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A Knowledge-based view of People and Technology: Directions for a value co-creation based learning organisation

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A Knowledge-based view of People and Technology: Directions for a value co-creation based learning organisation

Abstract

Purpose - The paper aims to: 1) investigate the potential of Knowledge Management (KM) as a discipline in helping understand and manage social and economic complexity; 2) highlight potential relationships among the approaches to KM by different organisations and their economic performance; and 3) assess the role of human resources and technological infrastructures in the relationship between companies' approach to KM and their economic performance.

Methodology – Reflections herein are tested via a survey on a sample of managerial-level employees of Information and Technologies companies located in the city of Brno in Czech Republic. The results of the survey are used to investigate via Structural Equation Modelling (SEM) the relationships between KM, the human resources' willingness and training levels in collaboration and value co-creation, and the companies' economic performance.

Findings – The paper outlines that: 1) there is a direct and positive relationship between the approach to KM by an organisation and its economic performance; 2) workforce's behaviour and the technological infrastructure of the organisation affect the relationship between the approach to KM and business performance; and 3) to be considered as a learning organisations a link between human resource management and technology orientation must be established and supported by a KM strategy.

Originality – The paper offers a wider perspective of the ways to approach KM within the enterprise. Reflections and empirical results underline the need for companies to invest in the implementation of KM strategies involve both the human resources and technological infrastructure as a way to improve the impact of knowledge on the companies' economic performances.

Article classification – Research paper

Keywords – Knowledge Management phases, Human Resources, Technology, Learning organisation, Survey, Structural Equation Modelling.

1. Introduction

Social and economic dynamics pose a continuous and dynamic set of challenges to both researchers and decision makers (Miles, 1993; Mittelman, 1996; Castro Laszlo & Laszlo, 2002; Schweitzer et al., 2009). The opportunities and risks that are emerging from the changes in the relationships among social and economic actors require an increasing degree of efforts to build and apply models, instruments, and approaches able to better support the understanding and managing of increasing social and economic complexity (Andersen et al., 2006; Barile & Saviano, 2010, 2011; Kuhn, 2012). This confirms what Porter and Kramer (2007) stated about the strong interdependence between companies and society. According to the authors, activities of a company have a direct impact on the communities they work with. At the same time, companies are required to meet stakeholders' expectations (Grant, 1991; Bowen et al., 2001; de Bakker and Nijhof, 2002; Strand and Freeman, 2015). The interdependence between company and society must lead to pursuing a shared value, or "a long-term investment on the future competitiveness of the company, where both parties have benefits " (Porter and Kramer, 2007, p. 231).

New dimensions are required in the definition of business models and social plans and a wider perspective is essential for the definition of efficient, effective, and sustainable pathways able to ensure the survival of every type of organisation (Kirkeby, 2000; Gummesson, 2006; Golinelli et al., 2012).

The marketing and organisational literature includes several initiatives that have sought to provide answers to the emerging need for new managerial and social models (Cox & Blake, 1991; Day, 1994; Brown & Duguid, 2001; Payne & Frow, 2005). Some of these contributions have focused on the interaction between service providers and their users (Moorman et al. 1992; Merlyn & Välikangas, 1998; Berry, 1995; Grönroos, 2004). Others have pointed to the role of Information and Communication Technologies (ICT) in supporting the understanding of social and economic dynamics (Roberts, 2000; Malhotra, 2005; Castells & Cardoso, 2006) and on the potential contributions that more performant organisational models could offer in terms of management of the resources available (Hansen & Wernerfelt, 1989; McElroy, 2000; Tseng, 2010).

Considering the importance of comprehensive value creation, recent developments in stakeholder theory highlight the relevance of interaction between companies and their stakeholders to strategic management (Scherer and Palazzo, 2007; Freeman, 2009; Baden, 2010; Smith et al., 2011).

From a managerial perspective, Prahalad and Ramaswamy (2000; 2004) pointed out that the evolution of customers "active players" is leading companies to a new industry model "where value is created by experiences" (Prahalad 2004, p. 172).

This form of dialog should be seen as an interactive process of learning together (Ballantyne, 2004). Despite the value of these contributions, a shared approach to the solution of the emerging social and economic dynamics still appears unfulfilled (Allen et al., 2011; Barile et al., 2013; Di Nauta et al., 2015).

(KM) and, more specifically, by the concept of learning organisation as a construct based on the combination of knowledge, organisation, people, and technology (Senge, 2014).

As a matter of fact, one key aspect of value co-creation is the amount of information, knowledge, skills and other resources that companies can access and use (Normann, 2001).

As several authors pointed out, dynamic capability could allow companies to integrate, build and configure internal and external expertise to address rapidly changing environments (Wernerfelt, 1984; Barney, 1991; Teece et al., 1997; XX).

In this perspective, several authors analyze how Knowledge management capabilities can help companies in responding to ongoing changes in the business environment and in improving their competitive advantage (Huang et al. 2011; Marques et al. 2015).

Building on this construct, this research aims to focus on two key drivers in the understanding and management of social and economic complexity: people and technology. More specifically, the paper aims to enrich previous theoretical and empirical contributions on KM and learning organisation investigating the ways in which knowledge, as a complex mixture of competences, capabilities, interpretation models, information, and perceptions that influence companies' strategies, plans, and actions is related to human resources' behaviours, companies' stock of technologies, and companies' economic performances. The main goal of this paper is therefore to investigate how the phases of KM – acquisition, documentation, transfer, creation, and application – impact on the companies' economic performances and what is the role of human resources (HRs) and technological infrastructures (TIs) in this relationship.

As several authors stated, HRM and Technological Infrastructures could affect companies performances (Florkowski, 2018; Macke and Genari, 2019). HRM, for example, fosters knowledge sharing at individual and organizational level, which, in turn, improves companies performances (Armstrong, 2000). KM generally described as the missing link between HRM strategies and organisational learning. According to Garavan et al. (2000), KM processes are assuming a strategic role in HRM strategies and organisation learning throughout the development and implementation of KM strategies, the building of relational network to support knowledge sharing, and the definition of a double-loop learning. In this context, the use of Information Technologies could support human interactions and collaboration processes (Yahya and Goh, 2002) supporting business (Tapscott and Caston, 1993).

Starting from this scenario, the key concept that the paper aims to investigate is how some phases of KM (i.e. Creation and Application) are directly related to companies' profit whereas in other phases the relationships is mediated by the availability of technology infrastructure (as is the case of Documentation and Acquisition) or by the willingness and training of HRs to collaboration and value co-creation (it is the case of Transfer).

The rest of paper is structured as follow: next section contains a brief analysis of the contribution reported in the literature and the hypotheses proposed by the research. The approach to data collection and analysis is discussed in section 3. Section 4, presents the findings of the empirical study. The theoretical and practical implications of the research are discussed in section 5. Finally, in the section 'final remarks and possible future lines of research' some final reflections and possible implications of proposed research are outlined.

2. Theoretical and Conceptual Background

2.1. Knowledge Management

The growing pressures of the emerging hyperconnected society are requiring the identification of new efficient, effective, and sustainable managerial and organisation models able to support both researchers and decision makers in understanding and managing social and economic complexity (Holling, 2001; Godes et al., 2005; Barile et al., 2014, 2015). Among the different research streams interested in the building of a wider perspective in the study of social and economic topics, the contributions of the KM field have acquired an increasing interest both from theoretical and practical viewpoints (Tsoukas, 1996; Berkes, 2009).

In the last few years, more contributions have been offered on the topic of KM (Rubenstein-Montano et al., 2001) and further understanding of its different dimensions (Argote et al., 2003) and dynamics (Gold et al., 2001). Despite this, according to Beesley and Cooper (2008) a shared definition of KM is still lacking. However, notwithstanding the inexistence of a shared definition for KM, the knowledge can be considered one of the most relevant strategic factor for companies' strategies (Spender, 1996) and competitive advantages (Teece, 2001).

Different authors have underlined the existence of a strong relationship between the companies' approach to KM and their economic performance (Wong and Aspinwall, 2004). More specifically, McAdam and Reid (2001) using a research survey on 49 Small and Medium Enterprises, 46 large organisations, and 8 qualitative workshops found a correlation between the presence of strategies for Knowledge acquisition and sharing and economic performances in organisations. In the same direction, Salojärvi et al. (2005) through a survey of 108 Finnish companies found that the maturity of companies' knowledge is positively related with long-term sustainable growth.

The positive impact of companies' attention to knowledge practices on companies' performances is commonly shared among researchers and practitioners interested in the subject of competitive advantages (Tsai, 2001). Despite this, it is important to highlight that different approaches to KM are possible and that the ways in which companies face the challenges on Knowledge Economy are affected by their specific features, aims, and perspective (Hislop, 2013). According to Varun Grover (2001), a general approach to KM cannot be defined and specific customised reflections must be developed with reference to each company, context or situation.

This latter consideration represents an evident obstacle in the studies on KM and in the application of best practices in companies' strategies (Alavi & Leidner, 2001). Filius et al. (2000) studied the implications of this limitation by building on the previous reflections of Wiig (1993), Davenport and Prusak (1998), and Bukowitz and Williams (1999), who identified five phases in which it is possible 'split up' the KM processes independently from companies' features and social and contextual influences. These phases are: 1) knowledge acquisition, 2) knowledge documentation, 3) knowledge transfer, 4) knowledge creation, and 5) knowledge application.

Thanks to the contribution of Filius et al. (2000) it is possible to build interesting research pathways to investigate the potential relationships between the KM phases and firm's economic performance. Therefore, by combining their classification with the existing empirical and theoretical contributions on the relationships between KM and firm's economic performances the paper hypothesise that:

***H₁:** There is a positive and direct relationship between companies' approach to knowledge creation and their performance levels.*

***H₂:** There is a positive and direct relationship between companies' approach to knowledge application and their performance levels.*

The first two hypothesis build on the possibility to identify a direct relationship between the KM phases related to knowledge creation and acquisition and companies' profit levels. For the remaining phases, a more detailed analysis is required. Building on the existing theoretical and conceptual contributions a wide analysis is requested in order to verify in which ways HRs and companies' can affect the impact of KM phases on the companies' profit.

2.2. Human Resources management

KM studies have often been strictly related to Human Resources Management (HRM) and its contributions to the processes of evaluating, addressing, and improving firms' performance by increasing the productivity of employees (Oltra, 2005). The distinction between tacit and explicit knowledge (Polanyi, 1966) and later the introduction of the 'Spiral of Knowledge' (Nonaka & Takeuchi, 1995) have led to a significant volume of works that combine KM and HRM theories in attempts to support knowledge transfer within organisations (Smith, 2001; Pablos & Lytras, 2008). Such views were then strengthened by the work of Liebowitz (1999), who argued that most of the knowledge available to a firm is strictly related to the mental models, perceptions and experiences of their people and therefore cannot be easily codified and shared. Soliman and Spooner (2000) then concluded that people are the key component in KM strategies as they can: 1) identify the more relevant knowledge dimensions for the company, 2) define a common and shared knowledge vocabulary, 3) develop instruments to support KM processes, and 4) constantly update the knowledge categories. Thus, the relationship between KM and HRM gained in relevance and has been stressed by different authors more recently (Robertson & O'Malley Hammersley, 2000; Shih & Chiang, 2005; Chen & Huang, 2009).

Building upon previous contributions, the role of the human resources in the success of the knowledge transfer processes within the business can be highlighted (Davenport and Prusak, 1998). In a recent research, Ardito & Messeni Petruzzelli (2017) explored the relationship between the breadth of external knowledge sourcing and product innovation by unveiling the moderating effects of strategic HR practices, as represented by the implementation of heterogeneous work groups and brainstorming sessions. These authors found that the implementation of strategic HR practices does influence the breadth of external knowledge sourcing and its effects on product innovation. Furthermore, by combining the theoretical contributions in the field of KM with more recent developments in the

subject of service logic it can be argued that the ways in which human resources' behaviours influence the relationship between companies' approach to knowledge transfer and companies' economic performance depend by human resources' willingness and training in collaboration and value co-creation (Yahya & Goh, 2002; Barile & Polese, 2010; Barile et al., 2010; Badilenni et al., 2012). Further, Beugelsdijk (2008) hypothesised on the relation between strategic human resource practices and a firm's capability to generate product innovations, and found that factors such as training and performance-based pay are essential for incremental innovations, while factors such as flexible working hours help the emergence of radical innovations. The author also found interaction effects between individual HR practices, between HR practices and firm size, and between HR practices and R&D intensity. As described by Reagans and McEvily (2003), knowledge transfer is a consequence of the interaction among people, and it is only possible in cases where human resources are oriented towards a collaboration and co-creation of value with others and have acquired the ability to do so. We therefore hypothesise that:

H₃: There is an indirect relationship between companies' approach to knowledge transfer and their profitability, mediated by willingness and training of its human resources in collaboration and value co-creation.

2.3. Information and Communication Technology

The subject of Information and Communication Technologies (ICTs) and their role in the development and implementation of successful strategies has been key to the KM debate for many years (van den Hooff & De Ridder, 2004; Kowalkowski, 2008; Jarle Gressgård et al., 2014). Many authors have focused on the study of the potential contributions of ICTs to the success of KM strategies (Van Beveren, 2002); on the opportunities offered by ICTs for data management and interpretation (Malhotra, 2005); and on the implications for KM in a more technological and hyperconnected society (Sharma et al., 2008). For example, through a review of 234 research outputs, Liao (2003) found an increasing volume of research exploring ways to combine ICTs and KM in a common and shared management framework. Seufert et al. (1999) highlighted the relevance of ICTs to support interconnected knowledge networks; Ng and Li (2003) underlined that ICTs can support relevant dimensions of KM processes such as: storage, transfer, learning, and measurement; while Becerra-Fernandez and Sabherwal (2006) show how ICTs are intrinsically related to the KM processes and strategies. Karakas (2009) highlights that ICTs can effectively support the KM processes only if their management considers the human, social and psychological dimensions, building on previous views by Blacker (1995), who argued that an approach which is excessively based on ICTs would consider only the explicit dimension of knowledge.

Notwithstanding the different perspectives of ICTs and their relation to KM, there is consensus on the potentials of ICTs for the successful implementation of KM processes, as ICTs increase the speed and efficiency of information flows facilitating sharing and growth of knowledge (Kebede, 2010). However, we must underline that such improvements vary for different KM activities (Walsham, 2001). As concluded by Matzler et al. (2011) and Del Giudice et al. (2013), there is a stronger correlation between knowledge activities related to storage and acquisition of information and the firm's technological infrastructure. Such relationship has been found to be valid for both the Small and Medium Enterprises (Yew Wong, 2005) and large companies (McAdam & Reid, 2001). The

impact of ICTs on knowledge documentation and acquisition has also been verified by Van Der Velden (2002) with reference to specific tools such as e-mail and mailing lists, groupware infrastructures, and codification instruments. In sectors such as supply chain management, authors such as Ardito et al. (2018) have highlighted the role technology in terms of information acquisition, storage and influence on subsequent technological developments, while Feki et al. (2013) had referred in their introduction to a special issue on the subject, the impact of technological developments, in particular the Internet of Things, on several areas including human activity and education and learning.

Theoretical and empirical contributions from different research streams have underlined the potential impact that the use of ICTs can have on business performance and on the firms' ability to better use knowledge (Andreeva & Kianto, 2012). Therefore, by recognising the validity of such theoretical contributions we propose the following hypotheses:

***H₄:** There is an indirect relationship between firms' approach to knowledge documentation and their profit mediated by companies' technology infrastructures.*

***H₅:** There is an indirect relationship between firms' approach to knowledge acquisition and their profit mediated by companies' technology infrastructures.*

Confirming these hypotheses could lead to point out that companies' technology infrastructures and willingness and training of human resources in collaboration and value co-creation could improve the relationship between KM process and business performance.

In sum, the hypotheses outlined in this section can be represented in the conceptual framework in Figure 1.

Figure 1. *The conceptual model*

3. Methodology

3.1 Data collection and sample

The sample includes 237 managerial-level employees of 24 IT knowledge intensive companies located in the City of Brno in Czech Republic. This sector has gained growing attention due the potential impact of its product and service innovation on social issues (Eurostat, 2016). Moreover, the choice of ICT-related companies was motivated by the increasing attention that ICT companies have received by scholars doing research in the fields of KM and organisational learning in the last few years. The city of Brno in Czech Republic was chosen due to the growing volume of ICT companies that have either been created in or relocated to the city in the last two decades (Czech Invest, 2009).

Data were collected using a questionnaire formed by two sections and 36 items. The first section investigates via 31 items the KM phases. The items of this section are formulated by Filius et al. (2000). The second section investigates via 5 items the human resources' willingness and training in

relation to collaboration and value co-creation. The items are formulated on the basis of the extant literature on the topic of ICT and HRM in the light of KM.

The order of the questions was randomised to avoid any order bias.

The web-based survey was structured by the measures and items included in the Appendix 1, which were introduced on the basis of a careful literature review. The survey was administered to managers in charge of decision-making processes. The questionnaire was submitted to individuals holding management-level positions at a sample of ICT-related companies from those located in the city of Brno in the Czech Republic. The 36 close questions were assessed using the seven-point Likert-type scale in which 1 means 'strongly disagree' and 5 means 'strongly agree'. The value of each variable was defined by their items' average.

3.2. Data analysis

The next step in the research consisted of an assessment of the hypotheses, that is, an evaluation of the following correlations between five independent variables (*Knowledge Documentation, Knowledge Transfer, Knowledge Creation, and Knowledge Application*) and the mediating variable (*Human Resources willingness and training in collaboration and value co-creation*). Also, financial statements from 2015 were used to assess the dependent variable (*Companies' Profit*) and the mediating variable (*Companies' stock of ICT*). Therefore, the proposed structural model contains five independent, two mediating, and one dependent variables (see Figure 1).

The correlations were assessed by using structural equation modelling (SEM) (Gefen et al., 2000).

Data used to measure the dependent variable (*Profit*) and the mediating variable (*Stock of ICT*) were obtained from the analysis of the 2015 companies' financial statements. Data used to measure the

five independent variables (*Knowledge acquisition, Knowledge documentation, Knowledge transfer, Knowledge creation, Knowledge application*) and the mediating variable (*Human Resources willingness and training in collaboration and value co-creation*) were acquired via the survey. The questionnaires were submitted directly both in English and Czech language.

Questionnaires were gradually submitted starting in February 2016. By June 2016, 237 questionnaires had been submitted and 113 responses received, out of which 11 questionnaires were excluded due to non-completion. This led to 102 valid questionnaire responses being included in the research, for a response rate of 43.04 %.

The Data analysis pathway has structured as follows:

- The reliability of data obtained through the survey was measured using Cronbach’s alpha (Hinkin, 1995).
- The unidimensionality of the model was verified by investigating the Factor Loading (FL) of each item (Bentler, 2007).
- The convergent validity was measured by using the composite reliability (CR) and the average variance extracted (AVE) (Westen & Rosenthal, 2003).
- The discriminant validity was tested by comparing the square root of AVE for each construct with the correlation coefficients among the constructs (Garver & Mentzer, (1999).
- The hypotheses were tested using structural equation modeling (Bielby & Hauser, 1977).
- Finally, the fitting of the model was verified through the use of fitness indexes such as the normed fit index (NFI), the chi-square-to-degree-of-freedom ratio (χ^2/df), the comparative fit index (CFI), and the goodness of fit index (GFI) (Schumacker & Lomax, 2004).

4. Findings

4.1. Unidimensionality, reliability, and convergent validity

Table 1 shows the Factor Loadings (FL) coefficients for each item, the Cronbach’s alpha (α), the composite reliability (CR) and the average variance extracted (AVE) coefficients for each construct.

Table 1. Results for unidimensionality, reliability, and convergent validity

Constructs	Items	FL	α	CR	AVE
Knowledge acquisition (KAC)	KAC₁	0.632	0.792	0.743	0.602
	KAC₂	0.723			
	KAC₃	0.697			
	KAC₄	0.632			
	KAC₅	0.543			
	KAC₆	0.564			
	KAC₇	0.764			
Knowledge documentation (KDO)	KDO₁	0.678	0.843	0.729	0.593
	KDO₂	0.543			
	KDO₃	0.675			
	KDO₄	0.876			
	KDO₅	0.568			

	KDO₆	0.879			
Knowledge transfer (KTR)	KTR₁	0.764	0.827	0.802	0.652
	KTR₂	0.654			
	KTR₃	0.876			
	KTR₄	0.634			
	KTR₅	0.789			
	KTR₆	0.901			
Knowledge creation (KCR)	KCR₁	0.563	0.901	0.792	0.594
	KCR₂	0.587			
	KCR₃	0.812			
	KCR₄	0.567			
	KCR₅	0.826			
	KCR₆	0.572			
	KCR₇	0.910			
Knowledge application (KAP)	KAP₁	0.713	0.742	0.703	0.546
	KAP₂	0.682			
	KAP₃	0.752			
	KAP₄	0.342			
	HAP₅	0.821			
Human Resources' willingness and training for collaboration and value co-creation (HRC)	HRC₁	0.763	0.712	0.748	0.627
	HRC₂	0.543			
	HRC₃	0.521			
	HRC₄	0.912			
	HRC₅	0.532			
Companies' stock in ICT (ICT)	ICT₁	0.798	0.823	0.810	0.730
Companies' profit (PRF)	PRF₁	0.532	0.702	0.792	0.598

Note: Items with a factor loading lower than 0.5 have been removed

According to Hair et al. (2006), the unidimensionality is respected when the items have FL of 0.5 or higher. In accordance with Nunnally (1978), the reliability is achieved when the constructs have an α value of 0.70 or greater. Finally, the convergent validity is assured when the CR coefficients are equal or higher than 0.7 and the AVE coefficients are more than or equal to 0.5 (Hair et al., 2010).

As the results in Table 1 show, all the identified cut-off values were exceeded.

4.2. Discriminant validity

The square root of AVE for each construct is reported in Table 2 below.

Table 2. Results for discriminant validity

	KAC	KDO	KTR	KCR	KAP	HRC	ICT	PRF
KAC	0.734							
KDO	0.687	0.659						
KTR	0.593	0.413	0.802					
KCR	0.712	0.543	0.683	0.913				
KAP	0.543	0.572	0.721	0.827	0.654			
HRC	0.689	0.639	0.593	0.635	0.573	0.712		
ICT	0.630	0.537	0.785	0.789	0.437	0.629	0.598	

PRF	0.574	0.618	0.589	0.902	0.619	0.536	0.418	<i>0.643</i>
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Note: Italics in the diagonal: square root of AVE value for each construct.

According to Hair et al. (2010), discriminant validity is achieved when the square root of AVE for each construct is greater than the correlation coefficients among the constructs.

As the results in Table 2 show, the square root of AVE for each construct are greater than the related correlation coefficients among the constructs. Therefore, the discriminant validity is achieved.

4.3. Structural Equation Modelling

The hypotheses were tested via the Structural Equation Modelling and the results are reported in the following Table 3.

Table 3. Hypotheses Testing Results

Hypothesis	Standardised regression coefficient	P-Value
H1 (+): Companies' approach to knowledge creation → companies' profit	0.327	0.021
H2 (+): Companies' approach to knowledge application → companies' profit	0.218	0.012
H3 (+): Companies' approach to knowledge transfer → companies' profit via HRs willingness and training in collaboration and value co-creation.	0.237	0.007 *
H4 (+): Companies' approach to knowledge documentation → companies' profit via companies' stock of ICT.	0.427	0.003
H5 (+): Companies' approach to knowledge acquisition → companies' profit via companies' stock of ICT.	0.103	0.029 *

Notes: * is significant at the 0.001 level (two-tailed).

With reference to the results of SEM, the hypotheses which a probability value (P-value) was greater than 0.05 were refuted. As shown in Table 3, all the hypotheses have a P-value lower than 0.05, then they are considered significant and accepted.

4.4. Fitness indexes

To verify the fitness of model some fitness indexes were measured (Table 4)

Table 4. Fitness indexes

Index	Value	Cut-off value
normed fit index (NFI),	1.27	> 0.90 (Hu and Bentler, 1999)
the chi-square-to-degree-of-freedom ratio (χ^2/df)	2.74	≤ 3 (Byrne, 2001)
the comparative fit index (CFI)	1.03	> 0.90 (Hoe, 2008)
and the goodness of fit index (GFI)	0.93	> 0.90 (Jöreskog and Sörbom, 1996)

As shown in Table 4, all the identified indexes overcome the cut-off values. Therefore, the conceptual model can be considered validated.

5. Discussion

The results of empirical study show that all the hypotheses were confirmed. More specifically, from the results of the structural equation modelling it emerges that there is a positive relationship between firms' approach to knowledge creation' and their profit levels (H_1). This finding can be considered aligned with previous studies in KM (Sullivan, 1998; Bontis et al., 1999; Schulze & Hoegl, 2006). In fact, as Tsai (2001) found, there is an evident correlation between the ability of companies to create knowledge and their competitive advantages. In the same domain, Teece (1998) found that the ability of organisations to create knowledge by identifying relevant connection between existing knowledge becomes a source of competitive advantage. In accordance with the empirical results and also with previous theoretical and empirical contributions the firms' ability to create new knowledge can be considered a relevant pillar towards efforts to establish themselves as learning organisations (Zack, 1999) and to maximise the advantages for companies to invest in the creation of a large and shared knowledge framework (Minsky, 1974; Del Giudice & Maggioni, 2014).

From the empirical study it also emerges that there is a positive relationship between organisations' approach to knowledge adoption and reuse, and their profit levels (H_2). This result is coherent with previous empirical and theoretical contributions in the field of KM (Bose, 2004; Pfeffer & Sutton, 2013). More specifically, as highlighted by Quinn (1999), the ways in which companies use their knowledge has a direct impact on their economic performance and market position. In line with this, it is possible to emphasise the contribution that the companies' activities in the field of research and development have on their economic performance (Griliches, 1979). This finding can be considered a strong evidence of the relevance for companies to continually invest to identify better applications for the existing knowledge. Thus, the companies' approach to knowledge application can be considered another relevant dimension in relation to organisational learning (Gold & Arvind Malhotra, 2001). Furthermore, only the companies that are able to use the knowledge available in effective and efficient ways can be considered learning organisations (Simonin, 1997).

Our empirical study also shows a positive relationship between organisations' approach to knowledge transfer and their profit levels, **it** is a relationship mediated by people's willingness and training to collaborate and for value co-creation (H_3). This finding can be considered a relevant building block on which to reflect in order to better value the contributions made by individuals in any role to the plans and strategies of the firm (Martell & Carroll, 1995). Wright et al. (1994) had found that HRs can be considered one of the more relevant sources of competitive advantages for the organisation. The HRs often embody what defines the complex volume of companies' knowledge, information, organisational models, strong beliefs, and perspectives (Swart & Kinnie, 2003; Calabrese et al., 2013). This result and the findings of previous empirical studies add to previous contributions on the topic of information sharing in the fields of KM and HRM (Sparrow, 2006; Bishop et al., 2008; Caputo et al., 2016). In the same direction, this empirical evidence also shows the importance of any efforts to enable the workforce to collaborate and co-create value. In fact, only the companies in which all the HRs are engaged and oriented to achieve shared aims can be considered learning organisations (Del Giudice et al., 2012).

Finally, our empirical study shows that there is a positive relationship between companies' approach to knowledge documentation' and their profit levels, and that this relationship is mediated by the

companies' stock of ICT (H₄). Also, it was found that there is a positive relationship between companies' approach to knowledge acquisition and companies' profit levels in a relationship mediated by the companies' stock of ICT (H₅). These findings can be considered an evidence of the relevance that ICT have inside the companies' approach to KM (Palvalin et al., 2013). More specifically, in line with the evidence shown by Mohamed et al. (2010), our research highlights the potential of ICTs to offer relevant instrumental contributions to companies' KM approaches. From this point of view, the empirical study enriches previous contributions on the relationship between KM and ICTs. Furthermore, we also argue that ICT have a relevant role for the emergence of learning organisations (Easterby-Smith et al., 1999). In fact, only the companies able to be constantly and continually aligned with the contexts' information flows can be considered learning organisations and this alignment can be achieved only using opportunely the instruments offered by the ICT (Roberts, 2000).

6. Final Remarks and future lines of research

The current socio-economic environment is characterised by an unprecedented need for organisations to both access information from external sources and deliver the right information to their customers; an increasing willingness of customers and other stakeholders to remain involved in the companies' pathways and strategies; and a growing relevance for companies to be aligned with social and economic dynamics to survive. In such a dynamic environment, knowledge becomes a critical resource for organisations to create a sustainable competitive advantage (Spender, 1996; Mathews et al., 1999; Gintis, 2000). Paradoxically, a clear understanding of the possible levers on which to act to maximise the impact of knowledge on the delivery of the firms' strategy is still needed (Hansen et al., 1999; Del Giudice et al., 2010; Pfeffer & Sutton, 2013; Saviano & Caputo, 2013). This paper has aimed at contributing to the current debate on the subject of KM by highlighting potential relationships between the phases of knowledge, the role of companies' ICT stocks, the HRs willingness and training to collaborate and co-create value, and the effects of all of these on the companies' profit levels. In this direction, our main goal has been identifying the possible role of people and technology in supporting the emergence of value co-creation in learning organisations.

This research shows the role of ICT and HRs in the relationship between knowledge phases and companies' economic performance. It contributes to the existing literature exploring ways to improve the value of knowledge for companies by identifying some relevant dimensions in the evolution towards learning organisations. This is in line with Senge's (2006) notion of the possibility to evolve into a learning organisation as strictly related to the ways in which information and knowledge are acquired, created, and shared. Therefore, in line with the results of this empirical study, evolving towards a learning organisation relies on the companies' ICT stock as well as to the willingness and training of its people to collaborate and co-create value.

A series of implications both from theoretical as well as from practical standpoints have emerged from our research. From a theoretical point of view, the following are suggested as potential areas for future research:

- Further investigating the impact of people's willingness and training in collaboration and value co-creation on companies' performance in the light of KM,
- Define a wider perspective in the studies on KM, which includes the role of technology and people

and their interconnections,

- Investigating new, relevant relationships and dynamics between people, technology and knowledge inside and outside the organisation,
- Conducting cross-cultural studies to investigate the benefits of KM in different contexts.

From practical point of view the following is suggested:

- Developing management guidelines to support decision makers in better understanding the opportunities offered by KM strategies and tools,
- Develop training pathways to enable the workforce to collaborate and co-create value,
- Develop strategies to better align the human and technological components within organisations.

In accordance with the theoretical and practical implications listed, the reflections and empirical evidences herein cannot be considered exhaustive. They represent only a possible piece of a complex puzzle that requires a multi- and trans-disciplinary approach to be correctly assembled. Building on this, other researchers are encouraged to better investigate the relationships between knowledge, people, and technology and to define more specific directions to build value co-creation based learning organisations.

References

- Alavi, M. and Leidner, D.E. (2001), "Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues", *MIS quarterly*, pp. 107-136.
- Allen, P., Maguire, S. and McKelvey, B. (2011), *The SAGE Handbook of Complexity and Management*, SAGE, London.
- Andersen, H., Barker, P. and Chen, X. (2006), *The cognitive structure of scientific revolutions*, Cambridge University Press, Cambridge.
- Andreeva, T. and Kianto, A. (2012), "Does knowledge management really matter? Linking knowledge management practices, competitiveness and economic performance", *Journal of Knowledge Management*, Vol. 16 No. 4, pp. 617-636.
- Ardito, L., & Messeni Petruzzelli, A., (2017) Breadth of external knowledge sourcing and product innovation: The moderating role of strategic human resource practices, *European Management Journal*, <http://dx.doi.org/10.1016/j.emj.2017.01.005>
- Ardito, L., Messeni Petruzzelli, A., Panniello, U. and Garavelli, A. C. (2018) Towards Industry 4.0: Mapping digital technologies for supply chain management-marketing integration. *Business Process Management Journal*, forthcoming, doi:10.1108/BPMJ-1104-2017-0088.
- Feki, M. A., Kawsar, F., Boussard, M., & Trappeniers, L. (2013). The internet of things: the next technological revolution. *Computer*, (2), 24-25.
- Argote, L., McEvily, B. and Reagans, R. (2003), "Managing knowledge in organizations: An integrative framework and review of emerging themes", *Management science*, Vol. 49, No. 4, pp. 571-582.
- Armstrong, M. (2000), "The name has changed but has the game remained the same?", *Employee Relations*, Vol. 22 No. 6, pp. 576-93.
- Badinelli, R., Barile, S., Ng, I., Polese, F., Saviano, M. and Di Nauta, P. (2012), "Viable service systems and decision making in service management", *Journal of Service Management*, Vol. 23 No. 4, pp. 498-526.
- Barile S., Carrubbo L., Iandolo F. and Caputo F. (2013), "From 'EGO' to 'ECO' in B2B relationships", *Journal of Business Market Management*, Vol. 6 No. 4, pp. 228-253.
- Barile, S. and Polese, F. (2010), "Smart service systems and viable service systems: applying systems theory to service science", *Service Science*, Vol. 2 No. 1-2, pp. 21-40.
- Barile, S. and Saviano, M. (2010), "A new perspective of systems complexity in service science", *Impresa, Ambiente, Management*, Vol. 4 No. 3, pp. 375-414.
- Barile, S. and Saviano, M. (2011), "Qualifying the concept of systems complexity", in Various authors, *Contributions to theoretical and practical advances in management. A Viable Systems Approach (vSa)*, International Printing, Avellino, pp. 27-60.
- Barile, S., Saviano, M. and Caputo F. (2014), "A systems view of customer satisfaction", in *National Conference "Excellence in quality, statistical quality control and customer satisfaction"*, University Campus "Luigi Einaudi", University of Turin, September 18-19.
- Barile S., Saviano M. and Caputo F. (2015), "How Are Markets Changing? The Emergence of Consumers Market Systems", in *3rd International Symposium Advances in Business Management. "Towards Systemic Approach"*, University of Perugia, 21-23 January.
- Barile, S., Spohrer, J. and Polese, F. (2010), "Editorial column-system thinking for service research advances", *Service Science*, Vol. 2 No. 1-2, pp. i-iii.

- Becerra-Fernandez, I. and Sabherwal, R. (2006), "ICT and knowledge management systems", in Schwartz, D. (Ed.), *Encyclopedia of knowledge management*, IGI Global, New York, pp. 230-236.
- Beesley, L.G.A. and Cooper, C. (2008), "Defining knowledge management (KM) activities: towards consensus", *Journal of Knowledge Management*, Vol. 1 No. 3, pp. 48-62.
- Bentler, P. M. (2007), "On tests and indices for evaluating structural models", *Personality and Individual Differences*, Vol. 42 No. 5, pp. 825-829.
- Berkes, F. (2009), "Evolution of co-management: role of knowledge generation, bridging organizations and social learning", *Journal of environmental management*, Vol. 90 No. 5, pp. 1692-1702.
- Berry, L.L. (1995), "Relationship marketing of services—growing interest, emerging perspectives", *Journal of the Academy of marketing science*, Vol. 23, No. 4, pp. 236-245.
- Beugelsdijk, S. (2008). Strategic human resource practices and product innovation. *Organization Studies*, 29(6), 821-847.
- Bielby, W.T. and Hauser, R. M. (1977), "Structural equation models", *Annual review of sociology*, 137-161.
- Bishop, J., Bouchlaghem, D., Glass, J. and Matsumoto, I. (2008), "Ensuring the effectiveness of a knowledge management initiative", *Journal of Knowledge Management*, Vol. 12 No. 4, pp. 16-29.
- Blackler, F. (1995), "Knowledge, knowledge work and organizations: an overview and interpretation", *Organization Studies*, Vol. 16 No. 6, pp. 1021-1046.
- Bontis, N., Dragonetti, N.C., Jacobsen, K. and Roos, G. (1999), "The knowledge toolbox: A review of the tools available to measure and manage intangible resources" *European management journal*, Vol. 17 No. 4, pp. 391-402.
- Bose, R. (2004), "Knowledge management metrics", *Industrial management & data systems*, Vol. 104, No. 6, pp. 457-468.
- Brown, J.S. and Duguid, P. (2001), "Knowledge and organization: A social-practice perspective", *Organization science*, Vol. 12, No. 2, pp. 198-213.
- Bukowitz, W.R. and Williams, R.L. (1999), *The Knowledge Management Fieldbook*, Pearson Education, Harlow.
- Byrne, B.M. (2001), "Structural equation modeling with AMOS, EQS, and LISREL: Comparative approaches to testing for the factorial validity of a measuring instrument", *International journal of testing*, Vol. 1 No. 1, pp. 55-86.
- Calabrese M., Iandolo F., Antonucci E. and Caputo F. (2013), "Towards a value co-creation based Healthcare System", in Gummesson E., Mele C., Polese F. (eds.), *Service Dominant logic, Network & Systems Theory and Service Science: integrating three perspectives for a new service agenda*, Giannini Editore, Napoli, pp. 1-22.
- Caputo F., Del Giudice M., Evangelista F. and Russo G. (2016), "Corporate disclosure and intellectual capital. The light side of information asymmetry", *International Journal of Managerial and Financial Accounting*, Vol. 8, No. 1, pp. 75-96.
- Castells, M. and Cardoso, G. (Eds.) (2006), *The network society: From knowledge to policy*, Center for Transatlantic Relations, Paul H. Nitze School of Advanced International Studies, Johns Hopkins University.

- Castro Laszlo, K. and Laszlo, A. (2002), "Evolving knowledge for development: the role of knowledge management in a changing world", *Journal of Knowledge Management*, Vol. 6 No. 4, pp. 400-412.
- Chen, C.J. and Huang, J.W. (2009), "Strategic human resource practices and innovation performance- The mediating role of knowledge management capacity", *Journal of business research*, Vol. 62 No. 1, pp. 104-114.
- Cox, T.H. and Blake, S. (1991), "Managing cultural diversity: Implications for organizational competitiveness", *The Executive*, 45-56.
- Czech Invest (2009). *IT and Software Development in the Czech Republic*, available at: http://www.mzv.cz/public/c4/f/ce/481621_370909_CI_IT____Software_Development_in_the_Czech_Republic_08_2009.pdf.
- Davenport, T.H. and Prusak, L. (1998), *Working Knowledge: How Organisations Manage What They Know*, Harvard Business School Press, Boston, MA.
- Day, G. S. (1994), "The capabilities of market-driven organizations", *The Journal of Marketing*, 37-52.
- Del Giudice, M., Carayannis, E.G. and Della Peruta, M.R. (2012), *Cross-cultural knowledge management*, Springer, New York.
- Del Giudice, M., Della Peruta, M.R. and Carayannis, E.G. (2010), *Knowledge and the family business: the governance and management of family firms in the new knowledge economy*, Springer Science & Business Media, New York.
- Del Giudice, M., Della Peruta, M.R. and Carayannis, E.G. (2013). *Social media and emerging economies: Technological, cultural and economic implications*, Springer Science & Business Media, New York.
- Del Giudice, M. and Maggioni, V. (2014), "Managerial practices and operative directions of knowledge management within inter-firm networks: a global view", *Journal of Knowledge Management*, Vol. 18 No. 5, pp. 841-846.
- Di Nauta P., Merola B., Caputo F. and Evangelista F. (2015), "Reflections on the Role of University to Face the Challenges of Knowledge Society for the Local Economic Development", *Journal of Knowledge Economy*, pp. 1-19
- Easterby-Smith, M., Araujo, L. and Burgoyne, J. (1999), *Organizational learning and the learning organization: Developments in theory and practice*, Sage, London.
- Filius, R., De Jong, J.A. and Roelofs, E.C. (2000), "Knowledge management in the HRD office: a comparison of three cases", *Journal of Workplace Learning*, Vol. 12 No. 7, pp. 286-295.
- Florkowski, G.W. (2018), "HR Technology Systems: An Evidence-Based Approach to Construct Measurement", *Research in Personnel and Human Resources Management*, pp. 197-239.
- Garavan, T.N., Gunnigle, P. and Morley, M. (2000), "Contemporary HRD research: a triarchy of theoretical perspectives and their prescriptions for HRD", *Journal of European Industrial Training*, Vol. 24 No. 2/3/4, pp. 65-93.
- Garver, M.S. and Mentzer, J.T. (1999), "Logistics research methods: employing structural equation modeling to test for construct validity" *Journal of business logistics*, Vol. 20 No. 1, pp. 33-47.
- Gintis, H. (2005), *Moral sentiments and material interests: The foundations of cooperation in economic life*, MIT press, Cambridge, Massachusetts, United States.
- Godes, D., Mayzlin, D., Chen, Y., Das, S., Dellarocas, C., Pfeiffer, B. and Verleghe, P. (2005), "The firm's management of social interactions", *Marketing Letters*, Vol. 16, No. 3-4, pp. 415-428.

- Gold, A.H. and Arvind Malhotra, A.H.S. (2001), “Knowledge management: An organizational capabilities perspective”, *Journal of management information systems*, Vol. 18 No. 1, pp. 185-214.
- Golinelli, G.M., Barile, S., Saviano, M. and Polese, F. (2012), “Perspective Shifts in Marketing: Toward a Paradigm Change?”, *Service Science*, Vol. 4 No. 2, pp. 121-134.
- Griliches, Z. (1979), “Issues in assessing the contribution of research and development to productivity growth”, *The bell journal of economics*, pp. 92-116.
- Grönroos, C. (2004), “The relationship marketing process: communication, interaction, dialogue, value”, *Journal of business & industrial marketing*, Vol. 19 No. 2, pp. 99-113.
- Gummesson, E. (2006), “Qualitative research in management: addressing complexity, context and persona”, *Management Decision*, Vol. 44 No. 2, pp. 167-179.
- Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010), *Multivariate Data Analysis: A Global Perspective*, Pearson Education, New Jersey, NJ.
- Hansen, G.S. and Wernerfelt, B. (1989), “Determinants of firm performance: The relative importance of economic and organizational factors”, *Strategic management journal*, Vol. 10 No. 5, pp. 399-411.
- Hansen, M.T., Nohria, N. and Tierney, T. (1999), “What’s your strategy for managing knowledge?”, *Harvard Business Review*, Vol. 77 No. 2, pp. 106-116.
- Hinkin, T. R. (1995), “A review of scale development practices in the study of organizations”, *Journal of management*, Vol. 21 No. 5, pp. 967-988.
- Hislop, D. (2013), *Knowledge management in organizations: A critical introduction*, Oxford University Press, Chambridge.
- Hoe, S.L. (2008), “Issues and procedures in adopting structural equation modeling technique”, *Journal of applied quantitative methods*, Vol. 3 No. 1, pp. 76-83.
- Holling, C.S. (2001), “Understanding the complexity of economic, ecological, and social systems”, *Ecosystems*, Vol. 4 No. 5, pp. 390-405.
- Hu, L.T. and Bentler, P.M. (1999), “Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives”, *Structural equation modeling: a multidisciplinary journal*, Vol. 6 No. 1, pp. 1-55.
- Macke, J., Genari, D. (2019), “Systematic literature review on sustainable human resource management”, *Journal of Cleaner Production* 208, pp. 806-815.
- Jarle Gressgård, L., Amundsen, O., Merethe Aasen, T. and Hansen, K. (2014), “Use of information and communication technology to support employee-driven innovation in organizations: a knowledge management perspective”, *Journal of Knowledge Management*, Vol. 18 No. 4, pp. 633-650.
- Jöreskog, K.G. and Sörbom D. (1996), *PRELIS 2 User’s Reference Guide: A Program for Multivariate Data Screening and Data Summarization: a Preprocessor for LISREL*, Scientific Software International, New York.
- Karakas, F. (2009), “Welcome to World 2.0: the new digital ecosystem”, *Journal of Business Strategy*, Vol. 30 No. 4, pp. 23-30.
- Kebede, G. (2010), “Knowledge management: An information science perspective”, *International Journal of Information Management*, Vol. 30 No. 5, pp. 416-424.
- Kirkeby, O.F. (2000), *Management philosophy: A radical-normative perspective*, Springer Science & Business Media, New York.

- Kowalkowski, C. (2008), "Service productivity gains through information and communication technology applications: a service marketing approach", *International Journal of Knowledge Management Studies*, Vol. 2 No. 1, pp. 96-114.
- Kuhn, T.S. (2012), *The Structure of Scientific Revolutions: 50th Anniversary Edition*, University of Chicago Press, Chicago.
- Liao, S.H. (2003), "Knowledge management technologies and applications-literature review from 1995 to 2002", *Expert systems with applications*, Vol. 25 No. 2, pp. 155-164.
- Liebowitz, J. (Ed.) (1999), *Knowledge management handbook*, CRC press, Philadelphia, United States.
- MacCallum, R.C. and Austin, J.T. (2000), "Applications of structural equation modeling in psychological research" *Annual review of psychology*, Vol. 51 No. 1, pp. 201-226.
- Malhotra, Y. (2005), "Integrating knowledge management technologies in organizational business processes: getting real time enterprises to deliver real business performance", *Journal of knowledge management*, Vol. 9 No. 1, pp. 7-28.
- Martell, K. and Carroll, S.J. (1995), "How strategic is HRM?", *Human Resource Management*, Vol. 34 No. 2, pp. 253-267.
- Mathews, K.M., White, M.C. and Long, R.G. (1999), "Why study the complexity sciences in the social sciences?", *Human Relations*, Vol. 52 No. 4, pp. 439-462.
- Matzler, K., Renzl, B., Mooradian, T., von Krogh, G. and Mueller, J. (2011), "Personality traits, affective commitment, documentation of knowledge, and knowledge sharing". *The International Journal of Human Resource Management*, Vol. 22 No. 2, pp. 296-310.
- McAdam, R. and Reid, R. (2001), "SME and large organisation perceptions of knowledge management: comparisons and contrasts", *Journal of Knowledge Management*, Vol. 5 No. 3, pp. 231-241.
- McElroy, M.W. (2000), "Integrating complexity theory, knowledge management and organizational learning", *Journal of knowledge management*, Vol. 4 No. 3, pp. 195-203.
- Merlyn, P.R. and Välikangas, L. (1998), "From information technology to knowledge technology: taking the user into consideration", *Journal of Knowledge Management*, Vol. 2 No. 2, pp. 28-35.
- Miles, I. (1993), "Services in the new industrial economy", *Futures*, Vol. 25 No. 6, pp. 653-672.
- Minsky, M. (1974), *A framework for representing knowledge*, Massachusetts Institute of Technology, <http://dspace.mit.edu/bitstream/handle/1721.1/6089/AIM-306.pdf?sequence=2>
- Mittelman, J.H. (Ed.) (1996), *Globalization: critical reflections*, Lynne Rienner, Boulder, CO.
- Mohamed, M., Murray, A. and Mohamed, M. (2010), "The role of information and communication technology (ICT) in mobilization of sustainable development knowledge: a quantitative evaluation", *Journal of Knowledge Management*, Vol. 14 No. 5, pp. 744-758.
- Moorman, C., Zaltman, G. and Deshpande, R. (1992), "Relationships between providers and users of market research: the dynamics of trust within and between organizations", *Journal of marketing research*, Vol. 29 No. 3, pp. 314-329.
- Ng, J.J. and Li, K.X. (2003), "Implications of ICT for knowledge management in globalization", *Information management & computer security*, Vol. 11 No. 4, pp. 167-174.
- Nonaka, I. and Takeuchi, H. (1995), *The knowledge-creating company: How Japanese companies create the dynamics of innovation*, Oxford university press, Cambridge.
- Nunnally, J. (1978), *Psychometric methods*, McGraw-Hill, New York.

- Oltra, V. (2005), Knowledge management effectiveness factors: the role of HRM, *Journal of Knowledge Management*, Vol. 9 No. 4, pp. 70-86.
- Pablos, P.O.D. and Lytras, M.D. (2008), “Competencies and human resource management: implications for organizational competitive advantage”, *Journal of Knowledge Management*, Vol. 12 No. 6, pp. 48-55.
- Palvalin, M., Lönnqvist, A., & Vuolle, M. (2013), “Analysing the impacts of ICT on knowledge work productivity”, *Journal of Knowledge Management*, Vol. 17 No. 4, pp. 545-557.
- Payne, A. and Frow, P. (2005), “A strategic framework for customer relationship management”, *Journal of marketing*, Vol. 69 No. 4, pp. 167-176.
- Pfeffer, J. and Sutton, R. I. (2013), *“The knowing-doing gap: How smart companies turn knowledge into action”*, Harvard Business Press, Cambridge.
- Polanyi, M. (1966), *The tacit dimension*, Routledge and Kegan Paul, London.
- Quinn, J.B. (1999), “Strategic outsourcing: leveraging knowledge capabilities”, *MIT Sloan Management Review*, Vol. 40 No. 4, pp. 9-21.
- Reagans, R. and McEvily, B. (2003), “Network structure and knowledge transfer: The effects of cohesion and range”, *Administrative science quarterly*, Vol. 48 No. 2, pp. 240-267.
- Roberts, J. (2000), “From know-how to show-how? Questioning the role of information and communication technologies in knowledge transfer”, *Technology Analysis & Strategic Management*, Vol. 12 No. 4, pp. 429-443.
- Robertson, M. and O’Malley Hammersley, G. (2000), “Knowledge management practices within a knowledge-intensive firm: the significance of the people management dimension”, *Journal of European Industrial Training*, Vol. 24 No. 2/3/4, pp. 241-253.
- Rubenstein-Montano, B., Liebowitz, J., Buchwalter, J., McCaw, D., Newman, B., Rebeck, K. and Team, T.K.M.M. (2001), “A systems thinking framework for knowledge management”, *Decision support systems*, Vol 31 No. 1, pp. 5-16.
- Salojärvi, S., Furu, P. and Sveiby, K.-E. (2005), “Knowledge management and growth in Finnish SMEs”, *Journal of Knowledge Management*, Vol. 9 No. 2, pp. 103-22.
- Saviano, M. and Caputo, F. (2013), “Managerial choices between Systems, Knowledge and Viability”, in Barile, S. (Ed.), *Contributions to theoretical and practical advances in management. A Viable Systems Approach (vSA)*, Aracne, Roma, pp. 219-242.
- Schulze, A. and Hoegl, M. (2006), “Knowledge creation in new product development projects”, *Journal of Management*, Vol. 32 No. 2, pp. 210-236.
- Schumacker, R.E. and Lomax, R.G. (2004), *A beginner’s guide to structural equation modeling*, Psychology Press, London.
- Schweitzer, F., Fagiolo, G., Sornette, D., Vega-Redondo, F., Vespignani, A. and White, D. R. (2009), “Economic networks: The new challenges”, *Science*, Vol. 325 No. 5939, 422-439.
- Senge, P.M. (2006), *The fifth discipline: The art and practice of the learning organization*, Broadway Business, London.
- Senge, P.M. (2014), *The fifth discipline fieldbook: Strategies and tools for building a learning organization*, Crown Business, London.
- Seufert, A., Von Krogh, G. and Bach, A. (1999), “Towards knowledge networking”, *Journal of knowledge management*, Vol. 3 No. 3, pp. 180-190.

- Sharma, R.S., Ng, E. W., Dharmawirya, M. and Keong Lee, C. (2008), "Beyond the digital divide: a conceptual framework for analyzing knowledge societies", *Journal of Knowledge Management*, Vol. 12 No. 5, pp. 151-164.
- Shih, H.A. and Chiang, Y.H. (2005), "Strategy alignment between HRM, KM, and corporate development", *International Journal of Manpower*, Vol. 26 No. 6, pp. 582-603.
- Simonin, B.L. (1997), "The importance of collaborative know-how: An empirical test of the learning organization", *Academy of management Journal*, Vol. 40 No. 5, pp. 1150-1174.
- Smith, E.A. (2001), "The role of tacit and explicit knowledge in the workplace", *Journal of knowledge Management*, Vol. 5 No. 4, pp. 311-321.
- Soliman, F. and Spooner, K. (2000), "Strategies for implementing knowledge management: role of human resources management", *Journal of knowledge management*, Vol. 4 No. 4, pp. 337-345.
- Sparrow, P. (2006), "7 Global knowledge management and HRM", in Stahl, G.K. and Björkman, I. (eds.), *Handbook of research in international human resource management*, Edward Elgar, Cheltenham, UK pp. 113-140.
- Spender, J.C. (1996), "Making knowledge the basis of a dynamic theory of the firm", *Strategic management journal*, Vol. 17 No. S2, pp. 45-62.
- Sullivan, P.H. (1998), *Profiting from intellectual capital: extracting value from innovation*, John Wiley & Sons, New York.
- Swart, J. and Kinnie, N. (2003), "Sharing knowledge in knowledge-intensive firms", *Human resource management journal*, Vol. 13 No. 2, pp. 60-75.
- Tapscott, D., and Caston, A. (1993), *Paradigm Shift: The New Promise of Information Technology*, McGraw-Hill, Inc., New York
- Teece, D.J. (1998), "Capturing value from knowledge assets: The new economy, markets for know-how, and intangible assets", *California management review*, Vol. 40 No. 3, pp. 55-79.
- Teece, D.J. (2001), "Strategies for managing knowledge assets: the role of firm structure and industrial context", in Nonaka, I. and Teece, D.J. (Eds), *Managing Industrial Knowledge. Creation, Transfer and Utilization*, Sage, London, pp. 125-44.
- Tsai, W. (2001), "Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance", *Academy of management journal*, Vol. 44 No. 5, pp. 996-1004.
- Tseng, S.M. (2010), "The correlation between organizational culture and knowledge conversion on corporate performance", *Journal of knowledge management*, Vol. 14 No. 2, pp. 269-284.
- Tsoukas, H. (1996), "The firm as a distributed knowledge system: a constructionist approach", *Strategic management journal*, Vol. 17 No. S2, pp. 11-25.
- Van Beveren, J. (2002), "A model of knowledge acquisition that refocuses knowledge management", *Journal of knowledge management*, Vol. 6 No. 1, pp. 18-22.
- van den Hooff, B. and De Ridder, J. A. (2004), "Knowledge sharing in context: the influence of organizational commitment, communication climate and CMC use on knowledge sharing", *Journal of knowledge management*, Vol. 8 No. 6, pp. 117-130.
- Van Der Velden, M. (2002), "Knowledge facts, knowledge fiction: the role of ICTs in knowledge management for development", *Journal of International Development*, Vol. 14 No. 1, pp. 25-37.
- Varun Grover, T.H.D. (2001), "General perspectives on knowledge management: Fostering a research agenda", *Journal of management information systems*, Vol. 18 No. 1, pp. 5-21.

- Walsham, G. (2001), "Knowledge Management: The Benefits and Limitations of Computer Systems", *European Management Journal*, Vol. 19 No. 6, pp. 599-608.
- Westen, D. and Rosenthal, R. (2003), "Quantifying construct validity: two simple measures", *Journal of personality and social psychology*, Vol. 84 No. 3, pp. 608-623.
- Wiig, K.M. (1993), *Knowledge management foundations: Thinking about thinking-how people and organizations create, represent, and use knowledge*, Schema Press, Arlington.
- Wong, K.Y. and Aspinwall, E. (2004), "Characterizing knowledge management in the small business environment", *Journal of Knowledge Management*, Vol. 8 No. 3, pp. 44-61.
- Wright, P.M., McMahan, G.C. and McWilliams, A. (1994), "Human resources and sustained competitive advantage: a resource-based perspective", *International journal of human resource management*, Vol. 5 No. 2, pp. 301-326.
- Yahya, S. and Goh, W.K. (2002), "Managing human resources toward achieving knowledge management", *Journal of knowledge management*, Vol. 6 No. 5, pp. 457-468.
- Yew Wong, K. (2005), "Critical success factors for implementing knowledge management in small and medium enterprises", *Industrial Management & Data Systems*, Vol. 105 No. 3, pp. 261-279.
- Zack, M.H. (1999), "Developing a knowledge strategy", *California management review*, Vol. 41 No. 3, pp. 125-145.

APPENDIX 1

Items used to investigate the independent and mediating variables

Knowledge acquisition

KAC: Employees of this organisation are active in an external professional network or association
KAC₂: This organisation actively collects information about needs and wishes of clients
KAC₃: If important knowledge is not available, we buy it (i.e. advisers, licences)
KAC₄: If needed, our organisation hires new staff members who possess missing knowledge
KAC₅: Our organisation does research (i.e. with universities) to explore future chances/possibilities
KAC₆: Employees regularly follow courses, training programs and seminars to remain informed
KAC₇: We consider our competitors as a source of inspiration for developing new methods/approaches

Knowledge documentation

KDO₁: We frequently make use of brainstorming sessions to find solutions for problems we meet
KDO₂: Failures and successes are evaluated and ‘lessons learned’ are set down
KDO₃: This organisation has at its disposal up-to-date handbooks, which are frequently used
KDO₄: Our organisation informs its members systematically of changes in procedures, handbooks, etc.
KDO₅: Our organisation has documented the specific knowledge and skills of individual members
KDO₆: Experts are urged to make explicit the methods they use in a step-by-step description

Knowledge transfer

KTR₁: New employees are assigned a mentor who helps them find their way in the organisation
KTR₂: Much knowledge is distributed in informal ways (‘in the corridors’)
KTR₃: There are regular meetings being organised in which professional matters are discussed
KTR₄: Colleagues inform each other regularly about positive experiences and successful projects
KTR₅: We have a peer review process in place whereby members discuss their methods of working
KTR₆: Employees change jobs regularly, thus distributing their know-how

Knowledge creation

KCR₁: Performance is assessed regularly, and discussed in individual assessment meetings
KCR₂: Problems, failures, and doubts are discussed openly in our organisation
KCR₃: New ideas and insights lead, if necessary, to redesign of business processes and work methods
KCR₄: Employees are assigned to new projects depending on know-how and availability
KCR₅: Employees are assessed and rewarded for developing new knowledge and testing new ideas
KCR₆: We have learning groups, where members can discuss their work experiences and strategies
KCR₇: Important issues are explored using scenario or simulation techniques

Knowledge application

KCR₁: Selling knowledge, products, or services gets explicit attention
KCR₂: Employees promote new knowledge (products and services) externally in the market
KCR₃: Experiences of clients are used to improve products and services
KCR₄: We use existing know-how in a creative manner for new applications
KCR₅: Employees promote new knowledge (products and services) internally

Human Resources willingness and training to collaboration and value co-creation

HRC₁: Employees are oriented to collaborate and to share information to solve company’s problem

HRC₂: Employees are usual involved in team groups to improve their capabilities to collaborate and to share information

HRC₃: Company encourages information sharing and collaboration among the employees

HRC₄: Company organises activities, projects, or pathways to enforce the employees' orientation to collaborate and co-create value

HRC₅: Company's activities and plans require a strong interaction and collaboration among the human resources