowledge storage system. Knowledge transfer should be conducted through training programs, informal networks, or workshops and applied into the organizational decision-making process (Alavi and Leidner 2001).

Table 1 Classification of the literature review

Articles	Knowledge management				Internationalization			
	Creation	Storage	Transfer	Application	Opportunities	Commitment	Learning	Network
Davenport (2013)	***	***	***	***	***	**	*	
Wamba et al. (2017)	***	***	***	*	***	***	*	
Erevelles et al. (2016)	***	***	*	***	*	***	*	
McAfee et al. (2012)	***	***	***	***	*	**	*	
LaValle et al. (2011)	***	***	***	***	**	**	**	
Goth (2015)	***	***	***	***				
Chen et al. (2012)	***	***	***	***	**	**	**	*
Leeflang et al. (2014)	***	***	***	***	**	**	*	
Davenport (2006)	***	***	***	***	*	*	*	
Sivarajah et al. (2017)	***	***	***	***	*	*	*	
Xu et al. (2016)	***	**	**	*	*	*		
Janssen et al. (2017)	***	***	***	***			**	
Kumar et al. (2013)	***	***	***	***				
Hofacker et al. (2016)	***	***	***	***				
Barton and Court (2012)	***	***	***	***				
Moges et al. (2013)	***	***	**	**				
Baesens et al. (2016)	***	***	***	***				
Xie et al. (2016)	***	***	***	***	*			
Davis (2014)	***	**	**	***	*			
Fan et al. (2015)	***	***	***	***				
Liang and Liu (2018)	**	**	**	**				
Gupta and George (2016)	***	***	***	***				
He et al. (2015)	***	***	***	***	*			
Ketter et al. (2015)	***	***	***	***	*			
Gandomi and Haider (2015)	***	***	***	***				
Wamba et al. (2015)	***	***	***	***	**	*		
Chen and Zhang (2014)	***	***	***	***	**	*	*	*
Chaudhuri et al. (2011)	***	***	***	***				
Braganza et al. (2017)	***	***	***	***	**	*		*
Côrte-Real et al. (2017)	***	***	***	***	**	*		
Khan and Vorley (2017)	***	***	***	***				
Pauleen and Wang (2017)	***	***	*	*	*			
Pauleen (2017)	***	***	**	**	*		*	*
Merendino et al. (2018)	***	***	**	**				
Intezari and Gressel (2017)	***	***	***	***				
Rothberg and Erickson (2017)	***	***	***	**				
Tian (2017)	***	***	**	***				
George et al. (2014)	***	***	***	***	*			
Sumbal et al. (2017)	***	***	**	**				
Uden and He (2017)	***	***	**	**				
Jacobsen and Vugt (2017)	***	***	***	***	**	**	**	**
Knight and Cavusgil (2004)					***	**	**	***
Hult (2012)					***	***	**	**
Cardoza and Fornes (2011)			*	*	***	***	***	***
Johanson and Vahlne (2009)			*	**	***	***	***	***
Crick (2009)					***	***	**	**
Knight and Liesch (2016)				*	***	***	***	***
Laghzaoui (2011)			*	*	***	***	***	***

Table 1 (continued)

Articles	Knowledge management				Internationalization			
	Creation	Storage	Transfer	Application	Opportunities	Commitment	Learning	Network
Armario et al. (2008)	***	**	**	**	***	***	***	***
Navarro-García et al. (2016)	***	*	**	**	***	***	**	**
Sousa et al. (2008)	*			*	***	***	**	**
Raymond et al. (2014)	**			*	***	***	***	***
Monferrer et al. (2015)	**	*	**	*	***	***	***	***
Cavusgil and Knight (2015)	**				***	***	***	***
Prashantham (2005)	***	***	**	**	***	***	***	***
Mathews (2006)				*	***	***	***	***
Ribau et al. (2018)				*	***	***	***	***
Thai and Chong (2008)	**				***	**	**	***
Prange and Verdier (2011)	**			**	***	*	***	
Sousa et al. (2010)				*	***	**	**	
Magnusson et al. (2013)				*	***	*	***	
Samiee and Chabowski (2012)				*	**	***	***	**
Chen et al. (2016)					*	**	**	*
Sheth and Sharma (2005)					***	***	*	**
Souchon et al. (2012)	***		**	**	***	***	***	
Pinho and Prange (2016)				*	***	***	***	***
Efrat et al. (2017)	**				***	*	***	*
Ahi et al. (2017)	**				**	***	***	***
Sui and Baum (2014)	*	*			***	***	***	***
Wu and Zhou (2018)	**	*			***	***	***	***
Van Auken (2015)	**	**		**	**	*	**	
Weinberg et al. (2013)	***	***	**	**	**	**		
Oliver and Vayre (2015)	**			**	**	*		
Total	59	49	50	62	54	47	43	30
Total (weighted)	160	134	125	140	123	106	96	71

Notation: Highly covered: ***x3; Moderately covered: **x2; Slightly covered: *x1

Proposed framework for big data adoption in internationalization

This knowledge-based framework is integrated with the Uppsala, a well-known internationalization model (Johanson and Vahlne 2009), so that all the extracted knowledge from various sources of big data is relevant and pivotal for the internationalization process. With the perception of internationalization as a learning process, the Uppsala Internationalization model focuses on extracting and applying knowledge for an entry into foreign markets. The Uppsala model is considered as typical and dominant in internationalization theory with the focus on the values of knowledge (Johanson and Vahlne 2009; Sousa et al. 2010). The Uppsala principle indicates that lack of information and scarcity of resources will result in failure in the process of internationalization (Johanson and Vahlne 2009). Thus, developing the conceptual framework integrated from the Uppsala model and the knowledge management framework will definitely solve the challenges of acquiring and applying marketing intelligence that most enterprises are facing in the internationalization process. The integrated framework is proposed in Fig. 2.

Based on Fig. 2, knowledge related to internationalization will be applied to the four interrelated variables belonging to two categories: ***state*** (knowledge opportunities, network position) and ***change*** (relationship commitment decisions, learning creating trust-building) (Johanson and Vahlne 2009). Internationalization first starts with applying knowledge to detect and exploit opportunities in new markets. The extent of internationalization will depend on resource allocation that leverages the commitment for foreign markets. Then through the process of learning, creating, and building trust, enterprises will reach the desired state of network position (Johanson and Vahlne 2009). The model has inferred that applying knowledge to identify and exploit opportunities is the key to success in internationalization. In the other words, acquiring and applying knowledge or intelligence related to markets, competitors, customers, distributors,

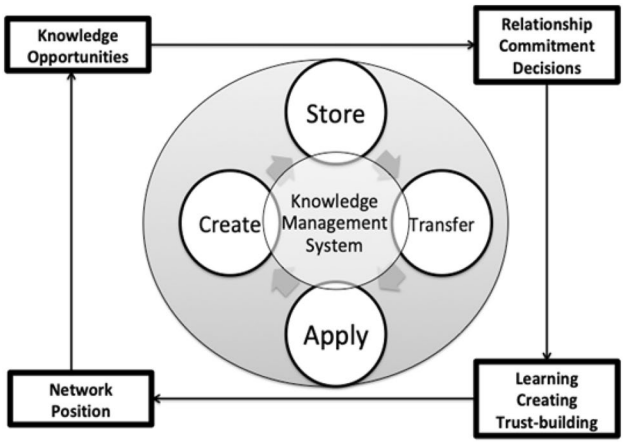

Fig. 2 Integrated framework for big data adoption in internationalization

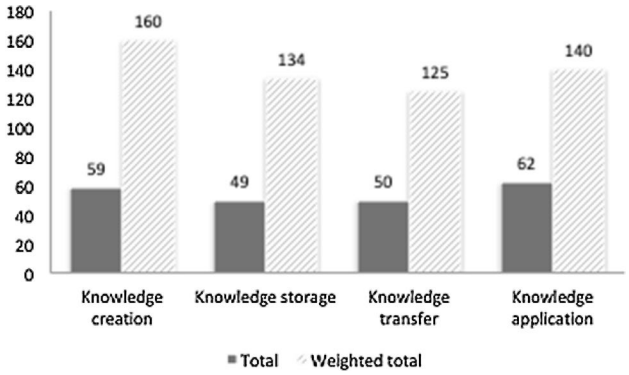

Fig. 3 Articles covering knowledge management

and other partners would help enterprises sense opportunities and build their network position successfully in foreign markets (Navarro-García et al. 2016).

Literature review

All the articles are categorized based on the integrated framework for internationalization. The extent of coverage of all the articles related to each sub-category is noted with three levels: highly covered (***), moderately covered (**), and slightly covered (*) (Rickenberg et al. 2012). Through these three levels, the degree of intensity among articles can be easily justified (Rickenberg et al. 2012). Relevant articles are categorized into units of analysis regarding knowledge management and internationalization. Units of analysis are considered as the breakdown of concepts for a solid literature review (Webster and Watson 2002). The authors apply the concept-centric structure to organize the framework for all the selected articles and build a concept matrix with units of analysis (Webster and Watson 2002). Accordingly, the proposed framework demonstrates two key concepts—knowledge management and internationalization. The concept "knowledge management" consists of four units of analysis: Knowledge Creation, Knowledge Storage, Knowledge Transfer, and Knowledge Application (Alavi and Leidner 2001). On the other hand, the concept "internationalization" covers the four units of analysis: knowledge opportunities, relationship commitment decisions, learning creating trust-building, and network position (Johanson and Vahlne 2009). Constructing units of analysis from the knowledge management framework by Alavi and Leidner (2001) and the Uppsala Internationalization model by Johanson and Vahlne (2009) will ensure the solidity and comprehensiveness of this literature review. Articles with knowledge management perspective are categorized on top, followed by articles covering the internationalization topic. Through the concept matrix with units of analysis, the relationship and coherence among these articles can be inferred (Rickenberg et al. 2012). Table 1 shows the classification of the literature review.

The dimension of knowledge management attracts the majority of the articles with the number of articles in each sub-topic as follows: knowledge creation (59), knowledge storage (49), knowledge transfer (50), and knowledge application (62). The degree of intensity of each sub-topic is calculated by adding the weighted score based on the level of coverage (highly, moderately, slightly) (Rickenberg et al. 2012). The total and weighted total of knowledge creation, storage, transfer, and application are demonstrated as in Fig. 3. It can be seen that the sub-topic of knowledge creation catches the most attention with highest intensity (160). Knowledge storage and knowledge transfer almost share the same level of research interest. Comparing the total and the weighted total, most articles deal with the knowledge application (62) but lack intensity (140).

Similarly, Fig. 4 presents the number of articles discusses the sub-topics in the perspective of internationalization practice: knowledge opportunity (54), commitment decision (47), learning creating trust-building (43), and network position (30). Thus, Fig. 4 describes more details these sub-topics with the weighted total. According to Fig. 4, the sub-topic of knowledge opportunity receives the most attentions from scholars with 54 articles. There is a slight fluctuation (from 47 to 43 articles) in the number of articles covering commitment decision and learning creating trust-building. Furthermore, it is obvious that the sub-topic of network position (30) is considered less often with the lowest intensity (71). Most of these articles covering the topic of internalization often mention the aspects of knowledge creation and application.

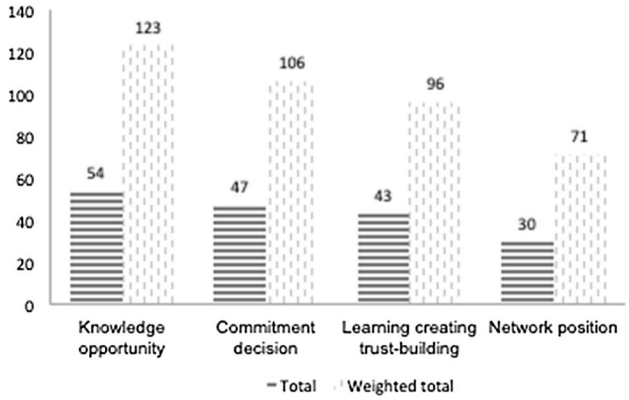

Fig. 4 Articles covering internationalization

Discussion

It can be seen that 73 articles from diverse marketing and management journals as well as information systems journals are reviewed. As chosen from the broad range of journals, a systematic literature review on these articles can make a significant contribution to research in knowledge management and internationalization. This paper supports previous findings that conclude that the state of big data adoption in international marketing is still immature and in a strong need for profound studies to make data-driven decisions in dealing with complexity of international markets (Leeflang et al. 2014; Samiee and Chabowski 2012; Sheth and Sharma 2005). The study of Chen et al. (2012) also strengthens this finding by stating that the most adoption of big data in marketing is in e-commerce and market intelligence and implies the need for further literature in this field.

Although big data has emerged as a key influential research stream, its adoption in internationalization, especially in the context of international marketing, has not been fully incorporated (O'Connor and Kelly 2017; Tian 2017). Most of the articles discussing the knowledge management perspective often lack the focus on internationalization (Goth 2015; Hofacker et al. 2016). In fact, these articles slightly discuss the aspect of knowledge opportunity in internationalization (Xu et al. 2016). On the other hand, the articles covering the dimension of internationalization usually take less consideration on knowledge management of big data (Cardoza and Fornes 2011; Efrat et al. 2017). Generally, these articles somewhat touch upon the dimension of knowledge creation and application but really lack intensity. In addition, the literature analysis also shows that enterprises seem to focus on creating and storing knowledge; yet, they do not really pay enough attentions on how to transfer and apply them (Pauleen and Wang 2017; Wamba et al. 2017).

In particular, the adoption of big data in internationalization in small and medium-sized enterprises (SMEs) and enterprises in developing countries is still in the very early stage of maturity due to the lack of infrastructure and marketing institutions (Jacobsen and Van Vugt 2017). For instance, exploring the internationalization process of SMEs in South East Asian countries, such as China or Vietnam, opens up interesting avenues for future studies (Cardoza and Fornes 2011; Thai and Chong 2008).

Indeed, SMEs are considered as late adopters of big data due to resource limitations (O'Connor and Kelly 2017). In terms of internationalization, very few SMEs adopt big data to gain marketing intelligence to understand and enter foreign markets (Jacobsen and Van Vugt 2017). Other reasons, which impede enterprises in general, and SMEs, in particular, from adopting big data, are as follows:

(i) *Commitments* to foreign markets (Souchon et al. 2012),
(ii) An *organizational learning* supporting internationalization (Monferrer et al. 2015),
(iii) A *network* for co-creating values in foreign markets (Cavusgil and Knight 2015; Sheth and Sharma 2005),
(iv) *Dynamic capabilities* related to international context (Pinho and Prange 2016), and
(v) *Sensing opportunities* for innovation (Roberts et al. 2016). These problems will be discussed in the following section as the potential future research directions.

Implications for future research directions

The future research directions are proposed based on two approaches: identifying the research gaps of each article and analyzing the literature review of 73 articles to find the correlation among them. Through these approaches, research directions are proposed according to the two key concepts in the framework: knowledge management and internationalization.

Knowledge management

With the role as the significant source of knowledge for knowledge management systems, big data not only brings incredible opportunities but also poses many challenges for enterprises. In this part, challenges in adopting big data for the knowledge management systems will be discussed as potential research directions.

Knowledge creation

Big data capture Several enterprises have successfully managed their business thanks to the ability to collect, analyze, and make decisions based on data (Davenport 2006; Van Auken 2015). However, it is not easy for them to acquire, store, cleanse, interpret, and manage data in order to trans-

form information into awareness and then action (Sivarajah et al. 2017). The challenge in knowledge creation is to choose and capture big data from diverse sources (Baesens et al. 2016; Sivarajah et al. 2017). Baesens et al. (2016) point out that accessing big data sources to ensure data quality is a real mantra when using big data. It is not easy to identify a relevant source of data for internationalization due to the problems of data overload (Hofacker et al. 2016; Kumar et al. 2013; Sivarajah et al. 2017) and data quality (Baesens et al. 2016; Moges et al. 2013; Janssen et al. 2017). These problems result from the own characteristics of big data such as huge volume, velocity, and variety (Sivarajah et al. 2017).

Big data quality As a multidimensional concept, data quality includes a variety of data properties such as accuracy, completeness, latency, security, interpretability, and data traceability (Moges et al. 2013). Therefore, the nature of data quality is assessed differently depending on problem domains with an acceptable margin of error (Moges et al. 2013). Future research should clarify specific domains and acceptable margins of error to ensure big data quality. Furthermore, as the study of Moges et al. (2013) indicates that data quality is highly related to characteristics of a specific job. However, these authors did not clarify certain characteristics of specific tasks in determining the data quality. Consequently, it is necessary to conduct further research on a method determining data quality based on characteristics of specific tasks to extract relevant knowledge about foreign markets.

Knowledge storage

Big data abstraction Data are overloaded due to the fact that the same data are recorded in various databases, and the old data are not updated and well organized (Hofacker et al. 2016). As the inconsistency, duplication, and diversity of many data sources cause data overload (Davenport 2006; Moges et al. 2013), it is necessary to build a data abstraction system enabling enterprises to identify and get rid of overlapped data (Kumar et al. 2013) to better acquire knowledge about foreign markets. The idea of a data abstraction system, which is easily built, maintained (Kumar et al. 2013), user-friendly (Barton and Court 2012), and specific to exploit opportunities for internationalization seems promising for further researches (Wu and Zhou 2018).

Big data integration In addition, although the amount of information is really massive and can be found everywhere (Kumar et al. 2013), 80% of enterprises lack customer data, especially the ability to integrate data for sales or customer practices (Leeflang et al. 2014). Managers' capabilities to leverage information to obtain and deliver real values seem to be the existent problem (Janssen et al. 2017). This also leads to the challenge of combining different data streams to find out the interrelationships of the big data (Baesens et al. 2016; Van Auken 2015). The value of data will be significantly leveraged when combining and linking several sources of data (Van Auken 2015; Weinberg et al. 2013). Future studies should focus on integrating various sources of big data to clarify the coherence in searching for opportunities in international markets, increasing the survival rate (Prange and Verdier 2011; Sui and Baum 2014). Conducting research in unifying diverse sources of big data, scholars will encounter the problem of data privacy and security (Oliver and Vayre 2015; Weinberg et al. 2013). This is also an interesting research path in optimizing data value in consideration of research ethical issues such as privacy and anonymity.

Knowledge transfer

Big data culture In order to encourage knowledge transfer, firms need to invest physical, human, and organizational capital (Erevelles et al. 2016) in developing a knowledge culture based on technologies and infrastructure supporting big data analytics such as intranets, data mining tools, cloud-based platforms, automatic identification, and data capture technologies (Barton and Court 2012; Wamba et al. 2017). Therefore, how to build a culture supporting data-driven decision (Leeflang et al. 2014) and innovativeness or international orientation for international markets (Knight and Cavusgil 2004) seems to be a problem to many organizations. While Erevelles et al. (2016) emphasize the importance of ignorance-based culture (what we do not know) for innovation, Davenport (2006) believes that a fact-based culture is necessary for firms to take full advantage of big data. From that perspective, a model for building an integrated culture based on facts and ignorance with international marketing orientation is needed and should attract future research interests. This will enable organizations to transform their cultures and business processes to optimize business outcomes (Barton and Court 2012).

Knowledge application

Big data analytics In applying knowledge from big data in internationalization, analytic techniques such as descriptive, predictive, and prescriptive (Davenport 2006) are used to gain information from data. However, most of data analysts focus more on aggregates or averages and pay less attention to outliers, which can be useful to reveal information on "critical innovations, trends, disruptions, or revolutions" (George et al. 2014). In future research, scholars need to be more aware of the importance of outlier analysis. The trend of the "cognitive computing" system, which can mimic the

way managers make decisions (Pauleen 2017), would be another attractive research path as it helps managers overcome the challenges of applying analytics to gain information from data.

Big data adoption practices Realizing big data adoption in general and in particular in internationalization is still in the very early stage (O'Connor and Kelly 2017; Tian 2017). In fact, enterprises fear to invest in adopting big data without any guarantees on expected results (Sheth and Sharma 2005). Therefore, there is a need for further study to focus on the impact of applying knowledge from big data to improve internationalization performance (Ribau et al. 2018). In the early stage of big data adoption, enterprises should focus on the relevant scale and scope of data and the sophistication of data analytic techniques (Tian 2017). In the same vein, the study of Chen et al. (2012) suggests that enterprises should start with structured or DBMS (database management system) data. Then in the next stage of analytics, Web-based and unstructured should be collected. Finally, enterprises should gather mobile and sensor-based for more complicated analysis (Chen et al. 2012). Along the same line with the scale and scope of data, enterprises can increase the level of analytic sophistication from descriptive, predictive to prescriptive analytics (Davenport 2006). Therefore, future scholars should pay more attention to building a maturity model for big data adoption in internationalization (Sivarajah et al. 2017; Sousa et al. 2008). Regarding SMEs' resource limitations, there is a call for future research on a strategy to acquire big data analytic capabilities through open-source systems and cloud-based services. Besides, a knowledge management project should be developed specifically for SMEs to fully exploit big data in the global marketplace (O'Connor and Kelly 2017).

Internationalization

Through the knowledge management system, knowledge from big data is applied to the internationalization process. Accordingly, the application of knowledge from big data, especially in marketing, opens up opportunities and challenges. This part of the paper includes a discussion of future research directions related to the application and practice of knowledge from big data in internationalization.

Knowledge opportunity

Marketing intelligence With an aim to apply knowledge in catching opportunities in new markets, enterprises need to transform knowledge into relevant marketing intelligence related to customers, markets, competitors, suppliers, content, etc. (Fan et al. 2015; Navarro-García et al. 2016). In terms of exploiting opportunities in foreign markets, customer intelligence seems to take the lead among many research interests as understanding customer behaviors helps enterprises gain a competitive advantage (Pinho et Prange, 2016; Weinberg et al. 2012). In particular, applying customer intelligence from big data in internationalization enables enterprises to predict customers' propensities as well as calculate their lifetime value (Leeflang et al. 2014; Xie et al. 2016). Researchers may find customer intelligence, especially customer lifetime value in foreign markets as a remarkable research direction. The additional area of future research related to customer intelligence arises from the contents (for example, texts, images, videos) created through customer interactions on social media or webpages (George et al. 2014; Intezari and Gressel 2017). Content intelligence can also be obtained from website layout, product images, customer reviews, or any user-generated content on competitors' websites (Chen et al. 2012; Fan et al. 2015). Mining content intelligence through customers and competitors empowers enterprises to better comprehend foreign markets (Morinaga et al. 2002). Accordingly, extracting opinions, mining texts and images to monitor competitors' products reputations on the web has caught attentions of many current and future studies (Fan et al. 2015; Leeflang et al. 2014).

Innovation and digitalization Big data adoption supports enterprises in internationalization by leveraging enterprises' sensing capabilities in identifying market opportunities and equipping sufficient knowledge of the target market and rivalry (Xu et al. 2016). Nevertheless, one of the most important factors in management challenges is leadership with clear goals and a vision to sense opportunities and understand foreign markets (McAfee et al. 2012; Roberts et al. 2016). In order to fully exploit knowledge opportunities, enterprises also need a decent team of data scientists with the ability to work with large quantities of information and master modern technology (McAfee et al. 2012) to adapt product's innovativeness to new markets (Efrat et al. 2017). Furthermore, in order to offer better product/service innovation, enterprises need to obtain real-time data (for example, geospatial information) and combine with other sources of data such as e-commerce transactions, customers' feedback, and product evaluations in foreign markets (Erevelles et al. 2016; Uden and He 2017; Xu et al. 2016). As innovation has been the top challenge to help business to be differentiated and unique in a new target market (LaValle et al. (2011); Roberts et al. 2016; Knight and Cavusgil 2004), there is a strong need for further research concerning customer real-time data and product/service innovation. Another new method to achieve product development and innovation is through the data obtained from social media (Davenport 2013). Further work is required in matching an enterprise's market orientation with the use of social media

(Berthon et al. 2012). In particular, social media is strongly believed to be a powerful tool for international marketing to identify foreign market opportunities and to build trust (Cavusgil and Knight 2015). To add up, the big data revolution has raised many questions about the need of further investigation for servitization for manufacturing and born global firms (Knight and Liesch 2016). Validated research about digitalization and servitization impacts on internationalization performance should be carried out (Knight and Liesch 2016).

Dynamic capabilities It can be inferred that, in order to respond to dynamic environmental changes and enhance the success in foreign markets, enterprises need to develop compatible dynamic capabilities (Hult 2012). The paper of Prange and Verdier (2011) describes dynamic capabilities as an internal process within enterprises to exploit their resource to adapt and generate market changes. Various dynamic capabilities in managing knowledge in internationalization have been discussed in this article: opportunity sensing capability, absorptive capability, network capability, managerial capabilities, new-product development capabilities, and so on. It is difficult for enterprises to determine the priority of capabilities that they need to take into consideration as it is inefficient to develop many capabilities at the same time (Davenport 2013). Future research can pay more attention to identify the most relevant capabilities in a specific internationalization context. Another research direction can come from examining the interrelation among these dynamic capabilities, particularly in an SME context (Raymond et al. 2014) and the impact of dynamic capabilities on internationalization performance (Pinho and Prange 2016).

Commitment decisions

Organizational commitment The extent of internationalization depends on commitments related to resources and competencies (Erevelles et al. 2016; Laghzaoui 2011), a vision in internationalization (Souchon et al. 2012) and availability of technologies and infrastructure supporting big data adoption such as intranets, data mining tools, cloud-based platforms, automatic identification, and data capture technologies (Barton and Court 2012; Wamba et al. 2017). Small enterprises would find it more challenging to commit their substantial resources to foreign markets; therefore, they should adjust the level of commitment gradually based on their specific advantages on the local market (Sui and Baum 2014). As the higher faster commitment would yield in the more superior internationalization performance, there is a strong need for research on enhancing commitment, especially for enterprises with regarding their limited resources. Furthermore, examining how domestic industrial developments (Chen et al. 2016) and specific advantages on the local market relate to commitments in foreign markets is another useful research path.

Learning creating trust-building

Organizational learning In internationalization, it is important for enterprises to learn and accumulate knowledge through experience and related networks (Prange and Verdier 2011; Raymond et al. 2014). Organizational learning from internationalization experience is defined as absorptive capability (Prashantham 2005) in which knowledge is created through learning orientation via customers (Efrat et al. 2017) and other partners as a key to success in internationalization (Cardoza and Fornes 2011). Organizational learning can compensate for any lacks of resources in foreign market penetration (Mathews 2006) and shorten the psychic distance between the home country and the foreign market (Sousa et al. 2010).

Organizational culture In fact, the organizational learning has to be compatible with organizational culture; otherwise, changing decision-marketing culture is necessary in utilizing vast flows of information (McAfee et al. 2012). It is important to build an organizational culture supporting data-driven decision across all departments of an enterprise (Leeflang et al. 2014). Organizational culture should be built based on trust in order to encourage all departments across an enterprise to share knowledge and make data-driven decisions (Janssen et al. 2017). The idea of a trust-based organizational culture should catch more attentions for future research.

Absorptive capability Enterprises' absorptive capability to learn from big data is also influenced by many factors such as network, commitment, and vision (Cavusgil and Knight 2015; Monferrer et al. 2015). Future researches could focus on mining the factors influencing the absorptive capability of enterprises. The interrelationship among absorptive capability, internationalization, and knowledge management is also an interesting research stream with a profound impact in this field (Samiee and Chabowski 2012). In the same vein, scholars may also explore the unlearning capability to get rid of outdated dominant logics within enterprises (Magnusson et al. 2013).

Network position

Value creation network As mentioned above, the majority of the articles in this literature review treat the topic of network position with least intensity. In fact, it is important to have networks of marketing scientists, practitioners (Leeflang et al. 2014), managers, consultants (Wamba et al.

2017), founders or senior managers (Wu and Zhou 2018), stakeholders (Xu et al. 2016), foreign distributors and intermediaries (Knight and Cavusgil 2004), and even suppliers and customers (Johanson and Vahlne 2009) for co-creating values from designing to consuming products or services (Sheth and Sharma 2005). Therefore, it is necessary to develop a unified network enabling data practitioners, who are not necessarily experts in programming languages (Goth 2015), and to stimulate the interconnection between organizations and customers (Xie et al. 2016). This system should be built based on trust in order to encourage all members of network to share knowledge (Janssen et al., 2017; Ribau et al. 2018). The idea of a trust-based network system should be studied more for future research as it facilitates early and rapid internationalization (Wu and Zhou 2018). It is recommended that future scholars should conduct further research in applying social media to build a network position (Pinho and Prange 2016). This network system would fortify the access to target foreign markets and customers (Knight and Liesch 2016) as well as the benefit from other potential new markets (Raymond et al. 2014).

Conclusion

This literature review synthesizes 73 articles through the integration of the knowledge management framework with the Uppsala internationalization model to link the gap between big data adoption and internationalization. The concept matrix is used to categorize all the articles with units of analysis to find out the relationship among them. The result of this article indicates the current status and future research directions of big data adoption in internationalization with the focus on international marketing.

The adoption of big data in internationalization is still in the early stage (O'Connor and Kelly 2017; Tian 2017). In particular, SMEs and enterprises in developing countries are considered as late adopters of big data due to resource constraints (Sheth and Sharma 2005; O'Connor and Kelly 2017). However, this research stream appears to be a fruitful area of future research due to the potential benefits for organizations and the availabilities of new trends such as open-source systems and cloud-based services. Future studies should give more efforts to promote big data adoption in internationalization for enterprises, especially SMEs.

Theoretical contributions

The findings of the paper, which reveal the status of research in knowledge management and internationalization, have fulfilled a significant gap in the literature. Considering the fact that there is little research on the interrelation among big data, knowledge management, and internationalization (Chen et al. 2012; Leeflang et al. 2014; Samiee and Chabowski 2012; Sheth and Sharma 2005), the integrated framework of big data adoption in internationalization has made an important theoretical contribution. Notably, the proposed framework has connected the two different domains: internationalization and knowledge management. It can be considered as one of the first frameworks that links these two domains together. Through the proposed framework, big data has been viewed from the lens of marketing analytics; therefore, knowledge from big data is well applied into internationalization. In the other words, the values of big data are amplified and leveraged through marketing analytics. Researchers can base on this framework to deepen their studies in specific research domains. This article can also be a source of reference for scholars, marketers, and data analysts. Through the literature review and analysis, some interesting research directions are proposed. Each future research will enrich the literature in this field.

Practical contributions

In terms of practical contributions, the integrated framework of big data adoption in internationalization helps enterprises, especially SMEs, clarify the specific process for creating, storing, transferring, and applying knowledge when going international. Through each step in the knowledge management process, potential challenges are identified. Enterprises should consider challenges as the starting point in the process of adopting big data. Finally, knowledge acquired from the integrated framework would be relevant for enterprises to exploit opportunities and build a strong network in foreign markets. Successful application of marketing analytics to transfer big data into knowledge on foreign markets will empower enterprises, especially SMEs, to gain a competitive advantage and improve internationalization performance (Chen et al. 2016; Ribau et al. 2018). Therefore, the integrated framework will make great contributions for enterprises in internationalization as big data can offer them certain competitive advantages to overcome the challenge of lack of knowledge in understanding competitors, forecasting market demand and innovating new products (Efrat et al. 2017; Lackman et al. 2000; Monferrer et al. 2015). The framework can serve as the kickoff for enterprises to acquire, store, share, and apply knowledge from big data in internationalization. In order to validate the framework, an ongoing project is being carried out with Vietnamese exporting firms. This project applies the integrated framework to help these firms explore and exploit data from open sources through the application of analytic techniques including descriptive, predictive, and prescriptive. Future researchers can further verify the validity of the integrated framework with real business settings. This would reinforce the practical and theoretical contributions of this paper.

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